

Consultation Report

Appendix 4.6 Consultation banners



Lake Lothing
**THIRD
CROSSING**

Welcome to the Lake Lothing Third Crossing Consultation

Suffolk County Council is seeking your views on our proposals for a new crossing over Lake Lothing in Lowestoft.

This is an important and exciting point in the development of the project and major step forward in the delivery of a much-needed piece of infrastructure for Lowestoft and the Eastern Region.

The crossing design not only focuses on its functionality, but also its look and potential to become a new emblem for the town.

The objectives of the Lake Lothing Third Crossing are therefore to:



Reduce community severance between north and south Lowestoft



Open up opportunities for regeneration and development in Lowestoft



Provide the capacity needed to accommodate planned growth.



Improve bus journey times and reliability



Encourage people to walk and cycle, and reduce conflict between cyclists, pedestrians and other traffic



Reduce congestion in the town centre and improve accessibility



Reduce congestion and delay on the existing bridges over Lake Lothing



Reduce accidents

In March 2016, the government committed **£73.4m** to construct a new bridge across Lake Lothing.

The project is predicted to cost in the region of **£100m** (2020 prices) including contingencies. The difference between the government funding and the remaining cost will be underwritten by Suffolk County Council.



Lake Lothing
**THIRD
CROSSING**

What we are proposing

The Lake Lothing Third crossing consists of a multi-span single carriageway bridge from Waveney Drive on the south side, to Peto Way on the north side.

The crossing will be 12 meters above high tide levels, significantly higher than the A47 Bascule Bridge, enabling a larger number of vessels to pass under the new crossing without the need for it to open.

The proposed design includes new roundabouts to the north and south of the lake to help connect the traffic smoothly into the existing road network as well as public spaces for people to enjoy. The crossing includes provision for pedestrians and cyclists.

Changes to the existing road layout include a new access from Waveney Drive to Riverside Business Park and closure of Durban Road at its junction with Waveney Drive.



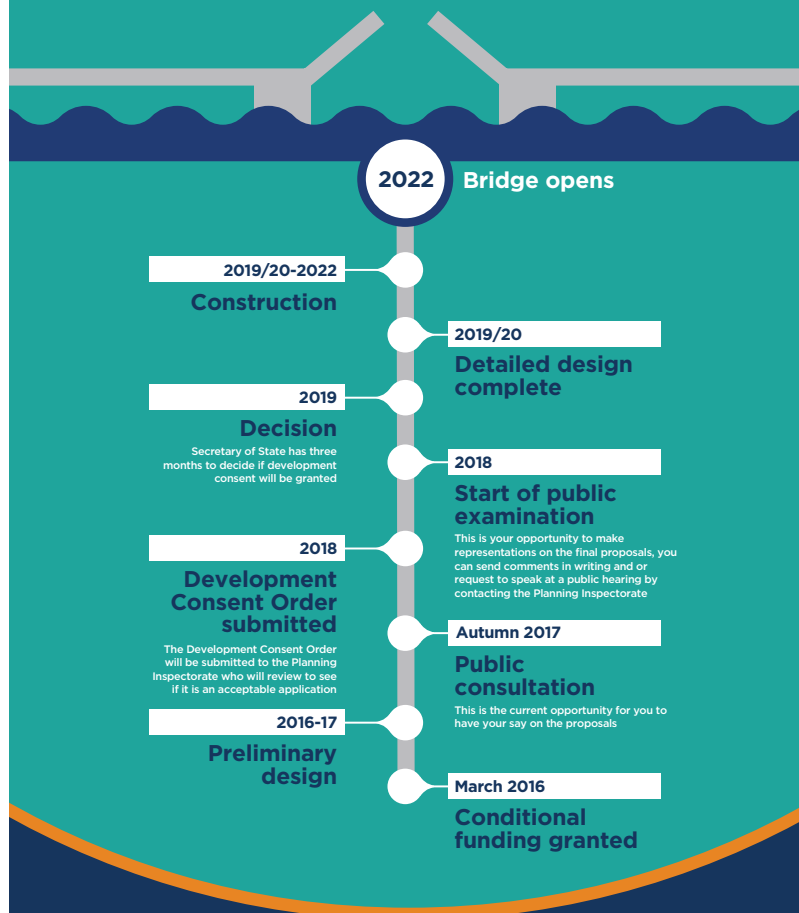


Why we are consulting

The Secretary of State for Transport has directed that the Lake Lothing Third Crossing be treated as a project of national significance for the purposes of the Planning Act 2008 requiring a Development Consent Order (DCO) to construct, operate and maintain the project.

This consultation is a statutory requirement that must be completed as part of our DCO application. Feedback received from this consultation will help shape the development of the final project proposals and be documented in a Consultation Report which will be submitted alongside our application for development consent.

The Planning Inspectorate will examine the application and make a recommendation to the Secretary of State for Transport, who will decide whether or not the project will go ahead. We currently intend to make our application for development consent in early 2018.





Northern Layout

The project will be designed to integrate into the wider townscape and road network to provide more reliable journeys for drivers, pedestrians and cyclists.

The project will see two new roundabouts on the north side of the lake to connect to Peto Way. The existing roundabout at the junction of Rotterdam Road and Denmark Road will also be reconstructed.

The design will include a dedicated left lane on Peto Way for those travelling east towards Denmark Road, which will utilise the existing road following construction of the new roundabout.

The northern landing point presents an opportunity to create a new public space alongside landscaping and environmental improvements.





Southern Layout

Traffic modelling shows that to adequately cope with predicted traffic flows on the approach to the Third Crossing from the south, a roundabout is required at the junction of Waveney Drive and Riverside Road.

There is not enough space to accommodate an appropriately sized roundabout within existing highway land, so land is required from adjacent properties and Durban Road is proposed to be closed at its junction with Waveney Drive.

Access to and from Durban Road at this location will however continue for cyclists and pedestrians and a turning point will be added to Durban Road to allow vehicles to turn in the road.

The carriageway between the new roundabout and Tom Crisp Way will be widened to become a dual carriageway with a central reserve.





Riverside Road

To achieve the necessary height over the lake, the new crossing will start rising from the current Riverside Road/Waveney Drive traffic lights. This will sever access to Riverside Business Park, via Canning Road, therefore a new access road from Waveney Drive west of Riverside Road will be built to continue to provide access to the Business Park.

This new road will connect to the retained section of Riverside Road at the northern entrance to Waveney District Council offices. A new access road will also be provided from this section of Riverside Road to serve the businesses off Canning Road and those that front Waveney Drive.

This road will also include pedestrian and cycle facilities, and could include tree planting.





Traffic impacts

Computer-based transport modelling has been used to assess the potential impacts of the new crossing and how it will change the traffic movements across Lowestoft. It also considers the additional increase in traffic flows associated with developments coming forward in the area up to 2037 (15 years after project opening).

The model was created using a range of data sources such as road traffic surveys, predictions of development in the town and information on road layout, dimensions and speeds.

The key findings from the modelling are:



There are increases in traffic flows on routes to the new bridge (Peto Way, Rotterdam Road, Waveney Drive and Tom Crisp Way).



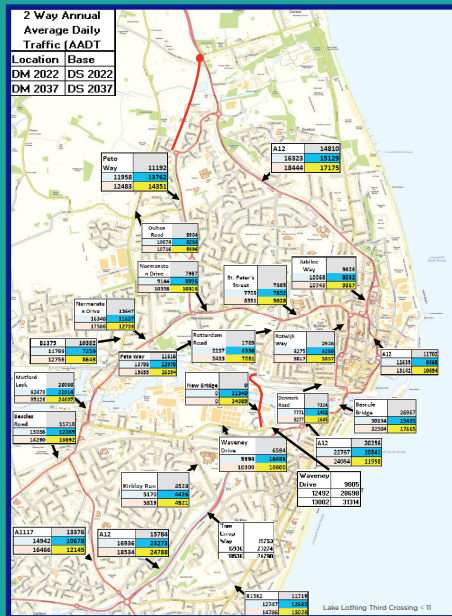
Traffic from the two existing bridges re-routes to use the new crossing, for journeys where a central crossing of the lake is more convenient and quicker for their journey



Traffic flows drop significantly on the two existing bridges (by at least a third)



Traffic journey times and network efficiency across the town improve considerably





Lake Lothing
**THIRD
CROSSING**

Land Acquisition

The delivery of the Lake Lothing Third Crossing requires the acquisition of, or access to, land which is owned or occupied by a number of third parties and includes statutory undertakers such as Network Rail, ABP and other parties such as Waveney District Council, as well as a limited number of private individuals.

As part of this consultation a plan of the land currently assessed as being required for the project's construction, operation and maintenance has been produced. This is known as the red line boundary.

The image below shows the red line boundary and the three main construction compounds required temporarily for construction of the project.





Environmental impacts

We aim to limit the impacts on the environment, local communities, local businesses, road users and residents where possible to do so.

The project requires an Environmental Statement (ES) within our application for development consent. A Preliminary Environmental Information Report is available for review today. This gives information about the potential environmental effects and potential measures to reduce these. A brief summary is below.

Air quality	Significant effects on air quality are not predicted during construction. An assessment for the operational phase will be provided in the ES, however it is known the scheme will reduce traffic at the A47 Bascule Bridge where the poorest air quality in Lowestoft is found.
Cultural heritage	It is not predicted that there will be any impact on buried archaeology and impacts on heritage assets, such as listed buildings, are predicted to be of slight significance only.
Visual impact	The new crossing will be visible from a number of locations around Lake Lothing and the wider area of Lowestoft. A number of viewpoints have been selected and an assessment will be provided in the ES.
Biodiversity and nature	At this stage, it is not considered that sites considered to be of ecological importance will be significantly affected.
Geology, Soils and Contamination	We are currently undertaking ground investigations which will determine the nature any contamination present. Construction methodologies will be designed to deal with any contamination found.
Noise and vibration	Baseline readings for noise have been undertaken. The preliminary assessment shows there could be some significant effects on nearby residents during construction. An assessment for the operational phase will be provided in the ES.
Materials	As part of the on-going ground investigations management of waste and materials will be assessed and confirmed in the ES.
Private Assets	Impacts have been identified on a number of private landowners and businesses, including ABP and Network Rail. We are seeking to understand the impacts better by working with those effected. A vessel simulation has been undertaken
Socio-economics	A peak construction workforce of around 100 workers per day is predicted. Through the procurement process to appoint a design and build contractor, we will ensure that the use of local workforce and suppliers is embedded. Once operational, the project will benefit connectivity in the town, increasing accessibility to community buildings, and benefit cyclists and pedestrians.
Water environment	The assessments have not identified any significant effects to date in relation to pollution, groundwater flows or patterns of erosion and deposition of sediments, although this will be refined if further information on the nature of the ground/sediments becomes available.
Flood Risk	This project does not significantly increase the risk of flooding elsewhere.
Traffic and Transport	Temporary road works will be necessary during construction. Once completed, congestion at the existing crossings will be reduced. There will be an increase in traffic on approach roads to the crossing.
Cumulative effects	The assessments carried out on this project consider the effects in combination with other projects including the new tidal barrier. No significant effects are predicted.



Lake Lothing
**THIRD
CROSSING**

Have your say

The consultation is your opportunity to express your views on the project.

This is a significant project for Lowestoft and it is important we gather feedback to help ensure a well-considered and robust application is submitted to the Planning Inspectorate.

This consultation will run for six weeks from Monday 4 September to Monday 16 October 2017.

You can use the following methods to respond to the public consultation:



Complete a questionnaire today



Go online to access the consultation documents and fill out a questionnaire at:
www.suffolk.gov.uk/lakelothing3rdcrossing



Send completed questionnaires or other feedback to us at:

**LL3X Consultation Team
Freepost RTUL-KAKE-BCTR
PO Box 73943 (Lake Lothing)
London
EC4P 4HN**



Drop your completed questionnaire at Lowestoft, Oulton Broad and Kessingland Libraries, the council offices at Riverside, Waveney District Council's Marina Customer Service Centre or Suffolk County Council's Endeavour House in Ipswich.



Email lakelothing3rdcrossing@suffolk.gov.uk

Consultation Report Appendix
4.7

Preliminary Environmental Information Report
(PEIR)

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The Lake Lothing Third Crossing, Lowestoft Development Consent Order



Lake Lothing
**THIRD
CROSSING**

Document: Preliminary Environmental Information Report

**Planning Act 2008 and 'The Infrastructure Planning (Environmental Impact
Assessment) Regulations 2009'**

For Consultation

Author: Suffolk County Council

Date: August 2017

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Acronyms

ALC	Agricultural Land Classification
IAQM	Air Quality Management
AQMAs	Air Quality Management Areas
AEP	Annual Exceedance Probability
AAP	Area Action Plan
ACM	Asbestos Containing Material
ABP	Associated British Ports
AMDS	Atmospheric dispersion model
BMV	Best and Most Versatile
BAP	Biodiversity Action Plan
BS	British Standard
CO₂	Carbon Dioxide
CD	Chart Datum
CIEEM	Chartered Institute of Ecology and Environmental Management
CMS	Construction Method Statements
CoCP	Construction Code of Practice
CTMP	Construction Traffic Management Plan
CoPA	Control of Pollution Act 1974
CWS	County Wildlife Sites
CROW	Countryside Rights of Way
CEA	Cumulative Effects Assessment
Db	Decibel
DEFRA	Department for Environment Food and Rural Affairs
DCLG	Department for Communities and Local Government
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DCO	Development Consent Order
DSM	Digital Surface Modelling
ECI	Early Contractor Involvement
EA	Environmental Agency
EAR	Environmental Appraisal Report
EIA	Environmental Impact Assessment
IEMA	Environmental Management

EPA	Environmental Protection Act 1990
ES	Environmental Statement
EQS	Environmental Quality Standards
EEA	European Economic Area
FDGiA	Flood Defence Grant in Aid
FRA	Flood Risk Assessment
GI	Geotechnical Site Investigations
GDD	Groundwater Daughter Directive
HAT	Highest Astronomical Tide
HER	Historic Environment Record
HLC	Historic Landscape Characterisation
HDV	Heavy Duty Vehicle
HC	Hydrocarbons
IMD	Index of Multiple Deprivation
IAN's	Interim Advice Notes
LAQM	Local Air Quality Management
LCA	Local Character Areas
LDO	Local Development Order
LNR	Local Nature Reserve
LAT	Lowest Astronomical Tide
LOAEL	Lowest Observed Adverse Effect Level
LNSR	Lowestoft Northern Spine Road
MCHW	Manual of Contract Documents for Highway Works
MMO	Marine Management Organisation
MW	Megawatts
NAEI	National Atmospheric Emissions Inventory
NHLE	National Heritage List for England
NPPF	National Planning Policy Framework
NPS	National Policy Statements
NNNSP	National Networks National Policy Statement
NSIPs	Nationally Significant Infrastructure Projects
NERC	Natural Environment and Rural Communities
NPSE	Noise Policy Statement for England
ONS	Office for National Statistics

OS	Ordnance Survey
OBS	Outline Business Case
PM	Particulate Matter
PPV	Peak Particle Velocity
	Personal Injury Collision
PINS	Planning Inspectorate
	Planning Policy Guidance
PPS	Planning Policy Statements
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
PVB	Present Value of Benefit
RFC	Ratio of Flow to Capacity
SM	Scheduled Monuments
SoS	Secretary of State
SWMP	Site Waste Management Plans
SRN	Strategic road Network
SLRR	South Lowestoft Relief Road
SAC	Special Area of Conservation
SPA	Special Protection Area
SOAEL	Significant Observed Adverse Effect Level
SuDS	Sustainable Drainage Systems
SCC	Suffolk County Council
PINS	The Planning Inspectorate
TPH	Total Petroleum Hydrocarbons
TA	Transport Assessment
TRA	Traffic Reliability Area
TEN-T	Trans European Network–Transport
TUBA	Transport User Benefit Appraisal
UKBAP	UK Biodiversity Action Plan
UKPN	UK Power Networks
VDV	Vibration Dose Value
WFD	Water Framework Directive
WDC	Waveney District Council
WCA	Wildlife and Countryside Act

WIMBY

What's in My Backyard'

ZTV

Zone of Theoretical Visibility

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1 Introduction

1.1 Background

1.1.1 WSP has been appointed by Suffolk County Council (SCC) to prepare Preliminary Environmental Information (PEI) in the form of a Preliminary Environmental Information Report (PEIR) for the Environmental Impact Assessment (EIA) for the proposed Lake Lothing Third Crossing (hereinafter referred to as the “proposed scheme”).

1.1.2 The proposed scheme involves the construction, operation and maintenance of a new bascule bridge highway crossing of Lake Lothing in Lowestoft. If constructed, the proposed scheme would include the following:

- A new single carriageway road crossing of Lake Lothing, consisting of a multi-span bridge which comprises:
 - an opening bascule bridge over Lake Lothing, in the Port of Lowestoft;
 - a bridge over the East Suffolk Line, and reinforced earth embankment joining that bridge to the C971 Peto Way between Rotterdam Road and Barnards Way;
 - a bridge over the northern end of Riverside Road providing access to existing commercial property, and
 - a reinforced earth embankment following the alignment of Riverside Road to a remodelled junction with the B1531 Waveney Drive;
- The closure of Durban Road at its junction with Waveney Drive
- A new access road from Waveney Drive west of Riverside Road to provide access to existing property at Riverside Business Park that would otherwise become inaccessible due to changes in level on Riverside Road;
- Dedicated provision for cyclists and pedestrians which ties into existing networks;
- Associated changes, modifications and/or improvements to the existing local highway network as informed by traffic modelling. This could include improvements within the existing highway boundary to some existing junctions within the Consultation Area (Plate 1-1).
- Works to facilitate the construction of the above elements including:
 - Creation of temporary construction sites and accesses from the public highway;
 - Provision of new utilities and services and the diversion of existing utilities; and
 - Provision of drainage, lighting and landscaping; and
- Such ancillary, incidental and consequential changes and/or improvements as are required and permitted.

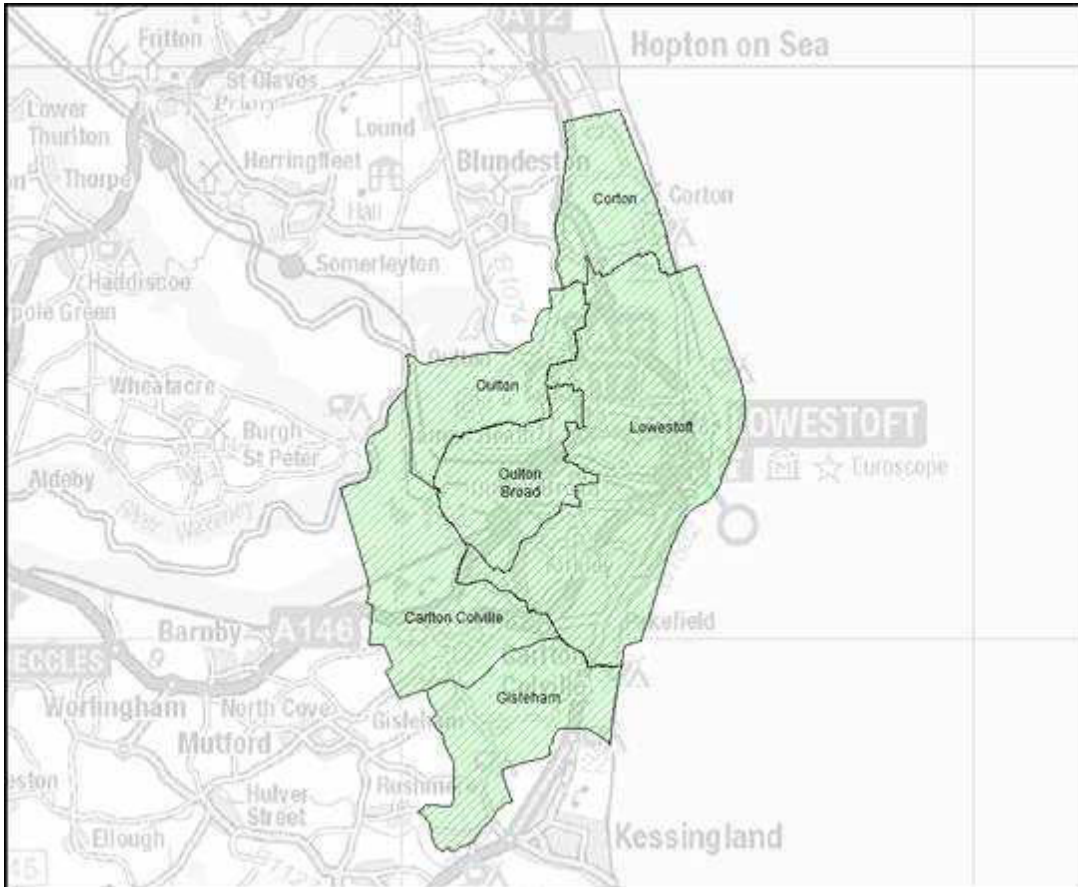


Plate 1-1 – Consultation area

1.2 Legislative & Policy Context of the Proposed Scheme

- 1.2.1 In the direction of the 22nd of March 2016¹, the Secretary of State (SoS) confirmed that he was satisfied that the proposed scheme was nationally significant for the following reasons:
- It provides a connection to/from the Trans European Network–Transport (TEN-T) and the Strategic Road Network. The TEN-T link is to the A12/A47, one of only a limited number of routes in the East of England which is recognised as such; and
 - It would act as a tactical diversion route for the strategic road network (SRN), the A12/A47 when the Bascule Bridge, a nationally recognised pinch point, is closed thereby reducing delays and congestion on the SRN;
- 1.2.2 In addition, it was the SoS’s view that the proposed scheme;
- Supports national growth potential by directly delivering over 9,000 jobs with a further 3,500 indirect jobs, thus supporting the proposed employment growth;
 - Improves connection to/from the Great Yarmouth and Lowestoft Enterprise Zone; and
 - Delivers the Port of Lowestoft’s role in being the hub for the off-shore wind farms that are part of the East Anglia Array, a major energy supplier for the UK.

¹ the Direction from the SoS and the associated qualifying request made by SCC is available on the project website - <https://www.suffolk.gov.uk/lake-lothing-3rd-crossing/>

1.2.3 Promoters of development that is the subject of a section 35 direction is required to apply to the Planning Inspectorate (PINS) for a Development Consent Order (DCO) to construct the project. In the case of the proposed scheme, the promoter and eventual applicant is SCC (“the Applicant”) and the determining authority is the SoS.

Pre-application statutory consultation

1.2.4 The Planning Act 2008 requires applicants for NSIPs to undertake pre-application consultation as follows:

- Section 42 consultation with consultees (e.g. Natural England, Environment Agency, Historic England), the local authority and landowners or those with an interest in the land;
- Section 47 consultation with the local community which should be in accordance with the Statement of Community Consultation; and
- Section 48 publicity of the application.

1.2.5 The Section 42, 47 and 48 consultations will all run in parallel from the 04/09/17 to the 16/10/17. Information about the scheme will be available on the dedicated website and a series of publicity events have been scheduled as shown in Table 3-1.

1.2.6 Section 42 of the Planning Act itself requires the applicant to consult parties and persons who have an interest in the proposals and whilst the Act does not require PEI to be provided it does require the applicant to state whether PEI is provided as part of the consultation. SCC as applicant has decided to present PEI in the form of a PEIR.

Environmental Impact Assessment

1.2.7 Under Schedule 2 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009, (hereinafter referred to as “the Regulations”), the proposed scheme qualifies as a development that may require an EIA insofar that it constitutes the “construction of roads (unless included in Schedule 1)”.

1.2.8 The need for an EIA is therefore informed by the parameters defined in Schedule 3 of the Regulations and having considered the nature of the proposed scheme, and the quality of the receiving environment, SCC is of the opinion that the development has the potential for likely significant effects upon the environment and, therefore, an EIA is required.

1.2.9 Consequently, on 28th February 2017, SCC notified the SoS under Regulation 6(1)(b) of the Regulations that it proposes to provide an Environmental Statement (ES) in respect of the proposed scheme. Therefore, in accordance with Regulation 4(2)(a) of the Regulations, the proposed scheme is determined to be EIA development.

1.2.10 Alongside the notification, SCC submitted a Scoping Report, requesting a Scoping Opinion from the SoS as to what should be included in an ES for the proposed scheme. This was duly issued on 7th April 2017. Both the Scoping Report and Scoping Opinion are available on the Planning Inspectorate’s website² and are included in Appendix 7A and 7B respectively. This PEIR has been informed by the Scoping Opinion.

1.2.11 PEI is defined in the Regulations as:

1.2.12 *“Information referred to in Part 1 of Schedule 4 (information for inclusion in environmental statements) which - (a) has been compiled by the applicant; and (b) is reasonably required to assess the environmental effects of the development (and of any associated development)”.*

² <https://infrastructure.planninginspectorate.gov.uk/projects/eastern/lake-lothing-third-crossing/?ipcsection=docs>

National Policy Statements

- 1.2.13 National Policy Statements (NPS) are produced by Government and they present the planning policy framework for all decision making for NSIPs. They also include the Government's objectives for the development of NSIPs and are produced for different types of infrastructure development, with the NPS for National Networks and the NPS for Ports pertinent to the proposed scheme.

NPS for National Networks

- 1.2.14 The NPS for National Networks (the NPS) was published in December 2014 and it sets out the Government's policy for nationally significant road and rail networks and the information that should be provided alongside any application for Development Consent in order to satisfy their requirements.
- 1.2.15 The NPS has therefore informed the assessments provided within this PEIR and where relevant the NPS is referenced and appraised within the relevant chapter.

NPS for Ports

- 1.2.16 The NPS for Ports was published in January 2012 and it sets out the Government's policy for ports and associated development such as road and rail links which are included within new Port proposals.
- 1.2.17 The proposed scheme does not provide port development. However, where aspects of the NPS for Ports are pertinent to assessments within this PEIR it has been appropriately referenced.

Communities and Local Government; Pre-Application Guidance

- 1.2.18 In March 2015 the Department for Communities and Local Government (DCLG) published a statutory guidance document on the pre-application process for NSIPs. Whilst statutory requirements for consultation are provided in the Planning Act the purpose of the guidance is to:
- advise users of the (Planning Act) regime on the processes involved in the pre-application stage;
 - guide applicants as to how the pre-application requirements of the Planning Act should be fulfilled and provide some advice on best practice;
 - inform other users of the regime, including consultees, of their roles in the pre-application process and to let them know what is expected of applicants at this stage; and
 - help ensure that the regime is transparent and accessible to all.

Planning Inspectorate Advice Notes

- 1.2.19 PINS has published a series of non-statutory Advice Notes to inform developers, consultees, the public and other interested parties about a range of procedural matters in relation to the Planning Act process. Not all of these Advice Notes are applicable to the PEIR, although those that are integral, and have informed the environmental assessment process for the proposed scheme, are discussed further below.

Advice Note seven

- 1.2.20 This Advice Note³ details the procedural requirements that apply to NSIPs which are EIA development and particularly, in the context of this PEIR, provides clarity on its role and purpose.
- 1.2.21 Advice Note seven recognises that the degree of information that is available within a PEIR is dependent upon the stage in the design process at which consultation takes place. Within this PEIR

³ Advice Note 7v4, Preliminary Environmental Information, Screening and Scoping. The Planning Inspectorate, March 2015

we have therefore presented information on the likely significant effects associated with the development of the proposed scheme, and where further studies and assessments remain, these have been clearly identified.

Advice Note nine

- 1.2.22 This Advice Note provides guidance on the use of the ‘Rochdale Envelope’; a term used to describe those elements of a scheme that have not yet been finalised but yet can be constrained within certain limits and parameters hence allowing a determination of likely significant effects to be presented in the ES.
- 1.2.23 When using the Rochdale Envelope to apply for flexibility within a DCO application, the developer should use a worst case approach to identifying likely significant effects and should incorporate mitigation accordingly within the parameters of their scheme. Greater information is included within Chapter 6 on how SCC intends to make use of the Rochdale Envelope in the consenting process for the proposed scheme

Advice Note seventeen

- 1.2.24 This Advice Note⁴ sets out the recommended approach to Cumulative Effects Assessment (CEA) for NSIP projects including guidance on the relative weight to be applied to other developments depending upon how progressed they are through the consenting process.
- 1.2.25 Greater information on the CEA is included within Chapter 20.

Advice Note eighteen

- 1.2.26 Advice Note eighteen⁵ is a recently published guidance document on the approach to coordinating the requirements of the Water Framework Directive (WFD) with the EIA process. Greater information is included in Chapter 17 and Appendix 17A.

Preliminary Environmental Information Report

- 1.2.27 The role of this PEIR is to provide consultees with preliminary information on the likely significant environmental effects of the proposed scheme based on the emerging design.
- 1.2.28 The S42 and S47 consultation that this PEIR accompanies presents the design of the proposed scheme as SCC presently prefer based upon the constraints of the corridor in which it is located. The preferred alignment will be reviewed having regard to consultation feedback and further technical analysis.
- 1.2.29 The PEIR is formed of three volumes. Volume 1 is the written statement, Volume II contains the Figures and Volume III comprises the Appendices. The format and information that is included in the PEIR is presented in Table 1-1 to Table 1-3.
- 1.2.30 PINS advice³ states that “*applicants (should) clearly explain that the information is ‘preliminary’; that the applicant is actively seeking their comments on this information; that there will be the opportunity for both the design of the proposed development; and the EIA to take into consideration any comments received through this consultation.*”
- 1.2.31 It is therefore important to confirm that the information presented within this PEIR presents the emerging conclusions on the significant environmental effects of the proposed scheme and where there is uncertainty about the degree of the impact that is anticipated, the assumptions made are clearly identified. In addition, if the uncertainty is likely to be reduced in the period between consultation and publication of the ES, then the process and studies that are to be undertaken are clearly identified.

⁴ Advice Note 17v4, Cumulative Effects Assessment, The Planning Inspectorate, December 2015

⁵ Advice Note 18v1, The Water Framework Directive. The Planning Inspectorate, June 2017

- 1.2.32 The applicant welcomes comments on the contents of this PEIR and there are opportunities to provide feedback either through the website at the consultation events, via the dedicated mailbox, or by post. Please refer to the project website for details. Once the draft DCO is submitted the application and examination documents will appear on the PINS website and from that point representations on the ES should be made to PINS directly
- 1.2.33 Following the end of consultation, the application will take account of all comments that have been received on this PEIR and undertake additional work as appropriate to finalise the ES which will form part of the application for the DCO.

Table 1-1 – Volume I – Written Statement

Chapter Number	Title
Chapter 1	Introduction
Chapter 2	Need for the Scheme
Chapter 3	Consultation
Chapter 4	Alternatives Considered
Chapter 5	The Existing Environment
Chapter 6	Description of the Proposed Scheme
Chapter 7	Scoping and Introduction to the Assessment
Chapter 8	Air Quality
Chapter 9	Cultural Heritage
Chapter 10	Townscape and Visual Impact Assessment
Chapter 11	Nature Conservation
Chapter 12	Geology, Soils and Contamination
Chapter 13	Noise and Vibration
Chapter 14	Materials
Chapter 15	Private Assets
Chapter 16	Socio Economics including Recreation
Chapter 17	Road Drainage and the Water Environment
Chapter 18	Flood Risk
Chapter 19	Traffic and Transport
Chapter 20	Cumulative Impacts

Table 1-2 – Volume II - Figures

Chapter Number	Figure Number	Figure Title
Chapter 1	Figure 1.1	Site Location Plan
Chapter 2	Not applicable	
Chapter 3	Not applicable	
Chapter 4	Figure 4.1	Alternatives considered
	Figure 4.2	Alternative Waveney Drive Access Arrangements

Chapter Number	Figure Number	Figure Title
Chapter 5	Figure 5.1	Adjacent Land Uses
	Figure 5.2	Designated Sites
Chapter 6	Figure 6.1	The Red Line and the Proposed Scheme
	Figure 6.2	Cross Sections
	Figure 6.3	Bridge Elevations
	Figure 6.4	Design considerations
	Figure 6.5	Indicative Drainage Proposal
	Figure 6.6	Indicative Construction Compound Locations
Chapter 7	Not applicable	
Chapter 8	Figure 8.1	Indicative Operational Air Quality Study Area
	Figure 8.2	Air Quality Construction Dust Assessment Area
	Figure 8.3	Air Quality Affected Links Opening Year
	Figure 8.4	Scheme Specific NO ₂ Diffusion Tube Air Quality Monitoring Locations
Chapter 9	Figure 9.1	Heritage Plan (500m buffer)
Chapter 10	Figure 10.1	Townscape Constraints
	Figure 10.2	Preliminary Zone of Theoretical Visibility (HGV Traffic)
	Figure 10.3	Preliminary Zone of Theoretical Visibility (Bridge Lowered)
	Figure 10.4	Preliminary Zone of Theoretical Visibility (Bridge Raised)
	Figure 10.5	Viewpoint Locations
	Figure 10.6 (1 of 11)	Photo Location 1
	Figure 10.6 (2 of 11)	Photo Location 2
	Figure 10.6 (3 of 11)	Photo Location 3
	Figure 10.6 (4 of 11)	Photo Location 4
	Figure 10.6 (5 of 11)	Photo Location 5
	Figure 10.6 (6 of 11)	Photo Location 6
	Figure 10.6 (7 of 11)	Photo Location 7
	Figure 10.6 (8 of 11)	Photo Location 8
	Figure 10.6 (9 of 11)	Photo Location 9
	Figure 10.6 (10 of 11)	Photo Location 10
Figure 10.6 (11 of 11)	Photo Location 11	
Chapter 11	Figure 11.1	Ecological Constraints Plan
	Figure 11.2	Extended Study Area
	Figure 11.3	Bat Survey Locations
	Figure 11.4	Reptile Survey Locations
	Figure 11.5	Bird Survey Locations
	Figure 11.6	Invertebrate and benthic survey locations

Chapter Number	Figure Number	Figure Title
Chapter 12	Figure 12.1	Historic Landfill Areas
Chapter 13	Figure 13.1	Noise monitoring locations
	Figure 13.2	Noise Important Areas
Chapter 14	Not applicable	
Chapter 15	Figure 15.1	Port of Lowestoft
Chapter 16	Figure 16.1	Socio Economic and Recreation
Chapter 17	Figure 17.1	Water Environment and Baseline Features
Chapter 18	Figure 18.1	Flood Zones 2 and 3
	Figure 18.2	Flood Model Location Points
Chapter 19	Figure 19.1	Junction Assessments and Study Area
	Figure 19.2	PRoW and Cycle Routes
	Figure 19.3	Community Assets
Chapter 20	Figure 20.1	Cumulative Impacts

Table 1-3 – Volume III - Appendices

Chapter Number	Appendix Number	Appendix Title
Chapter 1	Appendix 1A	Potential Health Assessment Topics
Chapter 2	Not Applicable	
Chapter 3	Not Applicable	
Chapter 4	Not Applicable	
Chapter 5	Not Applicable	
Chapter 6	Not Applicable	
Chapter 7	Appendix 7A	Scoping Report
	Appendix 7B	Scoping Opinion
Chapter 8	Appendix 8A	Construction Phase Assessment
	Appendix 8B	Scheme Specific Air Quality Monitoring
	Appendix 8C	Wind Rose
Chapter 9	Appendix 9A	Cultural Heritage Desk Based Assessment
	Appendix 9B	Deposit Model
	Appendix 9C	Written Scheme of Investigation (Trial Pits)
	Appendix 9D	Watching Brief Report (Quay Wall ties)
	Appendix 9E	Written Scheme of Investigation (Geoarchaeology)
Chapter 10	Not Applicable	
Chapter 11	Appendix 11A	Ecology Phase 1
	Appendix 11B	Interim Bat Survey Results
	Appendix 11C	BAP List
	Appendix 11D	Wintering Bird Survey
	Appendix 11E	HRA Screening Report
	Appendix 11F	Interim Reptile Survey
	Appendix 11G	Proposed Benthic Survey Methodology
Chapter 12	Appendix 12A	Environmental Desk Study Report Version B
Chapter 13	Appendix 13A	Construction Plant Sound Power Level Data
Chapter 14	Not Applicable	
Chapter 15	Appendix 15A	Vessel Simulation Modelling Report
Chapter 16	Not Applicable	
Chapter 17	Appendix 17A	Preliminary WFD Assessment
Chapter 18	Appendix 18A	Interim Assessment of Flooding
Chapter 19	Appendix 19A	Preliminary Transport Assessment
	Appendix 19B	Junction Capacity Analysis
Chapter 20	Not Applicable	

- 1.2.34 The requirements of Part 1 of Schedule 4 of the Regulations describes the information that needs to be included in an ES that accompanies a DCO application. Whilst this document is not a formal ES, for the benefits of clarity, we have identified in Table 1-4 where this PEIR presents this information.

Table 1-4 – Requirements of the 2009 Regulations and where in this PEIR they are met

Requirement of Part 1 of Schedule 4 of the Regulations	Location within the PEIR
Description of the development, including in particular: (a) a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases; (b) a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used; and (c) an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed development.	Chapter 6 and Chapters 8 to 20 for (c)
An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant's choice, taking into account the environmental effects.	Chapter 4
A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Chapters 8 to 20
A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects of the development, resulting from: (a) the existence of the development; (b) the use of natural resources; and (c) the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant of the forecasting methods used to assess the effects on the environment.	Chapters 8 to 20
A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Chapters 8 to 20 and
A non-technical summary of the Preliminary Environmental Information.	A separate document to this PEIR
An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information.	Chapters 8 to 20

1.3 Implementing European Directive 2014/52/EU

- 1.3.1 European Directive 2014/52/EU ("the 2014 Directive") was required to be implemented into English law by 16 May 2017. Article 3 of the 2014 Directive contained transitional provisions to allow certain projects to continue to be assessed under Directive 2011/92/EU ("the 2011 Directive"). On 18 April 2017 the Infrastructure Planning (Environmental Impact Assessment) Regulation 2017 ("the 2017 Regulations") were made, taking effect on 16 May 2017. The 2017 Regulations implemented the 2014 Directive and in Regulation 37 set out the transitional arrangements in accordance with Article 3. These continued to apply the earlier 2009 Regulations to DCO projects where before 16 May 2017 a request had already been made for a scoping opinion in relation to that project.
- 1.3.2 As a scoping opinion was requested from the SoS in February 2017 (and, indeed, the scoping opinion was issued by PINS on 7 April 2017), this PEIR has therefore been prepared on the basis that the

eventual DCO will be considered against the 2009 Regulations rather than against the 2017 Regulations.

- 1.3.3 As anticipated in the Scoping Report (for example in paragraphs 2.2.2, 2.2.5 and 2.2.6 of Appendix 7A) and recognised in the Scoping Opinion (paragraph 2.27 of Appendix B), the scheme has undergone further refinement since the Scoping stage, albeit the scheme described in this PEIR (see Chapter 6) remains fundamentally the same as that described in the Scoping Report. The Scoping Report in particular recognised that:
- the land requirements of the scheme were to be confirmed;
 - that work was ongoing in respect of the southern junction arrangements; and
 - that the scheme would involve alterations to local roads, including severing of access.
- 1.3.4 Section 5.9 of the Scoping Report identified the potential scope of the impacts of the project on private assets and confirmed that dwellings may be affected by the proposals. Further traffic modelling, and junction design work undertaken since the Scoping stage, has confirmed a larger land take is required for the southern junction, potentially affecting three neighbouring residential properties. Furthermore, it is now proposed to close Durban Road. These matters and the selection of a single leaf bascule bridge over a twin leaf are discussed further in Chapter 4, Alternatives and a preliminary assessment of these changes is considered in the relevant chapter of the PEIR, insofar as it is possible at this stage.
- 1.3.5 In respect of the 2017 Regulations, SCC notes that the SoS in issuing a Scoping Opinion (Appendix 7B) for the proposed scheme in April 2017 has set out that *“the Applicant is advised to consider the effect of the implementation of the revised Directive in terms of the production and content of the ES.”*
- 1.3.6 SCC considers that by reason of the transitional provisions expressly set out in both the 2014 Directive and the 2017 Regulations, their implementation strictly has no effect on the production or content of the proposed ES. Thus, in regulatory and procedural terms, the ES will be prepared in accordance with the Regulations. However, SCC recognises that the purpose of the 2014 Directive and the 2017 Regulations is to improve the quality of environmental information that is included in an ES. SCC will therefore review the substantive requirements of the 2017 Regulations in relation to the subject matter of each environmental topic, and will seek to present information which reflects the expectations of the 2017 Regulations. That said, in formal terms, the ES will remain an ES which had been prepared in accordance with the (2009) Regulations.
- 1.3.7 The 2017 Regulations places a number of new or expanded obligations upon an applicant for a DCO, although not all of these would be applicable to the proposed scheme. In any event SCC has considered in greater detail below the new elements within the 2017 Regulations that would be pertinent had the proposed scheme come under their remit and where appropriate has identified how this approach already addresses the requirement or why it isn't appropriate to do so.

Consideration of Alternatives

- 1.3.8 The 2017 Regulations require a “comparison” of environmental effects of the reasonable alternatives that have been studied when providing an indication of the main reasons for selecting the chosen option. As considered further in Chapter 4, the development of the alternatives include comparison of the environmental effects associated with the central, western and tunnel options as well as the option assessments associated with alternative arrangements within the proposed scheme.

Monitoring of significant effects

- 1.3.9 The 2017 Regulations require that all infrastructure such as the proposed scheme that is partially funded by Government is required to present in the first and fifth year after opening a Monitoring and Evaluation report that appraises the scheme against its objectives. This will include traffic monitoring, noise monitoring, air quality monitoring and how the landscaping and any ecological mitigation planting has established. SCC will review whether any further monitoring should be provided for, in the light of any identified significant adverse effects in the ES.

Coordination with the Habitats Regulations Assessment process

- 1.3.10 Included within Appendix 11E is a screening or threshold assessment of the proposed scheme as required by the Habitats Regulations to assess whether there are likely significant effects upon European Sites; a term given to sites of ecological importance which are designated at the European level.
- 1.3.11 This screening assessment has concluded that the proposed scheme is not likely to have a significant effect upon the European Sites and is presently being considered by the competent authority and SCC does not therefore envisage a need to include further Habitats Regulation Assessment in the ES.

The 'Do Minimum' Scenario

- 1.3.12 The 'Do Nothing' scenario, in effect the evolution of the baseline environment were the proposed scheme not to be constructed, is included where appropriate within the assessments within Chapters 8 to 20 and as identified further in Table 1-5 below.

Table 1-5 – Inclusion of the Do Nothing scenario with the assessments

Chapter	How it has been or will be addressed
Chapter 8 – Air Quality	The do nothing scenario is an intrinsic requirement of the assessment of road traffic during the operational phase in so far that the change in the future with and without the proposed scheme in place is the measure of the environmental effect. This assessment will be included in the ES.
Chapter 10 – Townscape	An assessment of the 'adjusted baseline' will be included within the ES, which, whilst not strictly the do nothing scenario, does present how the local townscape is expected to develop.
Chapter 13 – Noise	Similarly to air quality the assessment of change in road traffic noise with and without the proposed scheme in place is a fundamental part of the assessment and will be included in the ES.
Chapter 18 - Flooding	The interim assessment of flooding identifies the change in flood level that would be experienced should the proposed scheme be constructed, above the do nothing scenario.
Chapter 19 – Traffic and Transport	The traffic and transport chapter identifies the change to the highway network, including junctions that can be expected should the proposed scheme be built and the change anticipated in the future without the proposed scheme.

New Environmental Aspects

- 1.3.13 The 2017 Regulations introduce, in Part 3 of Schedule 4, environmental “factors” that are to be considered for inclusion within an ES; the 2009 Regulations refer to these as the environmental “aspects”.
- 1.3.14 The new environmental factors that have been introduced through the 2017 Regulations, compared to the environmental aspects in the 2009 Regulations are discussed in Table 1-6 below.

Table 1-6 – Environmental Factors included within the PEIR

Environmental Factors	How it has been addressed
The impact of the project upon climate change	Including within Chapter 18 is an assessment of the effects of the scheme upon flood risk as well as the risk of flooding to the scheme itself. The assessment has been undertaken in agreement with the Environment Agency and forecasts for climate change have been included within this assessment.
Land (for example land take)	Chapter 15 quantifies the extent to which businesses within the footprint of the proposed scheme will be affected. The amount of land taken from land owners will be quantified in the ES.
Climate (for example greenhouse gas emissions, impacts relevant to adaptation)	The change in greenhouse gas emissions from road transport associated with the operation of the proposed scheme will be included within Chapter 8 of the ES although it is not considered that the traffic effects of the operation of the scheme will give rise to any significant climate change consequences. Included within Chapter 18 is an assessment of how the proposed scheme will be impacted upon in the event of an extreme flood event that has been exacerbated in its magnitude as a result of climate change.
Human health	Impacts upon the effects of air quality, noise and contaminated land are included within the relevant assessments. Greater information on the topics and scope of a health assessment that has been provided by SCC is included in Appendix 1A.

- 1.3.15 In addition, the 2017 Regulations introduce in Paragraph 5 of Schedule 4 a greater number of sources (i.e. pollutants, noise, light etc.) to be considered in an ES, from which likely significant effects could result. Those that are new compared to The Regulations are included in Table 1-7.

Table 1-7 – New Sources of Environmental Effects

Environmental Factors	How it has been addressed
Risk from accidents and disasters	Natural disasters in Lowestoft are likely to be limited to those associated with flooding which are already addressed in Chapter 18. With regard to accidents, the assessments have included pollution control measures during the construction phase and within the mitigation in the noise, air quality and water environment chapters. Operational accidents, such as spillage from an HGV is included in the water environment chapter. Consideration is being given to the scope of any assessment of the likely significant effects of deliberate acts.
Demolition	The proposed scheme will not require a considerable amount of demolition during construction although where it is possible to determine this, the information will be provided in Chapter 6. Furthermore, an assessment of the decommissioning of the proposed scheme will be included within the ES.

Environmental Factors	How it has been addressed
Disposal and recovery of waste	The nature of waste that arises during both the construction and operation of the proposed scheme will be addressed within the ES in both Chapter 6; the proposed scheme and within Chapter 14: Materials.
Nature and magnitude of greenhouse gas emissions	As stated in Table 1-6, greenhouse gas emissions as a result of change in transport will be in Chapter 8.
Technologies and substances used	Whilst this requirement is more appropriate for developments that require the use of raw materials as an integral part of their process, such as chemical refineries for example, information has been included within Chapter 6 on the maintenance requirements of the proposed scheme and this is also addressed in Chapter 14: Materials.

1.3.16 A reference list of the sources used within the ES is also now a requirement of the 2017 Regulations although including footnotes of references is common practice and has been included within this PEIR.

2 Need for the Scheme

2.1 The need for the scheme

- 2.1.1 The national significance and need for the project derives from its benefit to the Strategic Road Network (SRN). For this reason, it has been identified as a project of national significance and is included in the National Infrastructure Delivery Plan 2016-2021 and its associated National Infrastructure Pipeline⁶.
- 2.1.2 Lowestoft is the eastern-most terminus of the SRN, with its end point being the Bascule Bridge. Following the detrunking of the A12 between Seven Hills near Ipswich and the A47 Bascule Bridge in 2001, access to Lowestoft via the SRN is by the A47⁷ from Great Yarmouth. Conversely, traffic wishing to access the SRN from the south is directed over the A47 Bascule Bridge.
- 2.1.3 The Department for Transport publication, Action for Roads⁸, identified capacity issues of increasing severity on the A47 south of Great Yarmouth into Lowestoft (including the A47 Bascule Bridge), with congestion predicted to be 'severe' on most of that section by 2040. A similar story is told in Annex A of the National Networks National Policy Statement (NPS)⁹.
- 2.1.4 Consequently, Highways England's 2015 Route Strategy for the East of England¹⁰ identifies river crossing capacity on the A47 at Lowestoft to be a key challenge in the region. Evidence prepared to support the Route Strategy in 2014, records that the "bascule bridge significantly influences capacity, speed and reliability of the route in Lowestoft"¹¹ and is the least reliable section of the SRN in the East of England, recording average peak (defined as Monday to Friday 7-10am and 4-7pm) speeds of less than 20mph. However, no solutions were put forward to resolve this.
- 2.1.5 Consequently, by providing additional north-south capacity across Lake Lothing the proposed scheme addresses these issues by improving journey times through the SRN in Lowestoft and increasing network resilience. At the Outline Business Case stage this was demonstrated by a BCR of 8.08, meaning the proposed project is very high value for money.
- 2.1.6 The historic need for the Project can further be traced back to the 1989 Roads for Prosperity White Paper as part of a scheme that included the South Lowestoft Relief Road (SLRR) and the Lowestoft Northern Spine Road (LNSR). The SLRR was promoted and constructed by SCC, and opened to traffic in 2007. A similar arrangement has followed for the LNSR which opened in 2015. There now therefore remains a central gap of less than 650m between these two roads, as the crow flies, but the actual driving distance (via the A47 Bascule Bridge) is nearly 2km. A new crossing of Lake Lothing, effectively linking these highway schemes, is the crucial remaining piece of the jigsaw.
- 2.1.7 Bridging this gap is not only important for the efficient functioning of the SRN, but to more widely address the congestion and severance within Lowestoft, caused by the current arrangement of crossing points of Lake Lothing. In turn, improved accessibility throughout the town, to the Port of Lowestoft and to key redevelopment sites identified with the Lake Lothing and Outer Harbour Area Action Plan, enhances the opportunities for regeneration, investment in the Port and fully realising the growth potential of the Great Yarmouth and Lowestoft Enterprise Zone.

⁶ <https://www.gov.uk/government/publications/national-infrastructure-pipeline-2016>

⁷ The A12(N) from Lowestoft to Great Yarmouth was renumbered as the A47 in March 2017

⁸ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212590/action-for-roads.pdf

⁹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf

¹⁰ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416730/East_of_England.pdf

¹¹ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364207/East_of_England.pdf

2.1.8 The Direction from the SoS, and the associated qualifying request made by SCC, is available on the project website¹.

3 Consultation

3.1 Non-statutory Consultation

Consultation undertaken

3.1.1 The following organisations were contacted or consulted prior to submission of the Scoping Report (Appendix 7A) and consultation has been ongoing since then in order to gather further information regarding environmental constraints and other considerations:

- The Planning Inspectorate (PINS);
- Suffolk County Council (SCC) planning department;
- SCC Archaeology Officer;
- SCC Landscape Officer;
- Waveney District Council (WDC) planning department;
- WDC Landscape Officer;
- SCC Senior Ecologist;
- Waveney District Council (WDC) Environmental Health;
- Natural England;
- Environment Agency;
- Highways England;
- Associated British Ports (ABP);
- Network Rail;
- Anglian Water;
- UK Power Networks (UPKN);
- National Grid;
- Marine Management Organisation (MMO); and
- Historic England.

3.1.2 In addition to those above the following have responded to the Scoping Report;

- Civil Aviation Authority;
- Great Yarmouth Borough Council;
- Health and Safety Executive;
- National Air Traffic Services;
- Norfolk County Council;
- Public Health England;
- Royal Mail;
- Suffolk Coastal District Council;

- Suffolk Fire and Rescue; and
- Trinity House.

3.2 Public Consultation

- 3.2.1 Public consultation as per the requirements and process described in Sections 42, 47 and 48 of the Planning Act will run from the 04/09/17 to the 16/10/17.
- 3.2.2 The Applicant (SCC) will advertise and participate in the following consultation events that are detailed in Table 3-1 that will give the public an opportunity to comment upon the proposed scheme including the PEIR.

Table 3-1 – Consultation event programme

Consultation Event Venue	Date	Time
Gunton Estate Community Hall, Hollingsworth Road Lowestoft Suffolk NR32 4AY	Tuesday 5 September 2017	12 noon – 7pm
Lowestoft Library, Clapham Road South Lowestoft Suffolk NR32 1DR	Saturday 9 September 2017	10.30am – 4.30pm
Kessingland Library, Marram Green, Hall Road Kessingland Suffolk NR33 7AH	Tuesday 12 September 2017	2.30pm – 7:30pm
Kirkley Centre, 154 London Rd S, Lowestoft NR33 0AZ	Thursday 14 September 2017	1pm – 7.30pm
Waveney District Council, Council Offices, Riverside, 4 Canning Road Lowestoft Suffolk NR33 0EX	Friday 22 September 2017	2pm – 7pm
Commodore Mission Hall, 26 Gorleston Rd, Oulton Broad, Lowestoft NR32 3AG	Monday 25 September 2017	2pm – 7pm
St Marks Church, Bridge Road, Oulton Broad, Lowestoft, NR33 9JX	Friday 29 September 2017	1pm – 7pm

- 3.2.3 The outcomes and feedback from the public consultation will be incorporated into the ES as appropriate when the DCO application is submitted.

4 Alternatives Considered

4.1 Introduction

- 4.1.1 This chapter outlines the alternative scheme options that have been considered. The Regulations, in Schedule 4, Part 1, and Paragraph 18 states that an ES must include: *“An outline of the main alternatives studied by the applicant and an indication of the main reasons for the applicant’s choice, taking in to account the environmental effects.”*
- 4.1.2 SCC has opted to provide this information within the PEIR to provide as much information as possible on the rationale behind the design and to present the decision making process that has been followed.
- 4.1.3 This chapter therefore provides an outline of what options and alternatives to the proposed scheme have been considered to date, and where the environmental effects have been considered, this is duly noted. As stated in paragraph 1.3.8 the requirements of the 2017 Regulations relating to the consideration of alternatives has been addressed within the information presented in Chapter 4.
- 4.1.4 Four types of alternatives have been considered to date:
- The broad location of the proposed scheme i.e. an eastern, western or central crossing of Lake Lothing;
 - The constraints associated with the chosen option corridor;
 - Waveney Drive Access Arrangements; and
 - Bascule Bridge Design Alternatives.
- 4.1.5 At the outset of the Outline Business Case (OBC) stage of the development of the proposed scheme in 2015, a number of scheme objectives were identified and a series of alternative options were developed and are discussed in detail below.
- 4.1.6 A total of 15 high level options were considered using criteria which reflected the ambitions and objectives of the scheme. As this chapter will illustrate, the decision to progress the central option is the result of assessments that strived to ensure the chosen scheme performed well in economic, social and environmental terms, resulting in the selection of the optimised solution.
- 4.1.7 Once the optimised solution had been identified, it has undergone further design to identify the preferred junction arrangements at the north and the south of the proposed scheme and this chapter provides an outline of the types of junctions that have been considered and the reasons for the arrangements that are presented within Figure 6.1 to 6.3.

4.2 Study Options (OBC Stage)

- 4.2.1 The overall aim of the proposed scheme at the outset of the development of the OBC was “to stimulate regeneration, sustain economic growth, and enhance Lowestoft as a place to live and work in, and to visit”. The specific proposed scheme objectives set in 2015 were:
- To open up opportunities for regeneration and development in Lowestoft;
 - To provide the capacity needed to accommodate planned growth;
 - To reduce community severance between north and south Lowestoft;
 - To reduce congestion and delay on the existing bridges over Lake Lothing;
 - To reduce congestion in the town centre and improve accessibility;
 - To encourage more people to walk and cycle, and reduce conflict between cycles, pedestrians and other traffic;

- To improve bus journey times and reliability; and
 - To reduce accidents.
- 4.2.2 In order to produce options to align with these project aims, a combination of desktop studies, historical studies and site observations were used to produce a list of spanning bridge, tunnel, non-road and low-cost alternative options.
- 4.2.3 Having taken into account the principal physical and environmental constraints of the project suitable 'corridors' were considered which broadly categorised the scheme into three distinct locations:
- A western crossing, linking Peto Way with Waveney Drive;
 - A central crossing, linking Denmark Road with Waveney Drive;
 - An eastern crossing, close to the existing A47 Bascule Bridge.
- 4.2.4 The following sections follow these general corridor categorisations to more effectively describe how final options selection was achieved and to demonstrate why options at specific locations were rejected.

4.3 Options generation

- 4.3.1 Using the locational distinctions outlined above, a 'long-list' of 15 options was compiled. For the purpose of option comparison, a series of objectives and parameters was developed, enabling all locations and design possibilities to be thoroughly examined against each other. The requirements of the scheme were developed as listed below:
- Provide a 7.3m single carriageway road with footways and a cycle lane;
 - Connect to the existing network with at-grade junctions, wherever possible;
 - Provide clearance above the railway line;
 - Allow large vessels to turn within the confines of the channel;
 - Relate logically to the existing network;
 - Have minimal impact on existing development; and
 - Avoid conflicting with planned new development, as envisaged in the Lake Lothing and Outer Harbour Area Action Plan.
- 4.3.2 Options that were considered, but not included in the long list, at this point included:
- Fixed Bridge Options – A non-lifting bridge would need to have a 35m clearance, would be more expensive than other options and more visually intrusive and more difficult to tie back in to the existing network due to the level changes involved;
 - Floating bridge options – this option was not feasible due to restrictions associated with the railway line on the northern shore of the Lake. A floating bridge would have to open for any size vessel whereas a conventional bridge would allow for smaller vessels to pass through; and
 - Dual carriageway options – as well as costing more, Lowestoft's road network has been developed exclusively with single carriageway roads.
- 4.3.3 The options appraisal identified a long list of options comprised of bridges, tunnels, junction improvements and road pricing, which are listed in Table 4-1 below. It is noteworthy that the number reference of the options has continued to evolve in conjunction with the design generation.

Table 4-1 – OBC Scheme Options

Name	Type	From (N)	To (S)
W1	Bascule Bridge	Peto Way	Waveney Drive
W2	Bascule Bridge	Peto Way/ Denmark Road	Waveney Drive
W3	Bascule Bridge	Peto Way/ Denmark Road	Waveney Drive/ Riverside Road
C1	Bascule Bridge	Peto Way/ Denmark Road	Waveney Drive/ A12 Horn Hill
C3	Bascule Bridge	Denmark Road	Waveney Drive/ A12 Horn Hill
C4	Bascule Bridge	Denmark Road	Waveney Drive/ A12 Horn Hill
E1	Bascule Bridge	Commercial Road	Belvedere Road
E2	Bascule Bridge	Katwijk Way/ Denmark Rd	Belvedere Road
E3	Bascule Bridge	Katwijk Way	Belvedere Road
E4	Bascule Bridge	Commercial Road	Belvedere Road
L1	Lock/flood barrier with lifting bridges	Denmark Road	Waveney Drive
T1	Road tunnel	Peto Way/ Denmark Way	Waveney Drive
J1	Junction improvement	Various measures	Considered as an alternative to a crossing
S1	Smarter Choices	Various measures	Considered as an alternative to a crossing
P1	Road Pricing	Introduce road pricing to discourage traffic	Considered as an alternative to a crossing

- 4.3.4 Of the 15 options identified in Table 4-1 and taken forward for further assessment, options J1, S1 and P1 were not considered viable alternatives for the following reasons.
- 4.3.5 Option J1 comprised a package of measures to increase capacity and improve traffic flow at problem junctions throughout Lowestoft without providing a third crossing, but rather “fine tuning” the existing network. This option was rejected as a viable alternative because it would fail to address the fundamental problem of physical severance caused by Lake Lothing and would therefore not fully meet the objectives of the scheme.
- 4.3.6 Option S1 was a package of ‘smarter choices’ to encourage people to make fewer journeys by private car. Earlier work by SCC suggested that against the achievements in modal shift to date and the congestion at the existing crossings that would still be expected even with this option implemented, it would be insufficient to meet the scheme objectives. This option was therefore rejected because it would be unlikely to fully address the scheme objectives, including the reduction of severance and unlocking of opportunities for regeneration.
- 4.3.7 Option P1 comprised the introduction of road pricing to discourage traffic from congested routes and to encourage people to make fewer journeys by private car. It was considered unlikely that this would be appropriate in the present economic climate, particularly in Lowestoft where parts of some wards are among the 5% most deprived in England. It could also dissuade investment in the town contrary to the scheme objectives to encourage regeneration and redevelopment
- 4.3.8 On a smaller scale, tolling a new crossing over Lake Lothing alone would discourage its use and thus fail to relieve congestion at the existing crossings points and in particular on the SRN.
- 4.3.9 Options J1, S1 and P1 were accordingly not taken forward for further assessment.

4.3.10 Option L1 was also discounted due to the impact on the operation of the Port, concerns over the intrusive nature of such a structure and the fact that proposals for a strategic flood barrier for Lowestoft have since been developed, making the flood defence capabilities of option L1 likely redundant.

4.4 Discounting of Options

4.4.1 Having selected a long-list of 11 remaining options, it was necessary to identify which did not represent realistic solutions. The need for the selected scheme to perform well across economic, environmental and social indicators required a process of sifting and discarding of options to ensure that final options made a significant contribution to achieving the scheme objectives.

4.4.2 During the next stage of sifting some further potential options were discarded because they:

- Did not achieve scheme objectives;
- Did not fit with existing local or national strategies and priorities;
- Would cause severe adverse impacts;
- Are not considered to be technically sound;
- Are unlikely to be affordable; and
- Are unlikely to be acceptable to stakeholders and the general public.

4.4.3 The reasons why these remaining 11 options were narrowed down to three final options are set out in Table 4-2 below.

Table 4-2 – Summary of the options assessed

Option	Outline of key environmental issues	Decision outcomes
Western Option (W1, W2, W3)	<p>Impact of Leathes Ham Local Nature Reserve. All western options would create disturbance and land take to this protected area which is used by breeding wildfowl.</p> <p>Options run through Brooke Yachts and Jeld-Wen Mosaic County Wildlife site which has a known population of reptiles, hosts the only mudflat habitat within Lake Lothing and has suitable habitat for nesting birds.</p> <p>Potential to impact bats and reptiles.</p> <p>Potential disturbance of contaminated land.</p> <p>Increased level of landscape impacts.</p>	<p>W1 and W2 do not effectively connect to the existing road network.</p> <p>W1 and W2 would increase traffic flows on Kirkley Run.</p> <p>W3 would require greater land take and greater severance of commercial land both north and south of the Lake.</p> <p>Traffic issues likely at Victoria Road as a result of the options.</p>
Central crossing options (C1, C2, C3)	<p>Potential impact to bats and reptiles although further, more detailed, assessment required to identify to what extent this is a constraint.</p>	<p>All options passed assessment criteria.</p> <p>Received over 60% support in public consultation undertaken in 2014 as being the preferred location.</p> <p>Poses a potential problem for river navigation to the port, ABP preferring an eastern option.</p> <p>Least impact on the Sustainable Urban Neighbourhood development to the south of the Lake (outlined within the Area Action Plan)</p>

Eastern Crossing Options (E1, E2, E3 and E4)	Unknown at this stage.	<p>Options E1, E2 and E3 are unlikely to meet a number of scheme objectives.</p> <p>E1, E2 and E3 would not significantly improve access to regeneration areas south of Lake Lothing.</p> <p>Severance would be an issue as Lake Lothing would continue to create a barrier of more than 2.5km long between the north and south halves of the town.</p> <p>Eastern options do not tie well into the existing network.</p> <p>E1 only connects directly into Commercial Road, providing no traffic relief.</p> <p>A new bascule bridge would have to open every time existing A47 Bascule Bridge opens.</p> <p>Need to relocate the railway.</p>
Tunnel Option (T1)	<p>Mitigation to prevent loss of important strategic/functional floodplain at Leathes Ham and Brooke Yachts and Jeld-Wen Mosaic would also be required. The areas are also designated as an important location for biodiversity.</p> <p>T1 Option runs through the Brooke Yachts and Jeld-Wen Mosaic County Wildlife site which has a known population of reptiles, hosts the only mudflat habitat within Lake Lothing and has suitable habitat for nesting birds. This ex-industrial area has a mixture of grassland and ruderal habitats with fringing mudflats. Potential to impact bats and reptiles.</p> <p>Assessments have determined that the tunnel option is likely to cause potentially Large Adverse impacts to floodplain and water abstractions and significant measures to mitigate these impacts would be required.</p> <p>Other impacts may include increased discharge into water bodies and therefore a slight decrease in water quality whilst there will likely be an increase in the potential of accidental spillage contaminating groundwater or surface water</p>	<p>Most expensive option for both construction and maintenance.</p> <p>Option does not provide attractive pedestrian or cycle routes and therefore fails to meet key objectives.</p> <p>Construction programme for the tunnel option suggests that bridge options would be delivered considerably quicker. It is also likely that additional, previously unseen or unknown complications associated with the tunnelling option could arise, placing further delays, cost and increasing risk onto the project.</p> <p>In addition to key environmental issues, the topography of the area would require additional compulsory acquisition of significant third party land to enable compliant entry and exit gradients.</p>

4.5 Final Alternative Locations Shortlisted

4.5.1 Following the discounting of options stage, three proposals were progressed to consideration within the OBC submission to Department for Transport (DfT). These were:

- A western bridge option;
- A western tunnel option; and
- A central bridge option.

Western option (formerly referred to as W3) (Bridge)

- 4.5.2 The western bridge option of W3 was considered a viable option and was selected to have further assessment undertaken. Options W1 and W2 were eventually rejected as the assessment considered it likely they would cause adverse impacts on residents and the environment.
- 4.5.3 This western bridge option would run from a new roundabout at Peto Way, to the north of Leathes Ham, and span both the railway line and Lake Lothing on a north-south alignment. In order for the new roundabout and bridge to not sever Peto Way, the existing Peto way traffic would be diverted under a new underbridge and connect into a new roundabout. To the south of the Lake, the new crossing would connect into Waveney Drive, to the east of Kimberly Road.

Western Tunnel Option (T3)

- 4.5.4 The tunnel option (an evolution of T1) flows in a very similar alignment to the western bridge option¹², running from a new roundabout on Peto Way, to the north east of Leathes Ham, passing beneath both the railway line and Lake Lothing on a north-south alignment. The existing alignment of Peto Way will be altered so that it can adjoin the newly created roundabout. To the south of the Lake, the tunnel would connect to Waveney Drive to the east of Kimberly Road.

Central Option

- 4.5.5 The central option follows the same alignments all central bridge options, although this specific option connects into Denmark way to the north and into Riverside Road to the south by means of a bascule bridge. The finished bridge height will need to be elevated to span across the railway line, before linking into a new roundabout and road layout near Denmark Road.

4.6 Comparison of final alternative locations

- 4.6.1 The adoption of the proposed scheme has been selected based on a combination of the following seven aspects:
- Delivery of scheme objectives;
 - User benefits, based on time and vehicle operating cost savings;
 - Cost of construction;
 - Benefit to cost ratio;
 - Traffic impacts;
 - Environmental impacts; and
 - Public and stakeholder support.
- 4.6.2 Each of the three final options were considered and appraised against these seven aspects with greater detail on the outcome below.

Delivery of scheme objectives

- 4.6.3 Traffic forecasts undertaken at the OBC stage showed that the western and tunnel options would be less effective than the central option in reducing traffic on the existing crossings. The tunnel option would unlikely be able to deliver any benefits to pedestrians and cyclists.
- 4.6.4 It was concluded that the central option would most closely align with the scheme objectives.

¹² While it was initially assumed that a tunnel might follow either a western or a central alignment, a central option was ruled out due to the difficulty in achieving a satisfactory vertical alignment

User Benefits

4.6.5 Using the Transport User Benefit Appraisal (TUBA) model, the Present Value of Benefit (PVB) in Table 4-3 below are predicted.

Table 4-3 – User benefits

Option	PVB (£)
Western bridge option	338,700
Central bridge option	453,300
Western tunnel option	338,300

Construction Cost

4.6.6 At 2015 prices, the schemes were estimated to have construction costs of:

- Western bridge option - £85 million;
- Central bridge option - £79 million; and
- Western tunnel option - £118 million.

Benefit to Cost Ratio

4.6.7 Adopting the DfT model for assessing transport scheme benefits in the OBC, the following BCRs were calculated;

- Western bridge option – 5.9;
- Central bridge option – 8.5; and
- Tunnel option – 4.27.

Traffic Impacts

4.6.8 The effectiveness of each option to reduce traffic is shown in Table 4-4.

Table 4-4 - Traffic impacts in peak hours

AM Peak 2020	Forecast traffic (2 way) veh/hr		
	On Mutford Lock	On new crossing	On A47 Bascule Bridge
Do Nothing	2,763	0	2,742
Western Bridge	1,923 (-30%)	1,579	2,327 (-15%)
Central Bridge	1,814 (-34%)	2,245	1,814 (-34%)
Western Tunnel	1,894 (-31%)	1,619	2,318 (-15%)
PM Peak 2020	Forecast traffic (2 way) veh/hr		
	On Mutford Lock	On new crossing	On A47 Bascule Bridge
Do Nothing	2,972	0	3,058
Western Bridge	2,318 (-22%)	1,653	2,663 (-13%)
Central Bridge	2,314 (-22%)	2,313	2,053 (-33%)
Western Tunnel	2,201 (-26%)	1,832	2,600 (-15%)

4.6.9 As shown in Table 4-4 there is little to differentiate between the effectiveness of all three options in reducing traffic on Mutford Lock. However, the central bridge option is clearly more effective than the western bridge and western tunnel option at reducing flow upon the existing A47 bascule bridge and thus the SRN.

Environmental Impacts

4.6.10 An Environmental Appraisal Report (EAR) was prepared at OBC stage to accompany the submission to DfT. The submission did not include an assessment of landscape or air quality and concluded against the remaining environmental aspects as follows:

Noise

4.6.11 All three options were considered to be likely to result in slight adverse impacts upon the noise environment with nothing to significantly differentiate between them.

Greenhouse gases

4.6.12 The TUBA model identified greenhouse gas savings associated with all three options, but the central option provided greater savings than the western tunnel or western bridge options.

Townscape

4.6.13 All three options were considered to be likely to result in slight adverse impacts upon the townscape with nothing to significantly differentiate between them.

Historic environment

4.6.14 All three options were considered to be likely to result in slight adverse impacts upon the historic environment with nothing to significantly differentiate between them.

Biodiversity

4.6.15 All three options were considered to be likely to result in moderate adverse impacts upon biodiversity with nothing to significantly differentiate between them.

Water environment

4.6.16 It was identified that the western bridge and western tunnel options were likely to have large adverse impacts upon the water environment, largely due to their proximity and the land take from the Leathes Ham waterbody. A moderate adverse impact was concluded for the central option.

Summary

4.6.17 It was accordingly concluded that lesser environmental impacts were likely with the central crossing option compared to the western tunnel and western crossing option.

Public Support

4.6.18 Consultation undertaken in 2014 pursuant to an earlier Options Appraisal prepared by WSP had previously considered broad options for a crossing location and the results are shown in Table 4-5. A tunnel option was not under consideration at this time.

Table 4-5 – Public consultation (2014)

Preferred location	Percentage
West	23.9%
Central	60.6%
East	8.3%
Other	4.4%
No Response	2.8%
TOTAL	100%

Stakeholder support

- 4.6.19 A survey of businesses was undertaken by Suffolk Business School in October 2015 to support the preparation of the Outline Business Case. It included a question as to which corridor (west, east or central) was preferred for a third crossing. The results of this are shown in Table 4-6

Table 4-6 – Stakeholder survey

Corridor	First choice	Second choice	Least preferred
West	61 (40%)	61	20
Central	70 (48%)	66	5
East	18 (12%)	9	99
No response	0	13	25
TOTAL	149	149	149

Preferred option

- 4.6.20 The assessment, therefore, demonstrated across a number of criteria that the central bridge option should form the preferred scheme on account of it being the least expensive and delivering the highest benefit, whilst having fewer environmental impacts and a high level of public and stakeholder support.
- 4.6.21 It was however identified during the course of stakeholder engagement in both 2014 and 2015 that a central option could have an impact on the operation of the Port which would need to be mitigated through the design process.

4.7 Central Option Design Alternatives

Constraints

- 4.7.1 The consideration of alternative arrangements within the central corridor are constrained by a number of parameters. These are identified in Table 4-7 below.

Table 4-7 – Design Constraints

Constraint	Implications to the design
Service Tunnel	The main alignment has been moved approximately 10m west from that originally identified during the OBC. This movement was due to the presence of an existing service tunnel that runs north/south under Lake Lothing and at the request of the owner (UK Power Networks) the bridge construction and its associated fenders must be no closer than 5m from the tunnel.
Network Rail minimum clearance requirements	Network Rail has a requirement for a minimum height clearance of 4.98m above the railway line.
Lake Lothing minimum clearance requirements	ABP has a requirement for a minimum height clearance of 12m above the HAT (Highest Astronomical Tide).
Existing ground levels	The proposed scheme is required to tie in to both Peto Way and Waveney Drive on the north and south respectively at their existing ground levels.
Carriageway gradients	The proposed crossing (finished road level) achieves a tie-in to the existing highway network at either Peto Way/Denmark Road or Riverside Road/Waveney Drive in accordance with DMRB guidance gradients of no greater than 6% should be applied to the crossing. Slacker gradients could be adopted, but they would increase the lengths of the approach ramps considerably and move the tie-in points away from the proposed tie-in points.
Carriageway bend radius	To provide a tie-in with both Peto Way/Denmark Road in the north and Waveney Drive in the south, the alignment of the proposed scheme is constrained by avoiding existing buildings adjacent to the proposed scheme corridor. However deflection (bending) is needed in the carriageway as it approaches the roundabouts to slow vehicles down for safety reasons. Conversely this deflection cannot be too severe and thus constrain visibility.
Minimum land take	The Lake Lothing area both to the north and south of the Lake is reasonably developed with a number of private and public buildings lying in close proximity to the proposed scheme corridor. Preserving existing buildings has been an objective throughout the development of the designs.

4.7.2 These constraints when viewed in cumulation have resulted in a very narrow horizontal and vertical corridor in which the proposed scheme can be constructed which demonstrates that there are no viable main alternatives to the location of the proposed scheme. The consideration of main alternatives within the central crossing corridor has therefore been focused upon the width of the carriageway (including provision for cyclists & pedestrians), the junction arrangements and the design of the bascule bridge, including pier arrangements

Carriageway Widths

4.7.3 As identified in Chapter 19, a single carriageway bridge is expected to be able to manage the flow of traffic in the design year and a three or four lane crossing is therefore not required. However, options for increasing the number of lanes provided across the bridge have also been investigated, including three and four lanes although both have been discounted due to cost, the additional land take from the Port and the increased geometric requirements to the proposed northern and southern junctions again leading to additional land take and the likely requirement for demolition of existing property. Taking into account that the existing road network either side of the proposed bridge location is generally single carriageway, a dual carriageway bridge would offer limited benefit which would not justify the significant additional cost.

4.7.4 The currently proposed layout for the bridge is shown in Figure 6.2. The Figure currently shows cycle and pedestrian provision on both sides of the crossing.

4.7.5 Having identified that the single carriageway central option was the preferred alignment and solution for the proposed scheme, the design work progressed to developing suitable junction arrangements at the north and the south of the scheme where connections to Peto Way and Waveney Drive will be respectively provided. Junction design has been based on achieving the relevant DMRB standard

Northern Junction

4.7.6 Three junction options have been considered comprising the following forms;

- Ghost Island;
- Traffic signals; and
- Roundabout.

4.7.7 Design iterations around these three options have been subject to traffic modelling, the results of which have indicated that only a roundabout option will provide sufficient capacity in the design year of 2037.

4.7.8 Several different roundabout options have been considered to develop a preferred solution to tie-in to the existing road network and a summary of the options considered and the reasons for the selection of the final option will be provided within the DCO application. The development of roundabout options has resulted in the layout shown in Figure 6.1 which also includes a dedicated left lane to enable traffic to access Rotterdam Road and Denmark Road.

4.7.9 Provision of the dedicated left lane removes traffic from negotiating the roundabout and improves the capacity of the junction.

4.7.10 Design development is still ongoing and there may be further refinements that are presented with the DCO application arising from further technical assessment and in response to consultation feedback.

Rotterdam Road/Denmark Road Junction.

4.7.11 The existing roundabout at the junction of Rotterdam Road with Denmark Road has been modelled to ascertain whether improvements are required to accommodate the change in flow associated with the Northern Junction.

4.7.12 Several options were investigated including changing the layout to a ghost island, but, following traffic modelling of the junction, the optimum solution identified was to retain the junction as a roundabout, but to convert it to a small conventional roundabout.

4.7.13 Design development is still ongoing and there may be further refinements that are presented with the DCO application arising from further technical assessment and in response to consultation feedback.

Southern Junction

4.7.14 Three junction options have been considered comprising the following forms;

- Ghost Island;
- Traffic signals; and
- Roundabout.

4.7.15 Design iterations around these three options have been subject to traffic modelling, the results of which have indicated that only a DMRB compliant roundabout option will provide sufficient capacity in the design year of 2037 (see Section 6.3.3 for more information on this arrangement).

4.7.16 SCC has also concluded that a DMRB compliant roundabout cannot fit within existing highway land and consequently the currently preferred option requires land take from a number of properties adjacent to the southern roundabout and this is considered in further detail in Chapter 15.

4.7.17 Design development is still ongoing and there are likely to be further refinements that are presented with the DCO application arising from further technical assessment and in response to consultation feedback.

Waveney Drive Access Arrangements

4.7.18 A new junction from Waveney Drive into the former Jeld Wen site and connecting to the retained section of Riverside Road will be provided in the form of a T-junction and the preferred option is shown in Figure 4.2. Alternatives considered include:

- Option A - A road through the car park associated with the offices of Essex and Suffolk Water;
- Option B - A road along the eastern boundary of the former Jeld Wen site; and
- Option C – A road through the former Jeld Wen site further to the west than Option B (SCC's preferred option).

4.7.19 Option A was discounted after discussion with the landowner, which highlighted the importance of current parking provision for their operations to continue as well as their longer term plans to extend the current building over this area in question and reposition the parking area on to adjacent land in its ownership.

4.7.20 Option B was discounted as it would impact on the landowners immediately to the east of the former Jeld Wen site, both through potential land take to achieve satisfactory visibility splays and through safety given the proximity of its own access points. Additionally, there is utilities infrastructure that could be costly and complicated to relocate in the south east corner of the former Jeld Wen site. Finally, it is considered that a new access road more centrally located in the former Jeld Wen site would be beneficial to its future development, as envisaged and encouraged in the Local Plan.

4.7.21 Preliminary layouts for a signalised junction, instead of a junction, have also been considered but these have been discounted due to safety issues in relation to residential property accesses opposite the former Jeld Wen site. Traffic leaving these properties would become isolated between the signal stop lines and would be unable to see the signal heads to safely exit. It would also be inappropriate to stop the traffic on Waveney Drive in advance of the new crossing to allow priority to a minor access road.

4.8 Bascule Bridge Design Alternatives

Pier Arrangement

4.8.1 As previously stated in Table 4-7 the minimum clearance between the HAT and the bridge deck is 12m. A width of 35m is required between the central piers and a width of 32m between the fenders, as this is the existing width of the navigation channel within the Lake and hence will provide the least disruption to port operations.

4.8.2 For a bridge of such parameters, spanning the width of Lake Lothing at the preferred location, a minimum of two piers are required within the Lake and given that the bridge superstructures also require supporting piers, consideration has been given to whether four piers in the Lake is more appropriate than the two piers that are proposed.

4.8.3 Following investigation of the south quay wall, and particularly the excavation of the ties and the anchor wall, and also obtaining as-built information on the north quay wall, a two pier solution within the Lake was considered the optimum solution. This is primarily because the bridge piers and foundations are located such that they will not adversely affect the quay walls. In addition, the two pier solution offers a lower construction cost and it will result in less disturbance to the lake bed and the potential environmental implications from disturbing a greater amount of sediment and the precise form of the piers is still undergoing design development.

Deck structure

4.8.4 Three different types of bridge deck have been considered;

- Steel;
- Precast; and
- In situ post-tensioned.

4.8.5 An in situ post-tensioned deck allows a longer span than a pre-cast option and the precast option would not be suitable for the span over the railway due to headroom restriction that is required by Network Rail. The steel option allows for the depth of the deck to be reduced, but would require periodic repainting would increase the whole life cost of the scheme.

4.8.6 The post-tensioned deck is therefore the preferred option as it allows a more aesthetically pleasing curve as well as having a lower cost.

Dual lifting option

4.8.7 Included within Chapter 6 are details of the proposed scheme that include for a single lifting bascule bridge with a counterweight structure.

4.8.8 At the time of Scoping (Appendix 7A), it was envisaged that a dual lifting bascule bridge with a simple trunnion would be progressed. However, following a comprehensive design review, it was concluded that a single leaf with a vertical counterweight would be preferable in that it could result in;

- Possibility of supporting bascule bridge over the deck resulting in slimmer piers and less impact in the marine environment (particularly hydromorphology);
- less impact on flood risk elsewhere (by virtue of a lower volume of material in the Lake);
- a more readily maintainable opening mechanism;
- a faster opening time; and
- a reduction in construction costs.

4.8.9 The form of structure currently proposed is also born from stakeholder feedback on the aspiration to provide a striking design that drew upon Lowestoft's maritime history and which would align with SCC's and WDC's aspirations for economic growth in the area.

5 The Existing Environment

5.1 Introduction

- 5.1.1 This Chapter provides an overview of the existing environment in the vicinity of the proposed scheme. A description of the existing environment relative to each individual environmental aspect is considered in Chapters 8 to 19 and this chapter is not meant to repeat what is included in those chapters, but rather to identify the constraints that are pertinent to all or some of the assessments.
- 5.1.2 This chapter is supported by Figures 5.1 and 5.2 that show the assets identified in this Chapter.

5.2 Adjacent land uses

- 5.2.1 For the purposes of presentation we have described the proposed scheme in two halves; the land that lies adjacent to the proposed scheme to the north of the Lake and the land that lies adjacent to the proposed scheme to the south.

The north

- 5.2.2 The proposed scheme connects into Denmark Road adjacent to the Lowestoft North Quay Retail Park. To the north of the proposed new roundabout and realigned roundabout on Denmark Road there are residential properties, industrial and commercial facilities and a play area. The immediate land surrounding the new roundabout is vacant hard standing.
- 5.2.3 Travelling southwards towards Lake Lothing the proposed scheme crosses the East Suffolk railway line into and from Lowestoft Station and the operational port of ABP. The land to both the east and west of the proposed scheme is used for port operations along the northern quay of Lake Lothing with the grain silo building located to the east. This building, of an approximate 50m in height, is a useful visual gauge for the height of the proposed bascule bridge (see Chapter 6).
- 5.2.4 Within Lake Lothing itself, there is a navigation channel, and quays on both sides of the proposed bascule bridge. The navigation channel is used 24 hours a day by both ABP and other maritime users.
- 5.2.5 The Port of Lowestoft is important to both the employment and economic status of Lowestoft in so far that 1,174 jobs and £79 million of revenue per annum are attributable to the port's operations¹³.

The south

- 5.2.6 The quays on the south side of Lake Lothing are presently unused for port operations, although a quay wall is present. Nexen, a manufacturer of fork lift trucks, operates from a building to the immediate east of the proposed scheme and buildings which house Suffolk County Council and Waveney District Council operations are present to the west.
- 5.2.7 Travelling south along the proposed scheme, to the east is a car showroom, operated by Motorlings whilst to the west are buildings which house office based operations of Essex and Suffolk Water and Riverside Business Centre. There is also an area set aside for biodiversity enhancement.
- 5.2.8 To the south of the proposed scheme, where it connects into Waveney Drive, there are residential houses, as well as a beauty clinic business.

5.3 Wider land uses

- 5.3.1 Beyond the area of the proposed scheme shown in Figures 5.1 and 5.2, the predominant land uses are dominated by urban development including transport, residential, commercial and industrial uses.

¹³ http://www.abports.co.uk/admin/content/files/assets/PDF%27s/EastAnglia_insert_4pp_proof6.pdf

The port operations of ABP cover an area of approximately 40 hectares¹⁴ and includes both industrial and recreational uses (see Figure 15.1)

5.3.2 Of particular note are the areas of vacant industrial land on the south side of Lake Lothing, Normanston Park and Leathes Ham to the north-west and the marina to the west of Lake Lothing.

5.3.3 Further afield, approximately 1.5km west of the proposed scheme boundary and along Lake Lothing, lies The Broads National Park (see Figure 10.1)

5.4 Designated Sites

5.4.1 The footprint of the proposed scheme does not lie within any designated sites at either the national or local level, however, a number of designated sites are present within the wider area and these are summarised in Table 5-1 and Table 5-2 and shown on Figure 5.2. Where environmental aspects are not included, there are no designated sites within the study area.

Table 5-1 – Environmental Statutory Designations

Environmental Aspect	Study area (from scheme boundary)	Statutory Designated sites
Cultural Heritage (Chapter 9)	500m	<ul style="list-style-type: none"> • South Lowestoft Conservation Area • The Port House (Grade II listed building) • The Royal Norfolk and Suffolk Yacht Club (Grade II* listed building)
Townscape and Visual Impact (Chapter 10)	3km	<ul style="list-style-type: none"> • The Broads National Park
Nature Conservation (Chapter 11)	2km for nationally designated sites and 30km for internationally designated sites	<ul style="list-style-type: none"> • Leathes' Ham Local Nature Reserve • The Broads Special Area of Conservation (SAC) • Broadland Special Protection Area (SPA) • Broadland Ramsar • South North Sea cSAC • Outer Thames Estuary SPA • Outer Thames Estuary pSPA Extension
Noise and Vibration (Chapter 13)	2km	<ul style="list-style-type: none"> • Noise Important Area 5003 • Noise Important Area 5004 • Noise Important Area 11285
Water Environment (Chapter 17)	2km	<ul style="list-style-type: none"> • Lake Lothing Main River • Kirkley Stream Main River

¹⁴ http://www.abports.co.uk/Our_Locations/Short_Sea_Ports/Lowestoft/

Table 5-2 – Environmental Non-Statutory Designated Sites

Environmental Aspect	Study area (from scheme boundary)	Statutory Designated site
Nature Conservation (Chapter 11)	2km for non-statutorily designated sites	<ul style="list-style-type: none"> • Brooke Yachts and Jeld-Wen Mosaic County Wildlife Site • Kirkley Ham County Wildlife Site • Harbour Kittiwake Colony County Wildlife Site.

6 Description of the Proposed Scheme

6.1 Introduction

- 6.1.1 Accompanying this chapter is Figure 6.1 which shows the red line for the proposed scheme (including land required permanently, temporarily for construction, and over which rights are sought for maintenance. Also shown on Figure 6.1 is the proposed arrangement, Figure 6.2 shows cross sections of the carriageway and Figure 6.3 shows the plan and elevation of the proposed bascule bridge. Included in Figure 6.4 is a diagrammatic image of the proposed scheme showing the design considerations.
- 6.1.2 Chapter 6 is a description of the proposed scheme at the consultation stage and any other descriptions in this PEIR document are merely a summary of, or subsidiary to, this chapter.

6.2 Main Design Considerations

The Route

- 6.2.1 The proposed scheme involves the construction, operation and maintenance of a new bascule bridge highway crossing of Lake Lothing in Lowestoft. If constructed, the proposed scheme would include the following:
- A new single carriageway road crossing of Lake Lothing, consisting of a multi-span bridge which comprises:
 - an opening bascule bridge over Lake Lothing, in the Port of Lowestoft;
 - a bridge over the East Suffolk Line, and reinforced earth embankment joining that bridge to the C971 Peto Way between Rotterdam Road and Barnards Way;
 - a bridge over the northern end of Riverside Road providing access to existing commercial property, and
 - a reinforced earth embankment following the alignment of Riverside Road to a remodelled junction with the B1531 Waveney Drive;
 - The closure of Durban Road at its junction with Waveney Drive
 - A new access road from Waveney Drive west of Riverside Road to provide access to existing property at Riverside Business Park that would otherwise become inaccessible due to changes in level on Riverside Road;
 - Dedicated provision for cyclists and pedestrians which ties into existing networks;
 - Associated changes, modifications and/or improvements to the existing local highway network as informed by traffic modelling. This could include improvements within the existing highway boundary to some existing junctions within the Consultation Area (Plate 1-1).
 - Works to facilitate the construction of the above elements including:
 - Creation of temporary construction sites and accesses from the public highway;
 - Provision of new utilities and services and the diversion of existing utilities; and
 - Provision of drainage, lighting and landscaping; and

- Such ancillary, incidental and consequential changes and/or improvements as are required and permitted.

Limits of Deviation

6.2.2 As discussed in Paragraph 1.2.22 the ‘Rochdale Envelope’ provides for robust environmental assessment of NSIPs with ‘limits of deviation’ for the design parameters of the scheme. The limits of deviation assessed in this PEIR are set out in Table 6-1.

Item	Parameters
Pier volume in the water	426m ³ each is the volume assessed in the Flood assessment (Chapter18), although smaller piers are presented for consultation.
Cofferdams (steel piled)	Two steel piled cofferdams have been assessed, although the proposed scheme may be built without the need for cofferdams.
Temporary bridges	Two temporary bridges may be required from the north and south quay. These would measure up to 32m.
Northern roundabout Diameter (ICD)	The northern roundabout has an ICD of 50m and a tolerance of 5m
Southern roundabout Diameter (ICD)	The southern roundabout has an ICD of 50m and a tolerance of 5m
Road gradient	A maximum of 6% and a minimum of 5%
Finished road level tolerance	The finished road level has a tolerance of +500 and -500mm from that presented.

Table 6-1 – Preliminary limits of deviation

Design Standards and Cross Section

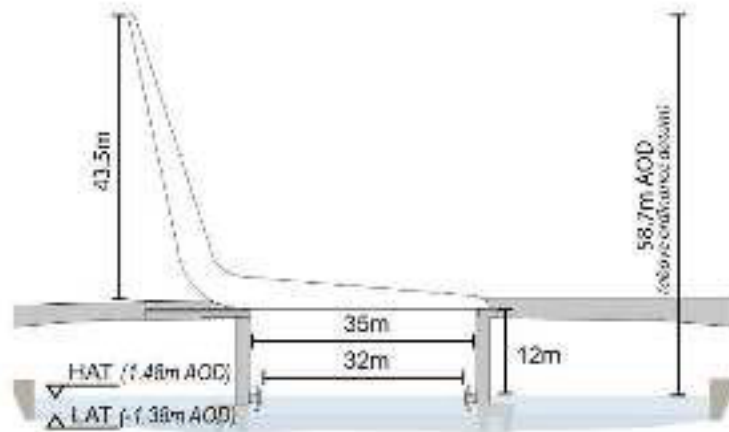
6.2.3 The new crossing will be designed using the Design Manual for Roads and Bridges (DMRB) which has informed the proposed limits of deviation in Table 6-1, and is currently being designed to have a:

- Design speed of 30mph (50kph);
- Carriageway width of 7.3m (2 x 3.65m wide traffic lanes);
- Safety strip of 0.5m between the proposed footway and carriageway to the east of the crossing and the combined footway/cycleway to the west of the crossing; and
- Dedicated footway on one carriageway and a segregated footway and cycleway on the other.

6.2.4 These elements are shown in Figure 6.1 and 6.2.

Structures and Earthworks

6.2.5 A new bascule (lifting) bridge will be constructed to allow the passage of vessels within the Inner Harbour. When closed, the bridge will have a clearance of no less than 12m above the HAT level which will enable smaller boats to pass under the bridge as shown in Plate 6-1. This 12m clearance combined with its location west of some of the docks, means that it will have to open less frequently than the existing A47 Bascule Bridge at the harbour entrance. The frequency of opening will be determined through a vessel survey and further discussion with ABP as Statutory Harbour Authority.



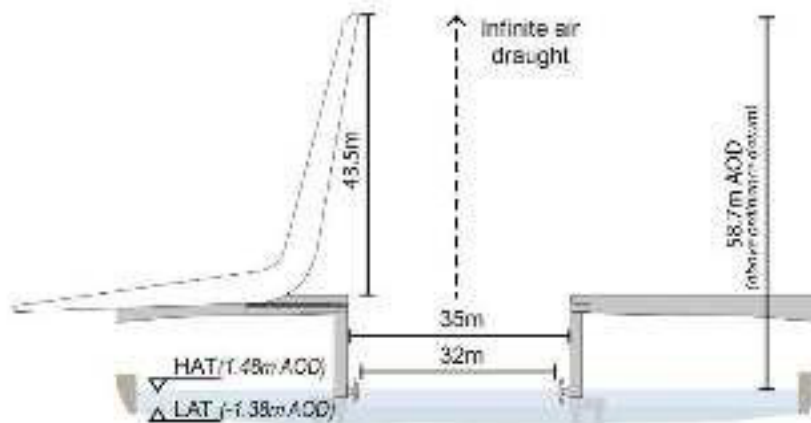
Proposed rolling
bascule bridge:
Closed

32m between fenders
35m between piers
12m air draught

HAT - Highest Astronomical Tide
LAT - Lowest Astronomical Tide

Plate 6-1 – Indicative profile of the proposed bascule bridge in the closed position

- 6.2.6 The new bridge will be a single carriageway with raised verges, footways and a cycleway linked to existing networks. Cycle provision will be provided in both a north and south bound direction.
- 6.2.7 In response to a request from ABP, vessel simulation modelling has been undertaken and the proposed clear span between the new bascule bridge piers is 35m, allowing a clear width of 32m between fenders. This is shown on Plate 6-1 and discussed in greater detail in Chapter 15. As shown in Plate 6-2 is the infinite air draught that is available when the bridge is open to marine vessels.



Proposed rolling
bascule bridge:
Open

32m between fenders
35m between piers
infinite air draught

HAT - Highest Astronomical Tide
LAT - Lowest Astronomical Tide

Plate 6-2 - Indicative profile of the proposed bascule bridge in the open position

- 6.2.8 The proposed bascule bridge will require two piers within Lake Lothing, although the form of these piers will be subject to further design and presented in the ES.
- 6.2.9 ABP has advised that the new bridge will require a continually staffed control tower, the location and detail of which will be determined in consultation with ABP, although possible locations for the tower have been identified either to the south west or south east of the bascule bridge adjacent to the quay wall.
- 6.2.10 A series of fenders will be provided within the Lake to provide protection to the bridge piers against impact from ships. Twelve discrete collision protection fenders, three each located northwest, northeast, southwest and southeast of the bridge, along with suitable pier protection fendering within the navigation channel. Fender design will continue to be developed in discussions with ABP.
- 6.2.11 Geotechnical Site Investigations (GI) on land and over water commenced in July 2017 which will provide information to progress the foundation design for the new structures. It is anticipated that all the material for the new earthworks/embankments will need to be imported. However, the opportunity to use existing materials won from site for the earthworks/embankments will be reviewed once results from the GI are available.
- 6.2.12 The quantities of imported material to site will largely depend on the form of construction of the superstructure and this will be refined and clarified as the design of the scheme progresses. Current estimates are shown in Table 6-1.
- 6.2.13 A preliminary GI has been carried out at the south quay, and historic information on the construction of the north quay has been reviewed. This additional information has reduced the risk of the proposed structure affecting the existing quay structures. In addition the obtained information has also resulted in the progression of a two-pier in the water option, as discussed in Chapter 4.

6.3 Main Junction Arrangements

- 6.3.1 Presented in Figure 6.1 are roundabout arrangements at both the north and south of the proposed scheme although these are subject to further assessment and design evaluation. The connection to Waveney Drive that will provide access to existing Riverside Road properties, is likewise subject to further evaluation and consultation to identify an optimum solution.

The northern junction

- 6.3.2 On the northern bank, a new roundabout is proposed to be installed to the west of the current Denmark Road roundabout to connect the proposed scheme with the existing localised road network. Heading south towards Lake Lothing, the new road layout will link into the construction of a new embankment which connects to the elevated bascule bridge, enabling users of the crossing to span the Lake and connect into the new road layout on the southern bank.

The southern junction

- 6.3.3 On the southern shore, the new crossing will follow the line of Riverside Road, initially at a high level, descending to a new roundabout junction at the intersection of Riverside Road and Waveney Drive, west of the Motorlings showroom. Possible improvements between this roundabout and the existing Waveney Road/Tom Crisp Way roundabout would provide access to the A12. Local roads which presently connect directly to Riverside Road would be served in the main from a new connection to Waveney Drive.

- 6.3.4 It is proposed that Durban Road is turned into a cul-de-sac and a turning head provided at the limits of the new southern roundabout. Access will be maintained for pedestrians.

Access to Waveney Drive Properties

- 6.3.5 As discussed in paragraph 4.7.18 a proposed junction is to be provided on Waveney Drive which will provide a new access road into the remaining section of Riverside Road which passes the northern access to the Waveney District Council/Suffolk County Council Offices.

- 6.3.6 The new connection to Canning Road will involve the relocation of the current southern access into the existing SCC and WDC car park.
- 6.3.7 Access to Nexen will be provided from the remaining section of Riverside Road through a new bridge structure below the new crossing.
- 6.3.8 Access to Motorlings will be retained although discussions with the land owner are ongoing to identify the optimum solution. The arrangement shown on Figure 6.1 provides for an access from Waveney Drive near the A12 roundabout. Additionally the formation of an access from the Motorlings site (at the southern end of Kirkley Ham) to the private road serving Asda is proposed to provide for the egress of transporters from the Motorlings site.
- 6.3.9 Access to the existing telephone mast and land adjacent to Riverside Road will be provided from the new access road connecting Riverside Road with Waveney Drive.
- 6.3.10 Access arrangements for properties immediately to the south of the new junction are still being considered.

6.4 Drainage

- 6.4.1 An indicative drainage design is shown on Figure 6.5 that shows how drainage could be managed within the proposed scheme, and is described further below.

Bascule Bridge

- 6.4.2 On the bascule bridge there is no provision for drainage upon the lifting section of the bridge due to the engineering constraints.

To the North of Lake Lothing

- 6.4.3 It is likely that cycle and footways will drain to the carriageway. Run off from the carriageway including the bridge deck (north of the opening section of the bascule bridge) will be collected by a combined kerb drainage system to the proposed northern junction.

- 6.4.4 North of the crossing it is proposed to discharge the run-off for the main carriageway and associated combined footway/cycleway and segregated footway/cycleway into a drainage pond/storage facility adjacent to the northern roundabout. It is anticipated that it will be discharged in to either the existing highway drainage system in Denmark Road or an Anglian Water sewer. A hydrobrake or equivalent will be incorporated into the layout to restrict the discharge to a rate acceptable to the appropriate authority.

- 6.4.5 A separate system with another pond/storage facility will be provided between Denmark Road and the proposed crossing to store run-off from the Rotterdam Road area prior to discharge into either the existing highway drainage system in Denmark Road or an Anglian Water sewer. A hydrobrake or equivalent will be incorporated into the layout to restrict the discharge to a rate acceptable to the appropriate drainage authority.

- 6.4.6 It is anticipated that the junction area itself and the surrounding area will be served by a conventional kerb and gully/manhole system before run-off is discharged into the proposed drainage ponds.

To the South of Lake Lothing

- 6.4.7 It is likely that the cycle and footways will drain to the carriageway. Run off from the carriageway including the bridge deck (south of the opening section of the bascule bridge) will be collected by a combined kerb drainage system to the proposed southern junction.

- 6.4.8 It is proposed to discharge the run-off for the main carriageway and associated footways and combined footway/cycleway at two separate locations:

- 6.4.9 South of Lake Lothing a storage vessel; sized to store the run-off from a 1 in 100 year storm with a six hour duration is likely to be required. Initial calculations indicate that the tank will need to be capable

of storing 150m³ and for the purposes of the PEIR it has been assumed that this is located beneath the bridge structure. The tank will then discharge into Lake Lothing with appropriate pollution control as informed by the Water Environment Assessment (See Chapter 18) either through a new discharge point with a suitable headwall, with a flap valve or into an existing Anglian Water sewer.

- 6.4.10 South of the proposed bridge serving Nexen, the drainage run-off will be captured by oversized pipes within the vicinity of Waveney Drive, before it is discharged into either the existing highway drainage system or an Anglian Water sewer in Waveney Drive. A hydrobrake or equivalent will be incorporated into the layout to restrict the discharge to a rate acceptable to the appropriate drainage authority.

Riverside Road

- 6.4.11 The proposed drainage for the new access to the Riverside Business Park is likely to be a conventional manhole and gully system. It is assumed that the new systems will outfall into the existing drainage system which is present in Waveney Drive, Canning Road and the remaining length of Riverside Road west of the crossing.

- 6.4.12 The proposed manholes, gullies and pipe runs will be constructed in accordance with either:

- Suffolk County Council's standard drawings; or
- The Manual of Contract Documents for Highway Works (MCHW) Highway Construction details.

Footway/Cycleways

- 6.4.13 Other footway and cycleway provision which is part of the proposed scheme, but not on the crossing itself, shall either:

- Drain towards the carriageway; or
- Drain into a separate system, which will be collected into the main drainage system.

6.5 Other Design Elements

Lighting

- 6.5.1 The full extent of the proposed scheme will be lit in accordance with DMRB requirements. The lighting design will be developed during detailed design and will utilise LED luminaires with specialised optics in proximity to the waterways to minimise obtrusive light. Discussions will continue with ABP and Network Rail to ensure their requirements are considered and a suitable design developed that does not affect the safety of their operations.

Technology

- 6.5.2 Technology and signalling arrangements will be provided as part of the proposed scheme consisting of CCTV monitoring, electronic signage confirming the new bascule bridge status and associated warning signs and barrier systems. The locations of electronic signage will be informed by detailed review of the likely traffic movements around Lowestoft.

Road Restraint

- 6.5.3 New near side road restraint will be provided for the full length of the new crossing using steel barrier systems. The height of the barriers will be provided as required by relevant standards and stakeholders including SCC and Network Rail.

- 6.5.4 This road restraint over the railway crossing is known as an H4A barrier and is a standard specification and requirement of Network Rail for all such road schemes over their infrastructure.

Landscaping

- 6.5.5 The proposed scheme will include hard and soft landscaping where it is necessary to mitigate any identified environmental effects and to enhance the setting of the proposed scheme so that is fully integrated into the wider townscape. Proposals are likely to include amenity tree and shrub planting, having regard to biodiversity interest, which will reflect the wider townscape and provide areas of interest to the adjacent hard landscape.

NMU Crossings

- 6.5.6 At the approaches to both the northern and southern roundabouts there will be crossing points allowing both pedestrians and cyclists to cross both Denmark Road, Peto Way and Waveney Drive. Crossing points are also proposed on Rotterdam Road in the north, on the approach to the bascule bridge and on the new access points to Riverside Road Business Park and Motorlings.

6.6 Construction

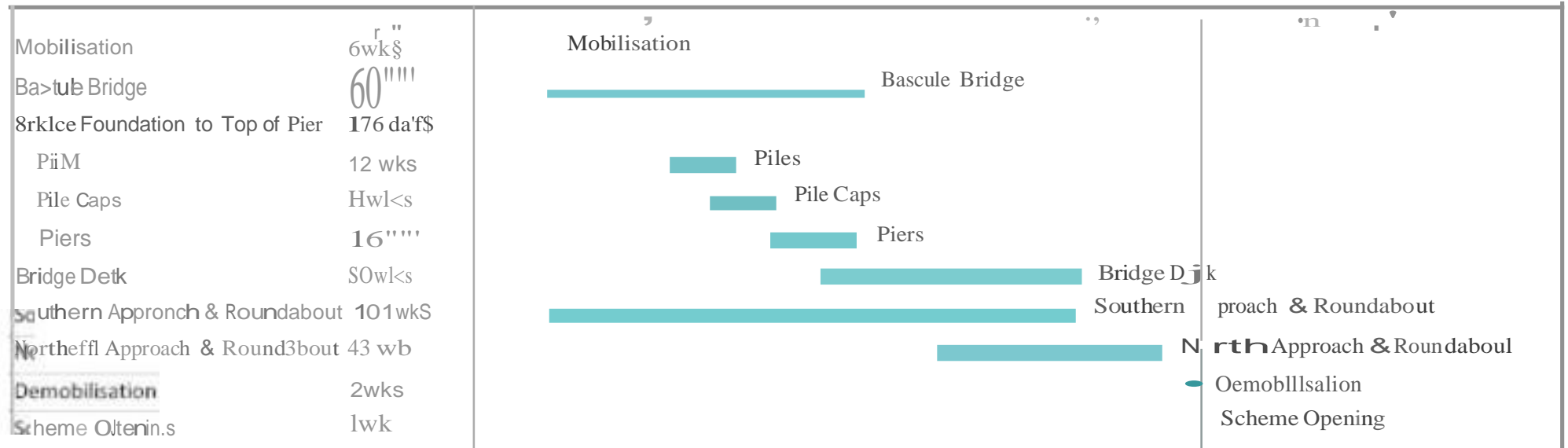
Early Contractor Involvement

- 6.6.1 SCC has obtained buildability and Early Contractor Involvement (ECI) from Kier Infrastructure and the advice that they have provided has been incorporated within this PEIR as appropriate. Notwithstanding that the eventual main contractor for the proposed scheme is yet to be appointed, the ECI advice is considered to be representative of how the scheme could be built and is therefore broadly representative of the potential effects.

Construction Programme

- 6.6.2 Subject to planning approval, it is anticipated construction of the proposed scheme would commence in late 2019 and take between two and three years to complete.
- 6.6.3 An approximate programme, based upon a two year construction period, that shows the main construction activities from mobilisation through to scheme opening is shown below in Plate 6-3. The ES that accompanies the application will include greater information on the construction processes and timings including staffing and delivery profiles than is provided in this PEIR.

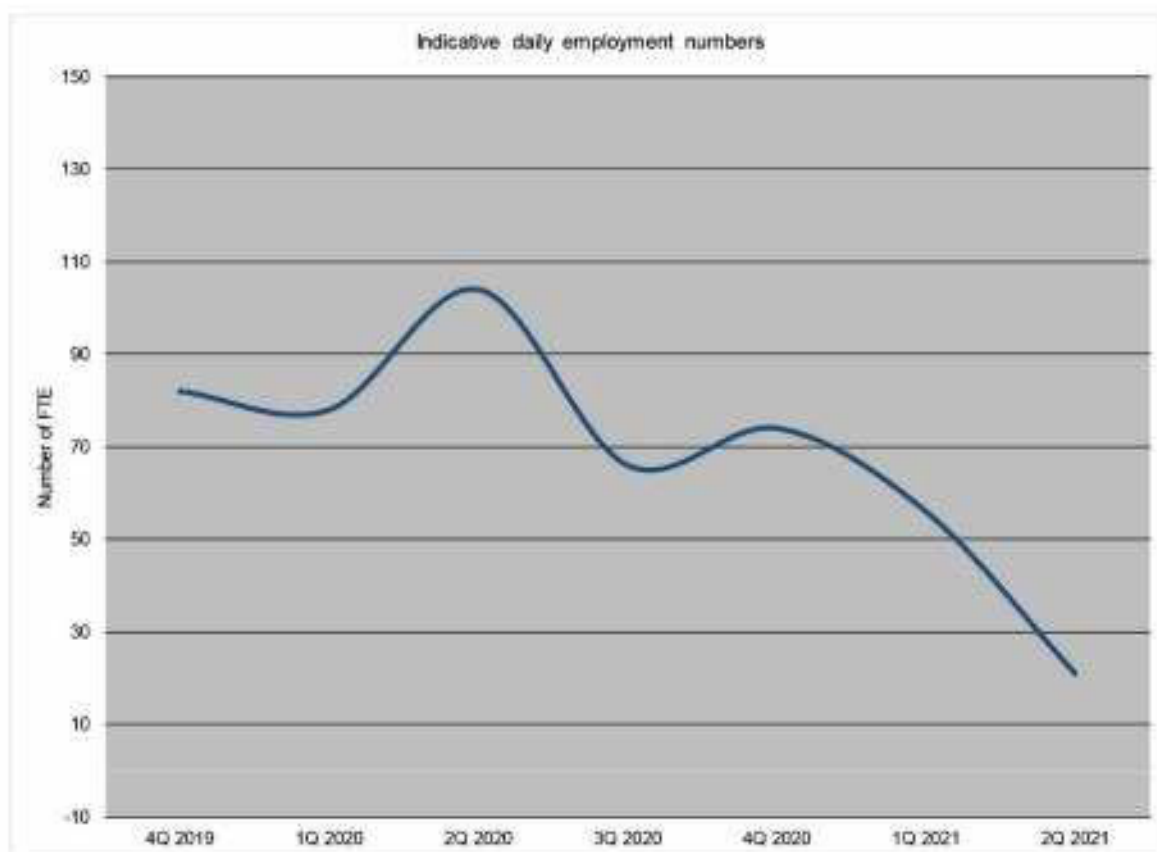
Plate 6-3- Preliminary construction programme showing likely timings and durations to inform the PEIR assessments



Construction staffing and transport

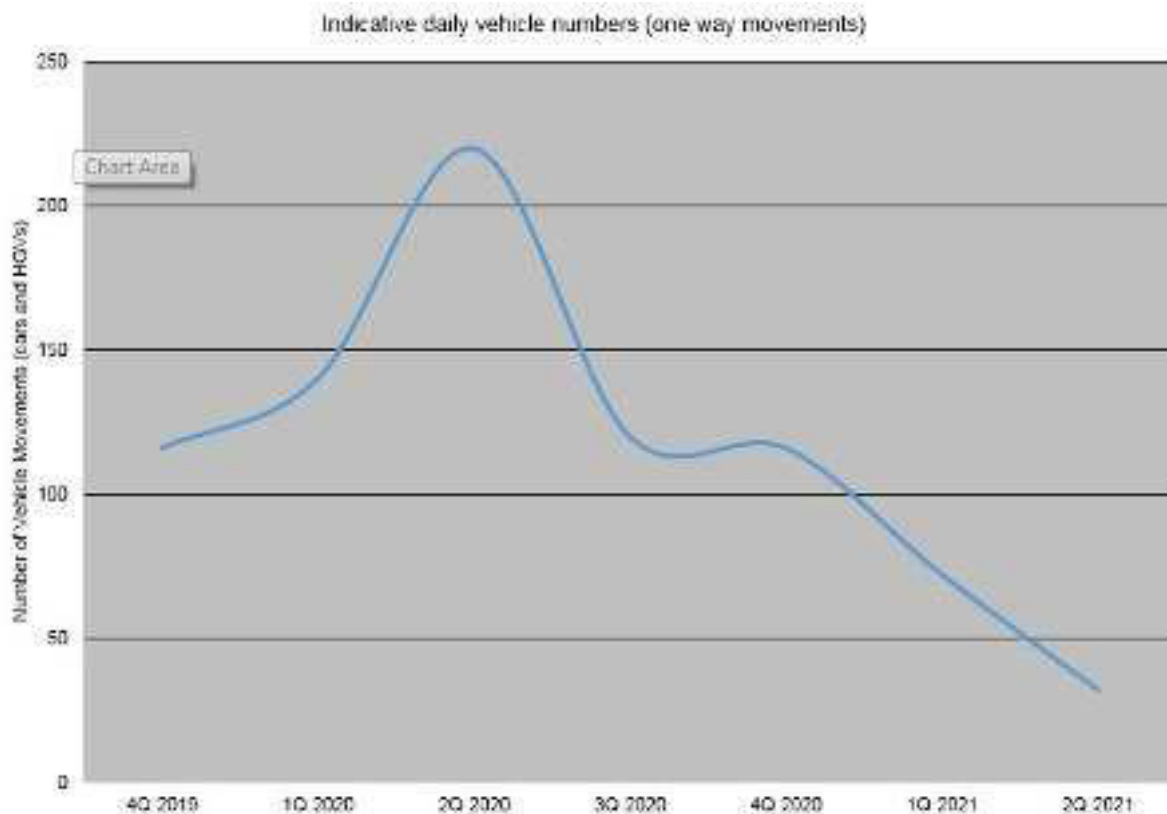
- 6.6.4 In their Scoping Opinion (Appendix 7B), PINS noted that construction traffic was one of the three main potential issues identified. SCC has therefore sought from Kier Infrastructure estimates on the delivery profile of staff and construction materials as well as an estimate of the number of staff likely to be employed during the construction phase.
- 6.6.5 An indicative profile of numbers of staff employed on site on a daily basis is included in Plate 6-4 below. As shown, the peak in staff numbers is anticipated about a third of the way through the construction and is anticipated to be approximately 100 full time equivalents working on site each day.

Plate 6-4 – Indicative daily employment numbers



- 6.6.6 An indicative profile of vehicle movements (both staff and HGVs) on a daily basis is shown in Plate 6-5 below. Similarly to the staff numbers, this shows a peak approximately one third into the construction programme that was assumed by Kier Infrastructure. No information is available on the split of movements to the proposed scheme, although it is assumed that 50% of deliveries would be to the southern compound and 50% to the north and hence movements along Waveney Drive or Peto Way would be approximately 50% of the value presented.
- 6.6.7 It is noteworthy that the information presented in Plate 6-5 shows one-way movements associated with both construction deliveries and staff commuting. A one-way movement is a single access to or egress from a site.

Plate 6-5 – Indicative daily vehicle numbers



Construction Code of Practice

- 6.6.8 The Contractor for the proposed scheme will be required to operate to an approved Construction Code of Practice (CoCP) document that will form a requirement to the DCO. As a CoCP is bespoke and individual to each contractor based upon their methods of working, it is not possible to produce this in advance of the submission of the DCO application. However, an 'Interim CoCP' will accompany the ES that provides clear requirements for the contractor and forms the basis of the 'full CoCP' that the contractor will be responsible for.

Construction phasing

- 6.6.9 Kier Infrastructure have provided advice on the stages of construction for the roundabout and embankments of the proposed scheme and this is summarised in Table 6-2 below.
- 6.6.10 The installation of the bascule bridge will follow a process of installing the cofferdams, fender piles, construction of a temporary deck from the north and south quays to and north and south main piers respectively, piling of the main pier structures, shuttering and installation of the mechanical and engineering equipment.
- 6.6.11 The installation of the structure over the East Suffolk railway will follow a similar process in so far that the piling of the main pier structures will precede the shuttering. It is presently proposed that the bridge over the railway, and the operational Port will be constructed perpendicular to the main alignment with the bridge then rotated into position as shown in Plate 6-6 and Plate 6-7.

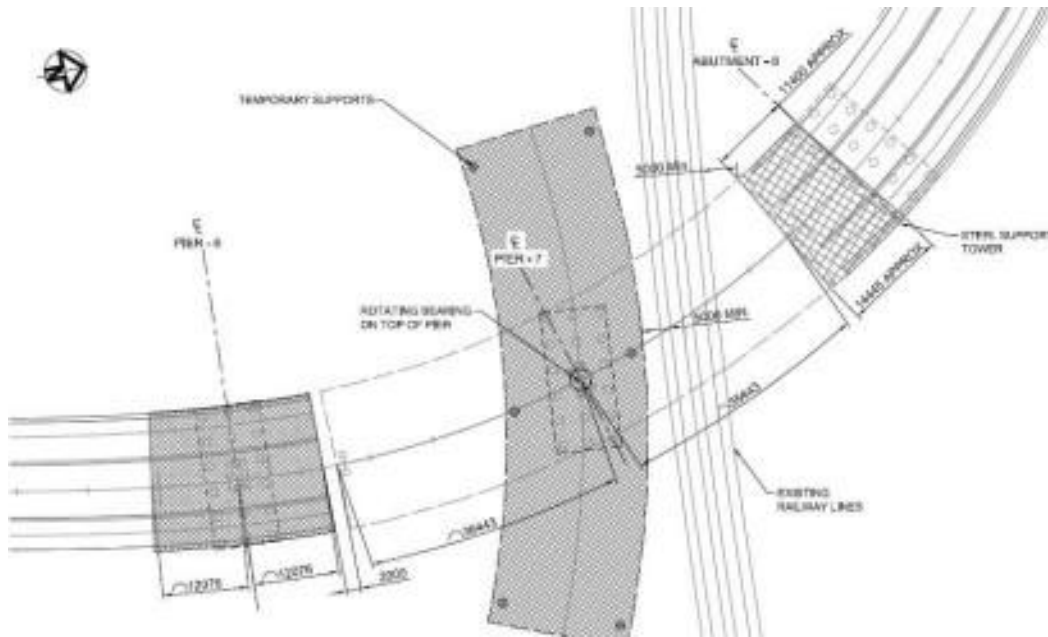


Plate 6-6 – Sketch showing area of cantilever construction parallel to the railway line

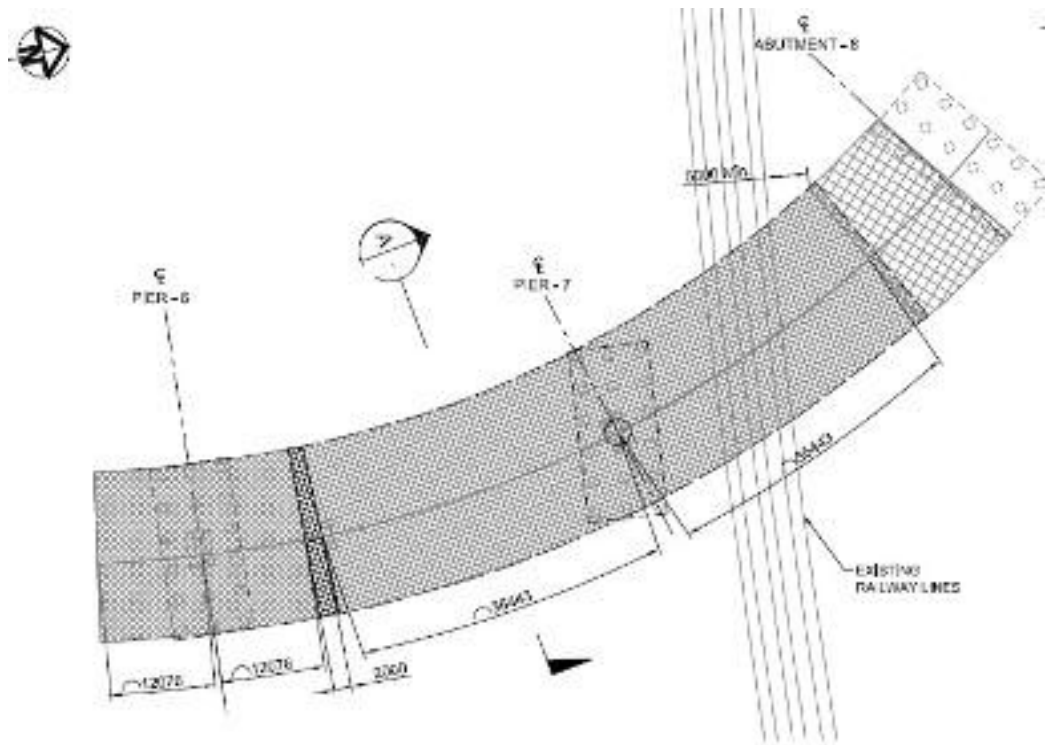


Plate 6-7 – Sketch showing area of cantilever construction after the completion

Table 6-2 – Construction phases

South of Lake Lothing	
Phase	Main tasks
1	Construction of the Waveney Drive junction and new road to allow access to the Riverside Business Park.
2	Creation of an alternative route into Nexen
3	Construction of the underpass into Nexen
4	Construction of the internal roads to the Riverside Business Park
5	The construction of the approach from the proposed southern roundabout past Motorlings and NWES's Riverside Business Centre.
6	Construction of the northern elements of the new southern roundabout
7	Construction of the southern elements of the new southern roundabout
North of Lake Lothing	
Phase	Main tasks
1	The embankment to the bridge over the railway will be constructed.
2	The northern roundabout would be constructed off line without need for highway diversions.
3	The northern roundabout is tied into Denmark Road

Construction requirements

6.6.12 Kier Infrastructure have also advised that the following are likely to be required at some stage during the construction phase of the proposed scheme:

- Traffic Management (the temporary diversion of highway traffic);
- Temporary diversions and temporary access restrictions including limited possessions of both Network Rail land and the navigational channel within Lake Lothing as required and in discussion with the relevant bodies;
- Lighting of the works during construction that incorporates the requirements of ABP as Harbour Authority;
- Site compounds on each side of the Lake for storage and delivery of materials as well as site offices, workshops and parking (please see Figure 6.6 for indicative locations);
- Pollution preventing measures to minimise risks from the storage of fuel, oils and chemicals;
- Creation of steel framed sheet pile coffer dams;
- Temporary working space to construct the structures including areas for lifting of bridge elements, wherever necessary;
- Construction of the structures and bascule bridge would require:
 - Piling operations for the piers and abutments both in the lake and in land;
 - Excavation for foundations;
 - Lifting operations of bridge components or temporary works; and
 - Falsework.

- Working space to divert Statutory Undertakers apparatus affected by the works;
- Limited 24 hour construction;
- Levelling and major and minor earthworks using scrapers, excavators, generators bulldozers and dump trucks;
- Lifting bridge elements;
- The import and export of material (fill, spoil and road stone) to establish the carriageway;
- Construction vehicle movements to deliver and dispose of materials including possible abnormal load deliveries to site along the A146;
- Possible de-watering activities; and
- Restoration of temporarily used sites on completion.

Next steps

- 6.6.13 Development of an interim Code of Construction Practice which will accompany the ES which will have regard to consultation feedback, further discussions with consultees and additional contractor involvement.

6.7 Operation and Maintenance

- 6.7.1 While the proposed scheme will be an SCC asset, it is likely that the operation of the bascule bridge opening will be controlled by the Harbour Authority, in a similar way to which Highways England owns the A47 Bascule Bridge, but it is operated by ABP. At present, ABP operate the A47 Bascule Bridge and similarly to the A47 Bascule Bridge the proposed bascule bridge will be opened for commercial vessels as required, and for private vessels by prior arrangement and at set times.
- 6.7.2 At the present time no information is available on when the proposed scheme bridge would be opened, although it was assumed in the Outline Business Case that the proposed scheme would operate to a similar schedule as the existing A47 Bascule Bridge.
- 6.7.3 Maintenance of the proposed scheme will be the responsibility of SCC as the highway authority. It is likely that the maintenance regime will require the following:
- Flexible hose replacement on a five year basis that could require the bridge to remain closed for two to three days;
 - Cylinder and pump refitting on a ten year basis that could require the bridge to remain closed for two to three days; and
 - Cylinder and pump replacement on a 25 year basis that could require the bridge to remain closed for up to seven days.
- 6.7.4 All other routine maintenance operations can be undertaken without a bridge closure or the need for excessively noisy plant or equipment.

6.8 Decommissioning

- 6.8.1 The proposed scheme bascule bridge will be designed to have a life of at least 120 years in accordance with the requirements of BS EN 1990:2002.
- 6.8.2 Any decommissioning would be likely to be completed in less time than the construction of the proposed scheme and whilst SCC have no plans to decommission and remove the proposed scheme were it to

be removed, it would be likely to require a similar degree of plant, equipment and disturbance within the navigation channel to that predicted during construction.

- 6.8.3 Likewise, should the proposed scheme be decommissioned it will be probably be necessary to remove by road the materials that arise from the demolition and these are likely to be greater in frequency than those envisaged during construction given that decommissioning would be carried out over a shorter time frame.
- 6.8.4 Given that SCC has no plans to decommission the proposed scheme, and as the environmental constraints in the mid-22nd Century cannot be reasonably predicted, further consideration of decommissioning is not considered appropriate although please refer to Chapter 14 where greater information on the nature of the materials used in construction and how their suitability will be assessed is included.

7 Scoping and Introduction to Environmental Assessments

7.1 Scope of the Assessments

- 7.1.1 Regulation 8 of the 2009 Regulations makes provision for an applicant to request a scoping opinion from the relevant authority.
- 7.1.2 As noted earlier in Section 1.2.10, an EIA Scoping Report was submitted to PINS in February 2017 which provided an outline approach for the identification and assessment of likely significant effects for each of the identified environmental aspects within the Scoping Report. A copy of this Scoping Report is included as Appendix 7A.
- 7.1.3 On the 7th of April 2017, PINS, on behalf of the Secretary of State (SoS) provided their Scoping Opinion to the Applicant and this Scoping Opinion is included as Appendix 7B.
- 7.1.4 The executive summary to the Scoping Opinion identified the main potential issues to be considered within the ES to be:
- Impacts on designated ecological sites and their features;
 - Impacts as a result of mobilisation of contaminants and sediments; and
 - Construction traffic and transportation impacts on the local highway network.
- 7.1.5 The purpose of Chapter 7 in the ES will be to identify and present how the scope of the assessment has evolved since the scoping and consultation stages.

Transboundary Effects

- 7.1.6 On the 18th of July 2017 the SoS published a screening of the proposed scheme against whether significant transboundary effects were likely. This screening was undertaken by PINS on behalf of the SoS and concluded that the proposed scheme was not likely to have a significant effect on the environment in another European Economic Area (EEA) state.

7.2 Format of the Assessments

- 7.2.1 A common format has been adopted for the reporting of the assessments undertaken for each of the environmental aspects investigated in Chapters 8 to 19 of this PEIR, and a similar proposed format will be adopted for the ES.

Scope of the Assessment

- 7.2.2 This section describes the potential impacts identified during scoping, specific to the aspect reported in the chapter. It explains the nature of the potential impacts, the specific assessments considered appropriate, extent of the study area for each of the assessments and where appropriate, the timescales considered.

Study Areas

- 7.2.3 The extent of the study area for the assessments varies according to the specific assessment. They have been determined in light of an initial review of the relationship of the proposed scheme to sensitive receptors (people, environmental features or fauna) and the likelihood of consequential impacts. For some assessments, the study area is relatively localised to the proposed alignment. For others it may extend out to the surrounding road network, along watercourses or include more distant communities and environmentally sensitive areas. The extent of the study area for each assessment is described in each assessment chapter and summarised below in Table 7-1.

Table 7-1 – Study areas within the assessment

Environmental Aspect	Sub-Topic	Study Area
Air Quality	Construction	350m from dust generating activities
	Operation	200m from roads due to experience a change in traffic as per DMRB criteria
Cultural Heritage	Construction and operation	500m from the proposed scheme
Townscape	Townscape character	A 3km radius around the proposed scheme
	Visual impact	The Zone of Theoretical Visibility (ZTV) has been calculated using computer software. Figures 11.2-11.4 show an indicative area where the proposed scheme will be visible in part.
Nature Conservation	Main study area	A 500m radius around the proposed scheme that considers habitats and species that may be affected.
	Broad study area	A 2km radius to identify locally and nationally designated sites.
	Extended study area	A 30km radius to identify internationally designated sites.
Geology and Soils	Contamination	The proposed scheme boundary
Noise and Vibration	Construction	350m from dust generating activities
	Operation	600m from roads due to experience a change in traffic as per DMRB criteria
Private Assets	Construction and operation	The proposed scheme
Socio-economics and recreation	Construction and operation	The area administered by Waveney District Council and Great Yarmouth Borough Council.
Road Drainage and the Water Environment	WFD surface waters	2km buffer from the proposed scheme boundary.
	WFD groundwaters	1km buffer from the proposed scheme boundary.
	Tidal regime	The extent of Lake Lothing between Mutford Lock and the A47 Bascule Bridge.
Flood Risk	Flood risk assessment	The study area for the flood risk assessment is based upon the extent of flooding in the 1:1000 year flood event, plus climate change.
Traffic and Transport	Junction capacity	Determined based upon the junctions that are affected through a change in traffic flow. The area of study is shown in Figure 19.1.
Cumulative Impacts	N/A	As established through CEA Stage 1 (see Chapter 20).

Timescales

7.2.4 Similarly, the timescales adopted for the assessments vary according to the environmental aspect being considered. For many environmental aspects, the DMRB guidance calls for an assessment based on predicted changes during construction, as the scheme would be opened to use (the Opening

Year) and 15 years subsequent to the Opening Year (the Design Year). The latter represents the period generally adopted for forecasting the volumes of traffic using the road and within parts of the wider road network as the basis for designing the proposed scheme. The specific timescale for each assessment is described in each assessment chapter.

7.2.5 The adopted Opening and Design Years for the proposed scheme are 2022 and 2037 respectively.

Directives, Statutes and Relevant Policy

7.2.6 This section identifies directives, statutes and policies which have informed the conduct of the assessments with particular reference to the NPS for National Networks.

Methods of Assessment

7.2.7 This section details the methods of assessment adopted for the various assessments. It explains the nature of the data relied on and the surveys, models and calculations used and undertaken to validate:

- the baseline environment with particular reference to environmental resources and receptors; and
- predicted impacts associated with the introduction of the proposed scheme into the baseline environment.

7.2.8 There is an explanation of the quantitative and qualitative criteria adopted to evaluate impacts and determine the order of beneficial and adverse impacts. Methodologies are predominantly sourced from the DMRB, except where clearly identified in each individual chapter.

Determination of Significance

7.2.9 A common methodology for the determination of significant effects was requested by the SoS in the Scoping Report (Appendix 7B). At this PEIR stage the applicability of using the criteria within Table 7-2 is proposed for those assessment for which it is appropriate and consultation feedback on whether this is suitable is sought during consultation. Unless otherwise stated in the individual assessment, a significant effect is deemed to occur when a moderate or greater impact is identified.

Table 7-2 – Assessment criteria

Magnitude of Impact	Major	Neutral	Slight	Moderate / Large	Large / Very Large	Major
	Moderate	Neutral	Slight	Moderate / Slight	Moderate / Large	Large / Very Large
	Minor Adverse	Neutral	Slight / Neutral	Slight	Moderate	Moderate / Large
	Negligible	Neutral	Slight / Neutral	Slight / Neutral	Slight	Moderate / Slight
	No change	Neutral	Neutral	Slight / Neutral	Slight / Neutral	Slight
	Neutral	Slight	Moderate	Large	Very Large	
	Value					

Baseline Environment

- 7.2.10 This section includes a description of the context, key components, characteristics and status of the baseline environment relevant to the environmental aspect discussed within the chapter and with specific consideration to the potential impacts being assessed.

Resources and Receptors

- 7.2.11 Environmental resources are defined as those aspects of the environment that support and are essential to natural or human systems. These include areas or elements of population, ecosystems, soil, water, air and climatic factors, material assets, landscape, water courses, community facilities etc.
- 7.2.12 Environmental receptors are defined as people (occupiers of dwellings and users of recreational areas, places of employment and community facilities) and elements within the environment (flora and fauna), that rely on resources.

Predicted Impacts and Residual Effects

- 7.2.13 This section describes the predicted impacts in accordance with the criteria detailed in the methods of assessment. The assessment considers impacts during construction and once the proposed scheme is open to use.
- 7.2.14 Impacts comprise identifiable changes in the existing environment (the baseline environment) which would occur or be likely to occur as a consequence of implementation of the proposed scheme (e.g. the loss of a habitat or the pollution of a watercourse). Impacts are described in the form of ratings (thresholds) appropriate to the nature of the environmental aspect and in accordance with accepted terminology where standardised methodologies are used.
- 7.2.15 Impacts may be direct (e.g. the loss of a habitat to accommodate the proposed scheme) or indirect (e.g. pollution downstream arising from silt deposition during earthworks). They may be short-term / temporary (e.g. dust associated with construction) medium-term (e.g. the loss of vegetation prior to re-establishment) or long-term / permanent (e.g. improvement in local air quality). They may be beneficial (e.g. reduction in noise levels) or adverse (e.g. loss of a private asset).
- 7.2.16 The prediction of impacts has been based on:
- the known or likely presence of environmental receptors / resources;
 - the environmental value of the resources / receptors, as determined through their designated status along with qualitative criteria such as rarity, status and condition;
 - the vulnerability or sensitivity of affected resources;
 - the number and sensitivity of affected receptors;
 - the extent, nature and duration of physical change resulting from the construction or operation of the proposed scheme;
 - the ability of the resource / receptor to respond to change; and
 - the adaptability, and thus effectiveness, of the resource / receptor to controlled change (i.e. mitigation).
- 7.2.17 All of the assessments are based on comparisons between the environment immediately prior to the assumed construction of the proposed scheme and the predicted environment, assuming the proposed road is built and mitigation has been successfully implemented.

Mitigation

- 7.2.18 The principles adopted during the identification of mitigation measures is one of avoidance if possible, reduction where avoidance cannot be achieved or compensation where reduction cannot be achieved or would not achieve practicable levels of mitigation.
- 7.2.19 Where possible to do so, mitigation that is inherent to the design has been identified and is distinct from mitigation that is in addition to the original proposals. The ES will clarify and clearly present within the Schedule of Environmental Commitments chapter what these mitigation measures are.
- 7.2.20 The PEIR and the ES will reference both mitigation and embedded mitigation and a definition of both is provided below in paragraphs 7.2.21 and 7.2.22.

Embedded Mitigation

- 7.2.21 In the context of a road scheme, such as Lake Lothing, a number of mitigation measures that reduce the impact of the scheme upon the environment will be included. The definition used to describe embedded mitigation is mitigation that is provided regardless of the location and characteristics of the development. For example, the proposed scheme will be designed to alleviate rainwater run-off to a rate that is acceptable to the Environment Agency and this will be incorporated within the design regardless of any assessment identifying whether it is necessary to do so to mitigate a significant effect.

Mitigation

- 7.2.22 Mitigation differs from embedded mitigation insofar that it is defined in this assessment as being mitigation that is required as a result of the location and characteristics of a development. An acoustic barrier is a form of mitigation in so far that it would only be employed in specific locations and never as a matter of course.

Enhancement

- 7.2.23 Further to mitigation measures, enhancements are defined as improvements to the environment that are provided by a scheme when there is no particular requirement to do so to mitigate a significant effect. Such an example would be the creation of a habitat for a protected species when no such record of that species being present was available, or when, should the species be present and there was no adverse effect from the scheme, but yet an 'enhanced' environment for them had been created.

Conclusion and Significant Effects

- 7.2.24 This section describes which, if any, of the impacts are predicted to have a significant environmental effect. It describes the nature of any such effects and their geographic influence of the predicted effect such as local or national.

Additional Studies to be Undertaken

- 7.2.25 Where further survey data is to be collected, or further assessment remains to be undertaken prior to the ES, this is clearly identified at the end of each chapter.

8 Air Quality

8.1 Scope of the Assessments

8.1.1 This chapter describes the air quality impact assessment to determine the likely significant effects of the proposed scheme on local and regional air quality.

8.1.2 The air quality impact assessment will consider potential impacts associated with the following activities;

- Emissions associated with the construction phase of the proposed scheme with a focus on construction dust emissions;
- Emissions associated with the operational phase of the proposed scheme with a focus on vehicle emissions;

8.1.3 It is supported by Figure 8.1 to 8.4 and Appendices 8A to 8C.

Study Area

8.1.4 The study area for the assessment of local air quality impacts due to the release of fugitive dust during the construction of the proposed scheme is defined by the location of sensitive receptors identified within 350m of the site redline boundary as shown in Figure 8.2.

8.1.5 The operational air quality assessment study area that will be presented in the ES will incorporate sensitive receptors identified within 200m of the affected roads as shown in Figure 8.3. Further information defining affected roads given in paragraph 8.2.20.

Limitations

8.1.6 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.

8.1.7 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).

8.1.8 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

8.2 Directives, Statutes and Relevant Policy

8.2.1 The following Directives and Regulations have informed the conduct of the assessments.

The Environmental Protection Act 1990 (EPA)

8.2.2 The EPA (Section 79, Chapter 43, Part III - Statutory Nuisance and Inspections) contains a definition of what constitutes a 'statutory nuisance' with regard to dust and places a duty on Local Authorities to detect any such nuisances within their area. Dust arising from construction works could lead to statutory nuisance if it 'interferes materially with the wellbeing of the residents, i.e. affects their wellbeing, even though it may not be prejudicial to health'.

National Policy Statement for National Networks (NPS)

- 8.2.3 The NPS provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
- 8.2.4 The NPS Chapter 5, Generic Impacts, Air Quality states the requirement for an Environmental Statement (ES) where ‘the impacts of the project (both on and off-scheme) are likely to have significant air quality effects in relation to meeting EIA requirements and / or affect the UK’s ability to comply with the Air Quality Directive, the applicant should undertake an assessment of the impacts of the proposed project as part of the environmental statement.’ The ES should describe;
- ‘existing air quality levels’;
 - ‘forecasts of air quality at the time of opening, assuming that the scheme is not built (the future baseline) and taking account of the impact of the scheme; and’
 - ‘any significant air quality effects, their mitigation and any residual effects, distinguishing between the construction and operation stages and taking account of the impact of road traffic generated by the project.’
- 8.2.5 The applicant’s assessment should be consistent with Defra’s published future national projections of air quality based upon evidence of future emissions, traffic and vehicle fleet.
- 8.2.6 In addition to information on the likely significant effects of a project in relation to EIA, the Secretary of State must be provided with a judgement on the risk as to whether the project would affect the UK’s ability to comply with the Air Quality Directive. This will be included in the ES.

8.3 Methods of Assessment

Construction Phase

- 8.3.1 The assessment of local air quality impacts due to the release of fugitive dust, including particulates, during the construction phase will be undertaken in accordance with the methodology detailed in the Institute of Air Quality Management (IAQM) guidance¹⁵, with reference to DMRB HA207/07. Full details of the construction assessment methodology are provided in Appendix 8A.
- 8.3.2 DMRB HA 207/07 states that where construction is predicted to last for more than 6 months then traffic management measures and the effect of the additional construction vehicles should be assessed. Construction advice from Kier Infrastructure (see Section 6.6) indicates that on average there will be approximately 200 construction related one way movements per day¹⁶, split between the proposed construction compounds to the north of Lake Lothing and the proposed construction compound to the south of Lake Lothing. As this figure is well below the DMRB criteria that requires assessment following a change of 1000 or more AADT daily traffic volume for an affected road (incorporating the sum AADT value for both lane directions where a road is bidirectional), an assessment of the vehicle emissions related to the construction phase has been scoped out of further assessment.

¹⁵ Institute of Air Quality Management (IAQM) (2014) *Assessment of Dust from Construction and Demolition*, IAQM

¹⁶ One way vehicle movements identify a vehicle travelling to or travelling from the construction site. The figures provided include staff vehicles as well as deliveries to the site.

- 8.3.3 The assessment will therefore focus on potential impacts associated with the following types of activity that occur throughout the works:
- Demolition;
 - Earthworks;
 - Construction; and
 - Trackout.
- 8.3.4 Dust impacts associated with annoyance due to soiling, health effects due to an increase in exposure to PM₁₀ and PM_{2.5}, and potential harm to ecological receptors will be assessed. Factors including the scale and nature of the activity, in addition to the sensitivity of the area, will be considered when assessing the risk of impacts which are determined without mitigation measures in place.
- 8.3.5 The study area has been defined by the location of sensitive receptors identified within 350m of the proposed scheme; this being the worst case maximum distance from source to receptor for any construction activities that could be a source of dust emissions, as defined by the screening criteria within the IAQM guidance on the assessment of dust from demolition and construction¹.
- 8.3.6 The demolition element of the Construction Phase Assessment will be prepared once the extent of the removal of existing structures is known as the volume of material being demolished and the nature of the material is key to making an assessment of the potential risk of dust emissions from demolition activities. The findings of the assessment will be incorporated as a component of step two of the assessment as detailed in Appendix 8A paragraph 8.1.6.
- 8.3.7 The assessment of potential construction phase impacts is used to define appropriate mitigation measures that should be implemented through the full Code of Construction Practice (CoCP), that the contractor will be required to work to and which will be commensurate to the scale and duration of the activities. The potential for significant effects with respect to both fugitive dust and exhaust emissions will be assessed with the assumption that the recommended mitigation measures are in place during construction.

Significance Criteria

- 8.3.8 The significance of any dust emissions from the construction of the proposed scheme has been assessed in accordance with guidance provided by the IAQM¹.
- 8.3.9 Step four of the IAQM guidance states that “...*For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation.*”
- 8.3.10 The assessment is used to define appropriate mitigation measures to ensure that there will be no significant effects from the construction phase of the proposed scheme and as such does not identify specific assessment significance criteria. A significant effect is defined by consideration of the risk of dust impact and the identification of appropriate dust mitigation measures, short term temporary annoyance, such as temporary failure of dust suppression due to adverse weather conditions or short term failure of a water supply would not be considered significant but professional judgement must be used in the context of the site and the surrounding area. The IAQM guidance states that “*in the context of construction impacts any effect will usually be adverse, however professional judgement is required to determine whether this adverse effect is significant based on the evidence presented*” and that “*it is anticipated that with the implementation of effective site-specific mitigation measures the environmental effect will not be significant in most cases*”.

Operation Phase

- 8.3.11 The assessment of local air quality and regional emissions impacts associated with operation of the proposed scheme will be informed by the approaches detailed in DMRB HA207/07 and relevant Highways England Interim Advice Notes (IAN's) with reference to respective Defra air quality technical guidance¹⁷ and IAQM guidance¹⁸.

Local Air Quality Assessment

- 8.3.12 The local air quality assessment will focus on the following scenarios, for which traffic data will be provided to facilitate atmospheric dispersion modelling:

- Base year (2016);
- Opening year (2022) without proposed scheme (Do Minimum); and
- Opening year (2022) with proposed scheme (Do Something).

- 8.3.13 Screening of the Do Minimum and Do Something traffic data will be completed to identify affected road links that adhere to the following criteria as provided by DMRB HA207/07:

- Road alignment will change by 5 m or more; or
- Daily traffic flows will change by 1,000 AADT or more; or
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or
- Daily average speed will change by 10 km/hr or more; or
- Peak hour speed will change by 20 km/hr or more.

- 8.3.14 Preliminary traffic data meets the DMRB criteria for a detailed assessment. Lower threshold criteria are published in the IAQM/EPUK Land-Use Planning & Development Control: Planning For Air Quality however initial screening of traffic data against the higher threshold DMRB criteria has determined that a detailed air quality assessment is required thus further screening against the IAQM/EPUK 'indicative criteria for requiring an air quality assessment' was not required.

- 8.3.15 Preliminary traffic data, provided for the outline business case, for the proposed scheme opening year were screened to provide an indication of the study area for the local air quality assessment. The identified affected links based on preliminary traffic data are presented in Figure 8.3. These traffic data will be finalised prior to progressing the air quality assessment. However, given the number of road links likely to meet the DMRB criteria, a detailed local air quality assessment will be progressed. Detail of the traffic conditions and traffic model is provided in Section 6.2 and Chapter 19.

- 8.3.16 Emissions inventory databases for each pollutant (NO_x, PM₁₀, PM_{2.5}) will be developed for all three of the above scenarios using Defra's latest emission factor toolkit (EFT v7.0), which accounts for vehicle flow characteristics, such as:

- Link flow volumes as annual average daily traffic (AADT);
- Link average speed (km/hr);
- Vehicle breakdown (e.g. percentage HDVs); and
- Link length.

¹⁷ Defra (2016) *Local Air Quality Management Technical Guidance (TG16)*, London: Defra

¹⁸ IAQM (2015) *Guidance on land-use planning and development control: Planning for air quality*, IAQM

- 8.3.17 Each scenario emissions database will be entered to an atmospheric dispersion model (ADMS-Roads v4) to enable prediction of pollutant concentrations at the identified sensitive receptor locations as will be determined in accordance with DMRB guidance, further information on sensitive receptors is given in paragraph 8.4.17. The modelling exercise will utilise hourly sequential meteorological data from the most representative observation site within proximity to the proposed scheme.
- 8.3.18 The base year model results will be verified in accordance with Defra's technical air quality guidance¹⁸. Model verification requires analysis of model outputs versus monitored data for equivalent locations within the study area. Therefore, baseline air quality monitoring is required to provide representative coverage of the identified affected links.
- 8.3.19 Within the traffic reliability area (TRA) (see Chapter 19), there is a network of eleven NO₂ diffusion tube monitoring locations operated by Waveney District Council, which do not provide adequate coverage of the proposed scheme alignment and affected roads. As such, a scheme specific network of 46 additional tubes (including a co-located tube in Norwich) has been established for a twelve month monitoring period, covering a number of the likely affected road links. The locations of these tubes were agreed through consultation with Waveney District Council and Suffolk County Council and are included in Figure 8.4.
- 8.3.20 The results of the baseline survey, which will be bias adjusted and annualised for comparison with the annual mean NO₂ limit value, will be used in the model verification exercise and to inform the review of existing air quality conditions within the study area. The derived model verification factor will be applied to all subsequent model outputs of NO_x/NO₂. Emissions of PM₁₀ and PM_{2.5} from vehicles will be included within the air quality model assessment scenarios to be undertaken for the ES. Verification of these pollutants will be completed using the factor determined through verification of NO₂ concentrations, in accordance with LAQM TG16 technical guidance, which states *"...In the absence of any PM₁₀ (and PM_{2.5}) data for verification, it may be appropriate to apply the road-NO_x adjustment to the modelled road-PM₁₀/2.5"*.
- 8.3.21 Scheme specific monitoring of PM₁₀ and PM_{2.5} was not undertaken as the Defra 1km x 1km gridded background pollutant concentrations for Lowestoft give a 2016 maximum concentration of 15.66 µg.m⁻³ PM₁₀ and 10.97 µg.m⁻³ PM_{2.5} for the grid squares covering the local air quality assessment study area, concentrations which are not approaching the respective objective values of the respective objective values of 40 µg.m⁻³ and 25 µg.m⁻³, as defined in the Air Quality Standards Regulations¹⁹. WDC has reported that there are no identified substantial sources of particulates within the borough and as such, monitoring is not currently undertaken by WDC for the purposes of Local Air Quality Management (LAQM) and was not undertaken by WSP as part of this assessment²⁰.
- 8.3.22 Emissions of particulates during the construction phase have the potential to result in localised increases in concentrations of PM_{10/2.5} dependant on the nature and extent of activity. However, control of such emissions is considered within the construction phase assessment (see Appendix 8A) and associated mitigation measures (see Section 8.6).
- 8.3.23 Current information available from Defra stipulates that concentrations of NO₂ near to roads are not reducing as expected, meaning future projected reductions in vehicle NO_x/NO₂ emissions are considered too optimistic. To account for this, Highways England has published Interim Advice Note (IAN) 170/12v3 (2013) – *Updated air quality advice on the assessment of future NO_x and NO₂ projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality*. The guidance presents a methodology for the verified modelled NO₂

¹⁹ HMSO (2010) Statutory Instrument 2010 No. 1001, The Air Quality Standards (England) Regulations 2010, London: HMSO

²⁰ Phone meeting WSP with David Porter EHO for Waveney District Council part of the East Suffolk Coastal and Waveney Councils in Partnership 05/12/16 to agree the scheme specific monitoring program.

concentrations to be adjusted to account for the long term NO₂ profiles. This approach will be adopted for the proposed scheme air quality impact assessment.

- 8.3.24 The results of the atmospheric dispersion modelling at each identified sensitive receptor will be compared to the respective air quality limit values to evaluate the potential for exceedances in all scenarios.
- 8.3.25 The magnitude of change of predicted concentrations at each location, as a result of the scheme, will be derived through analysis of the Do Something versus Do Minimum scenario data. The significance of potential changes to local air quality will be determined in accordance with the criteria provided by IAQM¹⁸ and Highways England²¹.

Regional Emissions

- 8.3.26 The regional emissions assessment will focus on total annual mass emissions of NO_x, PM₁₀, PM_{2.5}, total hydrocarbons (HC), and carbon dioxide (CO₂) associated with the aforementioned scenarios, in addition to:
- Design year (2037) without proposed scheme (Do Minimum);
 - Design year (2037) with proposed scheme (Do Something).
- 8.3.27 Screening of the Do Minimum and Do Something traffic data will be completed to identify affected road links that adhere to the following criteria as provided by DMRB HA207/07:
- A change of more than 10% in AADT; or
 - A change of more than 10% to the number of heavy duty vehicles; or
 - A change in daily average speed of more than 20 km/hr.
- 8.3.28 Traffic data for affected road links in each scenario will be entered to Defra's EFT v7, enabling the calculation of total annual mass emissions of the respective vehicle exhaust species. This will allow the magnitude of change of the proposed scheme on mass emissions to be predicted, which will be evaluated within the context of total regional road emissions data published by the National Atmospheric Emissions Inventory (NAEI).

8.4 Baseline Environment

- 8.4.1 The level of air pollution adjacent to roads and within urbanised areas is typically a function of vehicle emissions. Emissions of nitrogen oxides (NO_x, including nitrogen dioxide, NO₂) and particulate matter (PM₁₀ and PM_{2.5})²² from vehicles are of greatest concern with respect to human health.
- 8.4.2 Concentrations of these pollutants are most likely to approach their respective air quality limit values, established by UK legislation⁵ for the protection of human health, in proximity to the aforementioned areas. Therefore, the below review of the existing environment and subsequent air quality assessment scope will focus on these pollutants.

²¹ Highways England (2013) *Interim Advice Note 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (HA207/07)*

²² PM₁₀ - assessed as the fraction of airborne particles of mean aerodynamic diameter less than 10 micrometres PM_{2.5} – assessed as the fraction of airborne particles with an aerodynamic diameter less than 2.5 micrometres

8.4.3 Desk top information was collated from the following sources to inform the review of existing air quality conditions:

- Waveney District Council local air quality management (LAQM) reports and published monitoring data;
- Department for Environment Food and Rural Affairs (Defra) mapped background air pollutant concentrations specific to the proposed scheme; and
- Ordnance Survey (OS) mapping and address layer data to identify potentially sensitive receptors in proximity to the proposed scheme and surrounding areas.

Local Air Quality Management Review

8.4.4 A review of the latest LAQM report published by Waveney District Council, *2015 Air Quality Updating and Screening Assessment*, confirmed that there are no Air Quality Management Areas (AQMAs) declared within the District, with no requirement for the Council to progress to a detailed assessment of air quality for any pollutant.

8.4.5 Waveney District Council (WDC) does not currently operate an automatic continuous air quality monitor and does not monitor levels of PM₁₀ and PM_{2.5} within Lowestoft.

8.4.6 WDC does operate a network of NO₂ diffusion tube monitoring sites, eleven of which are located adjacent to roads that are likely to be affected by the proposed scheme, as detailed in Figure 8.4.

8.4.7 The annual mean NO₂ concentrations at these locations, obtained from Waveney District Council for the period 2010 – 2015 inclusive, demonstrate that there have not been any exceedances of the respective air quality limit value (40 µg.m⁻³). The maximum monitored annual mean concentration recorded in the last two years (2014/15) was 31.2 µg.m⁻³ adjacent to the A12/ B1532 junction located to the south of the existing A12 Bascule Bridge.

Table 8-1 Local Authority NO₂ Monitoring Results

Site ID	Site Name Maximum	Site Type	X,Y	Annual Mean Concentration (µg.m ⁻³) – Bias adjusted but not annualised					
				2010	2011	2012	2013	2014	2015
W1	Castleton Avenue	Roadside	650608,290476	16.7	16.7	15.7	16.2	15.2	19.5*
W2	Fir Lane	Roadside	653220,293794	20.8	21.1	20.1	19.5	19.4	21.8*
W3	Dutchman's Court	Roadside	651885,292105	26.5	23.5	21.7	21.7	22.8	20.9*
W4	Golden Court	Roadside	652242,292955	33.6	31.9	27.3	29.4	27.7	25.1*
W5	Yarmouth Road	Roadside	653049,295534	18.2	18.6	16.8	17.8	18.2	17.7*
W6	Mill Road	Roadside	654470,292395	26.1	22.8	20.9	19.6	18.7	19.6*
W7	St Margaret's Church Yard	Urban Background	654305,293914	-	17.8	16.3	16.5	16.5	12.3
W8	Belvedere Rd 1	Roadside	654651,292619	34.0	32.8	29.2	24	29.3	31.1
W9	Belvedere Rd 2	Roadside	654619,292619	34.8	32.8	30.0	25.7	31.2	29.5
W10	Pier Terrace 1	Roadside	654658,292598	37.1	35.1	30.8	35.3	29.9	27.8*
W11	Pier Terrace 2	Roadside	654658,292598	-	-		26.0	25.2	24.7

**values have been adjusted for fall off with distance from the road by the Local Authority using the Defra "NO₂ fall off with distance calculator" to assess relevant public exposure.*

Background Pollutant Concentrations

- 8.4.8 Defra publishes modelled background air pollutant data for the UK, based on a 1 km² grid, which accounts for a multitude of local emissions sources including road vehicles, industrial installations, domestic heating and other transport modes, in addition to regional sources and imported emissions. The modelled background data is available for years 2013 to 2030 inclusive.
- 8.4.9 For the purposes of reviewing the existing background and predicted future background levels, the maximum, minimum and average annual mean concentrations of each pollutant (NO₂, PM₁₀, PM_{2.5}) based on the 1 km² grids encompassing the proposed scheme and surrounding area, are presented in Table 8-2 below for the base year (2016) and opening year (2021).

Table 8-2 – Defra mapped background annual mean concentrations (µg.m⁻³) for each pollutant in base (2016) and future (2022) years

Pollutant	2016 Background Concentration			2022 Background Concentration		
	Maximum	Minimum	Average	Maximum	Minimum	Average
NO ₂	14.5	8.1	9.7	12.2	5.8	7
NO _x	20.6	10.9	13.2	16.9	7.6	9.2
PM ₁₀	16.7	13.2	15.0	18.4	12.2	15
PM _{2.5}	11.5	9.6	10.6	8.7	8.7	8.7

- 8.4.10 The predicted current and future background concentrations presented in Table 8-2 are well below the respective health-based annual mean limit values for NO₂ (40 µg.m⁻³), PM₁₀ (40 µg.m⁻³), and PM_{2.5} (25 µg.m⁻³). Similarly, the annual mean NO_x limit value (30 µg.m⁻³) set for the protection of vegetation and ecosystems, is not predicted to be exceeded.
- 8.4.11 Existing operations at the Associated British Ports (ABP) Port of Lowestoft generate funnel emissions and dust. The funnel emissions are included within the Defra Local Air Quality Management (LAQM) background maps which provide estimates of background concentrations for specific pollutants.

Scheme specific monitoring

- 8.4.12 As noted earlier, monitoring for NO₂ is presently being undertaken at a number of locations in Lowestoft as shown in Figure 8.4. This monitoring, conducted at locations agreed with WDC and SCC²³ was commenced in December 2016 and is programmed to continue until November 2017. The monitoring data collected to date is given in Appendix 8B.

Table 8-3 – Summary of scheme specific NO₂ diffusion tube monitoring (bias adjusted and annualised data from November 2016 to June 2017)

Site	Location Description	X	y	NO2 concentration (µg.m ⁻³) (annualised)
Site 1	The Street	646972	289445	14.8
Site 2	Keel Close	650656	290541	18.7
Site 3	Ark Close	652042	286690	16.8

Site 4	Cranleigh Road	652627	290379	21.6
Site 5	Laxfield Road	652930	290795	18.8
Site 6	The Avenue	653467	291445	20.2
Site 7	Long Road	652989	291235	20.9
Site 8	Ranworth Avenue	652267	291475	17.6
Site 9	Clarkes Lane	651283	291551	15.9
Site 10	Winston Avenue	652174	292219	*
Site 11	Dell Road	652694	292312	20.4
Site 12	Kirkley Run	653291	291968	21.9
Site 13	Notley Road	653699	292173	20.7
Site 14	Durban Road	653934	292393	21.5
Site 15	Waveney Crescent	653769	292370	20.0
Site 16	Crompton Road	652406	292483	18.3
Site 17	Victoria Road	652143	292483	27.5
Site 18	Bridge Road	652230	292923	34.3
Site 19	Lakeland Drive	652728	293347	19.0
Site 20	Princess Walk	653310	293434	16.9
Site 21	Petro Way	653533	293136	26.3
Site 22	Rotterdam Road	653873	293148	26.9
Site 23	Denmark Street	654159	292951	30.2
Site 24	Denmark Road	654667	292921	34.9
Site 25	Battery Green Road	655011	292965	35.1
Site 26	A12	655111	293373	35.2
Site 27	Milton Road East	654909	293432	20.6
Site 28	Minden Road	654164	293603	22.1
Site 29	High Beech	653601	293805	19.2
Site 30	Sands Lane	652564	293899	25.5
Site 31	Lime Avenue	651656	293963	17.0
Site 32	Lavenham Way	652974	294143	18.8
Site 33	Dunston Drive	652128	294564	15.7
Site 34	Union Lane	652346	295288	13.3
Site 35	Jenkins Green	653078	295366	16.9
Site 36	Leonard Drive	653266	295950	17.0

Site 37	Blyford Road	653439	295274	18.8
Site 38	Thirlmere Road	653166	294640	20.2
Site 39	Woods Loke East	653252	294146	17.9
Site 40	Bramfield Road	653222	294263	17.6
Site 41	Ashley Downs	654157	294459	20.1
Site 42	Church Road	654545	294037	21.5
Site 43	A12	654596	294746	*
Site 44	Hubbard's Loke	654492	295716	16.2
Site 45	Old Lane	653632	296575	16.4
Co-location	Co-location	623681	307013	15.1
* Blank cells are where data capture is thus far too low to annualise the results				

Potentially Sensitive Receptors

8.4.13 The proposed scheme will change the physical arrangement of the local road network and therefore alter vehicle flow characteristics, including flow volumes, composition, and speeds. Thus, there is the potential for vehicle emissions to impact local concentrations of air pollutants at the identified sensitive receptors situated within 200m of the affected links determined by screening of preliminary traffic data (Figure 8.3), which will warrant further assessment as outlined in Table 8-4.

8.4.14 The influence of vehicle emissions on ambient air quality is negligible beyond 200m of the respective road source according to DMRB HA207/07, predominantly due to horizontal and vertical atmospheric mixing. As such, an initial desk-based review of potentially sensitive receptors to air quality was undertaken to identify those located within 200m of the proposed scheme alignments and associated affected links. This review was based on OS mapping and address layer data. Sensitive receptors as defined in the Design Manual for Roads and Bridges (DMRB) Section 11.3.1 (HA207/07) include:

- Residential dwellings;
- Designated ecological sites;
- Locations of the young and elderly;
- Hospitals; and
- Schools.

8.4.15 No designated ecological sites (Ramsar, SPAs, SACs or SSSIs) are located within 200m of affected road links based upon the current traffic data. However, Sprat's Water and Marshes SSSI, Carlton Colville SSSI, Broadland Ramsar and SPA and The Broads SAC are located within 200 m of the A146 Beccles Road and as the assessment is finalised, the traffic change that is forecast along this road will be kept under consideration and an assessment upon designated sites undertaken if it is required. In the Scoping Opinion (Appendix 7B) the SoS requested that County Wildlife sites should be included as a designated ecological site, and whilst these are not statutorily designated ecological sites, they will be included in the assessment should they fall within 200m of an affected road.

Table 8-4 – Identified potentially sensitive receptor locations based on OS mapping review

Property Type	Count
Residential	19,532
Designated ecological sites	0*
Education	23
Health Care (Hospitals, Care Homes etc.)	26

*as defined by HA207/07 (SACs, SCI's, cSCI's, SPA's, pSPA's, SSSI's and Ramsar sites).

8.4.16 County Wildlife Sites in Lowestoft will also be considered as sensitive receptors where situated within 200m of an affected road as requested by PINS.

8.4.17 The Port of Lowestoft is situated at close proximity to the proposed construction site for the Lake Lothing Third Crossing. The Port will be considered as a receptor which could be sensitive to construction dust and measures will be included in the full CoCP to mitigate the risk of construction dust impacts to Port operations.

8.5 Predicted Impacts

Construction Phase: Dust Impacts

8.5.1 Construction works have the potential to generate fugitive dust emissions during earthworks and construction activities, as well as from the trackout of dust and dirt by vehicles onto public highways. Dust emissions can cause annoyance through soiling of buildings and surfaces and/or adversely impact human health.

8.5.2 Potential construction phase air quality impacts assessed in this section are considered prior to the application of site-specific mitigation measures. However, the contractor for the proposed scheme will be required to implement mitigation measures within the full CoCP, which will include the measures as outlined in Section 8.6.

8.5.3 Major construction activities that are likely to be required during construction of the proposed scheme include, but may not be limited to, the following:

- Site clearance;
- Topsoil strip;
- Excavation;
- Landscaping;
- Material import/export;
- Temporary stockpile of resources;
- Construction of compounds and access points; and
- Construction of road/bridge and footpath.

8.5.4 The main potential air quality impacts that may arise from the aforementioned activities are:

- Dust deposition, resulting in the soiling of surfaces;
- Dust plumes, affecting visibility and amenity; and
- Elevated ambient PM₁₀ concentrations due to fugitive dust releases.

- 8.5.5 The potential for sensitive receptors to be affected is dependent on the scale and locations of the dust generating activities, the nature of the activity, and local meteorological conditions.
- 8.5.6 There are existing residential receptors located within 350 m of the proposed scheme boundary and approach roads, where the aforementioned activities could occur. The nearest sensitive residential receptors are located within <20m of the current proposed scheme boundary.
- 8.5.7 Distance bandings contained within Table 8.1-3, Table 8.1-4 and Table 8.1-5 of Appendix 8A were analysed based on the redline boundary (Figure 6.1). The number and location of existing 'human' receptors from the proposed scheme boundary is detailed in Table 8-5.

Table 8-5 - Receptor Count within 350m of Earthworks and Construction Activities

Distance Bandings				
Distance from construction boundary (m)	Sensitive Receptor Count			
	Residential	Educational	Medical	Total
<20	76	0	0	76
20-50	35	0	0	35
50-100	208	0	0	208
100-200	481	0	0	481
200-350	870	1	0	870

- 8.5.8 There are two County Wildlife Sites (CWS) and no statutory designated ecological sites within 50m of the proposed scheme boundary, the CWS will be considered as part of the construction phase dust assessment for the ES.
- 8.5.9 The Port of Lowestoft is situated close to the proposed construction sites on the southern and northern bank of Lake Lothing. Silo Quay, and North Quay are situated within 350m of the construction redline boundary and operations at the Port could be adversely affected by construction dust.
- 8.5.10 The highest risk receptors are those that are downwind of potential dust-generating construction activities. A wind rose derived from data recorded at Weybourne meteorological station for the year 2016 demonstrates a prevailing south-westerly wind. Therefore, those receptors located to the northeast and east of and within proximity to the aforementioned construction activities are more likely to be affected by fugitive dust releases. As the precise location of dust generating activities within the construction site is not known a conservative approach is taken assuming that these activities could be occurring up to the site boundary. A wind rose showing the recorded data is presented in Appendix 8C.
- 8.5.11 The effects of construction dust generated during dry conditions could lead to annoyance through dust deposition and also localised increases in PM₁₀ concentrations with the potential to adversely impact human health. The maximum background annual mean PM₁₀ concentration for the study area – as predicted by Defra – is 14.5 µg.m⁻³ (2016), which is well below the annual mean limit value of 40 µg.m⁻³. Therefore, it is unlikely that the short-term construction operations would cause the daily (50 µg.m⁻³) or annual mean (40 µg.m⁻³) limit value to be either approached or exceeded at sensitive receptors near to the proposed scheme construction area.
- 8.5.12 The overall risk of construction dust impacts occurring; namely annoyance due to soiling (deposition) and impacts to human health, in the absence of mitigation, is detailed in Appendix 8A and was undertaken with reference to the IAQM guidance document¹⁵.

- 8.5.13 The risks of dust soiling and human health impacts caused by the proposed scheme construction activities were identified to be *medium to high* and mitigation proposals that will reduce this impact are proposed below.

Operational Effects

- 8.5.14 Notwithstanding that at this stage dispersal modelling has not yet been conducted, analysis of the preliminary traffic data indicates that traffic flows decrease as a result of the scheme in areas that correspond to areas where high traffic flows are presently experienced around the existing bascule bridge. The areas noted as having the poorest air quality through air quality monitoring measurements at Belvedere Rd, Pier Terrace, Bridge Rd, Denmark Rd, and Battery Green Rd correspond to areas where traffic flows are predicted to reduce with the proposed scheme in place thus air quality at these locations is likely to improve as a result of the scheme.

8.6 Proposed Mitigation and Residual effects

Construction

- 8.6.1 In the absence of mitigation, construction of the proposed scheme is considered to represent a *medium to high* risk with respect to potential dust impacts at nearby sensitive receptors. As such, a number of mitigation measures are recommended; with reference to IAQM guidance¹⁵, that are commensurate to the scale and nature of the proposed construction activities.
- 8.6.2 The mitigation measures focus on controlling fugitive releases of construction phase dust and will be implemented by the contractor through the full CoCP. Such measures include, but may not be limited to:
- Dust generating activities (e.g. cutting, grinding and sawing) will be minimised and weather conditions considered prior to conducting potentially dust emitting activities;
 - Fine material will not be stockpiled to an excessive height in order to prevent exposure to wind and/or dust nuisance;
 - Roads and accesses will be kept clean;
 - Where possible, plant will be located away from site boundaries that are close to residential areas;
 - Water will be used as a dust suppressant, where applicable;
 - Drop heights from excavators to crushing plant will be kept to a minimum;
 - Distances from crushing plant to stockpiles will be kept to the minimum practicable to control dust generation associated with the fall of materials;
 - Skips will be securely covered;
 - Soiling, seeding, planting or sealing of completed earthworks will be completed as soon as reasonably practicable following completion of earthworks;
 - Dust suppression and the maintenance of the surface of access routes will be appropriate to avoid dust as far as practicable, taking into account the intended level of trafficking;
 - Wheel wash facilities to minimise trackout of dust;
 - Material will not be burnt on site; and

- Engines will be switched off when not in operation.

8.6.3 The interim CoCP will stipulate the following to ensure the aforementioned mitigation is implemented effectively, continually monitored and updated accordingly:

- Identification of a nominated Environmental Site Manager;
- Notification procedures where potentially significant dust generating activities are required;
- Method statements for the control of dust in such locations and complaint receipt; and
- Management procedures to ensure issues are addressed should they be raised by the public.

8.6.4 The mitigation measures will reduce both the magnitude and duration of fugitive dust releases throughout the construction phase. With these measures in place, the residual dust impact will be, at worst, slight adverse at the highest risk receptors located downwind and within 50m of construction activities.

8.6.5 Any such impacts are expected to be intermittent and temporary for the duration of the respective activities and therefore would not constitute a significant environmental effect.

Operation

8.6.6 The significance of potential changes to local air quality will be determined in accordance with the criteria provided by IAQM and Highways England. The areas presently noted as having the poorest air quality through air quality monitoring measurements correspond to areas where traffic flows are predicted to reduce with the proposed scheme in place thus air quality at these locations is likely to improve as a result of the scheme.

8.7 Conclusion and Effects

8.7.1 The construction phase air quality assessment has demonstrated that, in the absence of mitigation, the scale and nature of the proposed works, excluding demolition represent a *medium to high* risk of dust related impacts. The highest risk sensitive receptors are those located within 50m and downwind of potential dust-generating activities.

8.7.2 Appropriate mitigation measures are recommended, which will be implemented via the interim CoCP to prevent or minimise potential fugitive dust emissions. With these measures in place, the residual dust impact will be, at worst, slight adverse at the highest risk receptors.

8.7.3 Any such impacts are expected to be intermittent and temporary for the duration of the respective activities only and would not constitute a significant environmental effect.

8.7.4 Operational impacts are likely to be longer term in nature, vehicle emissions are predicted to decrease with time with more stringent regulation of vehicle emissions and local air quality impacts attributed to the proposed scheme are likely to be worst in the opening year.

8.8 Assessments still be to undertaken

8.8.1 Scheme specific air quality monitoring, conducted by WSP at locations shown in Figure 8.4 will continue until November 2017 when a complete year of monitoring will be available.

8.8.2 The construction assessment described in this chapter will be updated in the ES to account for the latest information that is available with regard to the approach to construction.

8.8.3 An operational air quality assessment based upon finalised traffic data will be completed following the approach outlined in section 8.3 and as described in the Scoping Report (Appendix 7A). The findings of this will be presented in the ES.

9 Cultural Heritage

9.1 Scope of the Assessments

Introduction

- 9.1.1 This chapter addresses the likely effects of the construction and operational phases of the proposed scheme on Cultural Heritage and the identification of mitigation where relevant. It is supported by Figures 9.1 and Appendix 9A to 9E.
- 9.1.2 The preliminary assessment in relation to cultural heritage has focused on:
- Establishment of the baseline environment relative to archaeological remains, historic buildings and historic landscapes; and
 - Identification and description of predicted impacts on identified assets and resources.

Preliminary Study Area

- 9.1.3 This preliminary assessment focuses on the nature and extent of known or potential heritage assets located within a 500m buffer around the proposed scheme boundary (Figure 9.1). The preliminary study area includes parts of the Inner Harbour and Entrance Channel, the Inner Harbour – North, and the Inner Harbour – South character areas, as defined in a recent Historic England study of the port of Lowestoft (ref: HE 2016). Following a review of the Zone of Theoretical Visual Impact (ZVTI) (see Chapter 10) and in order to comply with SoS's Scoping Opinion (Appendix 7B), directing that SCC should "ensure that [the study area] is sufficiently wide to capture all cultural heritage features that could be significantly affected by the Proposed Development" (paragraph 3.45), SCC will continue to review the suitability of the study area in discussion with consultees and will provide a clear rationale in the ES for the selection of the final study area.
- 9.1.4 The number of conservation areas considered by the original desk based study was three, but it was subsequently agreed during scoping (Appendix 7B) that Oulton Broad Conservation Area and Lowestoft North Conservation Area would be screened from the proposed scheme by topography and the existing built environment and their setting would not be impacted upon. However, the revised ZVTI shows that distant views to the proposed scheme will be possible from part of the Oulton Broad Conservation Area and consideration is being given to reintroducing it to the assessment.

Limitations

- 9.1.5 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the preliminary assessment process.
- 9.1.6 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).
- 9.1.7 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the preliminary assessments for the production of the ES.

9.2 Directives, Statutes and Relevant Policy

9.2.1 The following national legislation, policies and guidelines have been considered.

National Legislation

Ancient Monuments and Archaeological Areas Act 1979

9.2.2 This legislation defines sites that warrant protection due to their being of national importance as 'ancient monuments'. These can be either Scheduled Monuments or "any other monument which in the opinion of the Secretary of State is of public interest by reason of the historic, architectural, traditional, artistic or archaeological interest attaching to it. The Act states that consent must be obtained from Historic England (formerly English Heritage) for works of demolition, repair and alteration that might affect heritage assets which are designated as Scheduled Monuments (SM) or assets being considered for adoption as an SM. Heritage assets which are not designated as SMs are protected through the development management process under the TCPA 1990 and the NPPF.

Planning (Listed Building and Conservation Areas) Act 1990

9.2.3 This Act makes provision for the protection and conservation of historic buildings and areas by way of a process of listing and designation. Listed buildings are classified as being Grade I, Grade II* or Grade II and historic areas are designated as conservation areas. Once listed, Listed Building Consent must be obtained from the local planning authority before works to demolish, alter or extend a listed building can be carried out. Similarly, consent must be obtained for the demolition of buildings in a Conservation Area. New developments in a Conservation Area are also expected to adhere to strict design criteria to ensure the character of the area is maintained or enhanced.

9.2.4 This Act requires a local planning authority (or the Secretary of State as the case may be), in considering whether to grant planning permission for development which affects a listed building or its setting, to have special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest. It also imposes a general duty on a local planning authority (or the Secretary of State) with respect to any buildings or other land in a conservation area to pay special attention to the desirability of preserving or enhancing the character or appearance of a conservation area. These statutory considerations apply in addition to the policies of the NPPF.

The Historic Buildings and Ancient Monuments Act 1953

9.2.5 This Act authorises Historic England to compile a register of 'gardens and other land' situated in England that appear to be of special historic interest. Registered Parks and Gardens are graded I, II* or II along the same line as listed buildings. A registered park or garden is not protected by a separate consent regime, but applications for planning permission will give great weight to their conservation.

National Policy

National Planning Policy Framework, 2012

9.2.6 The NPPF requires developers to assess Heritage Assets as part of their planning applications and to record assets that cannot be conserved as part of the works. This includes both designated and undesignated assets.

National Policy Statement for National Networks

9.2.7 The NPS for National Networks states the requirements that the SoS has for DCO applications. The NPS clarifies that a heritage asset can be a building, monument, site, place, area or landscape and that the significance of the asset is a factor both its physical presence as well as its setting.

9.2.8 Within an Environmental Statement, an applicant is required to “undertake an assessment of any likely significant heritage impacts of the proposed projectand describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the asset’s importance.”

9.3 Methods of Preliminary assessment

9.3.1 The preliminary assessment examines three topic areas:

- Archaeological remains consider those materials created or modified by past human activities, which include a wide range of visible and buried artefacts, field monuments, structures and landscape features. They also include areas which have been identified as being of archaeological potential;
- Built heritage considers architectural, designated or other structures with historical value (significance), such as listed buildings; and
- The historic landscape concerns perceptions that emphasise evidence of the past and its significance in shaping the present landscape.

9.3.2 The preliminary assessment is informed by Historic Environment Good Practice Advice in Planning Policy Notes 2-3 managing significance and setting, the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 2; Appendix 8 (DMRB: HA208/07) and Volume 5, Section 1, Part 2 (TA37/93) and Chartered Institute for Archaeologists standards and guidance documents (refs).

9.3.3 For ease of reference summary findings regarding identified individual heritage assets are presented in DMRB Annexes 5, 6 and 7 tabular format although the contribution of immediate, wider and extended setting, including association with other heritage assets, and the contribution these factors make to significance is presented in other sections of this chapter. The tables include consideration of the value (significance) of archaeological remains, historic landscapes, built heritage and set out the assessed magnitude of impact and significance of effect of the proposed scheme after mitigation has been taken into account.

Establishment of the baseline environment

9.3.4 The identification and description of the baseline environment has involved a combination of desk-based review of plans, records and other documents, consultation with statutory consultees and non-intrusive site surveys.

9.3.5 Information on recorded heritage assets and the development of the landscape has been collated from the Suffolk Historic Environment Record (HER), Suffolk Record Office and the National Heritage List for England (NHLE).

9.3.6 In relation to "Historic Landscapes", this chapter focuses on historic landscape types and historic landscape units within the preliminary study area where human, social and economic activity has shaped the landscapes and there is a discernible awareness of their evolution. Historic landscape types are distinctive areas of the landscape which contain a number of historic landscape units which are linked together by a consistent overarching theme such as 'woodland' or 'enclosed land'. Historic landscape units are subdivisions within historic landscape types which take account of variations such as morphology, location and time depth such as long established woodland and commercial forestry.

Desk Based Review

9.3.7 The following sources of information have been consulted:

- Information on designated heritage assets from the Historic England National Heritage List for England (NHLE) which comprises World Heritage Sites, SMs, Listed Buildings, Registered Parks and Gardens, and Registered Battlefields;
- Information on known undesignated heritage assets recorded on the Suffolk HER;
- Details on previous archaeological investigations which have been undertaken within the preliminary study area (recorded on the HER);
- Information on Conservation Areas (held by HER and WDC);
- Documentary and photographic sources (including aerial photographs) held the HER, Historic England and the Suffolk Archive Service; and
- Historic Mapping held by the HER and the Suffolk Archive Service.

Consultation

9.3.8 At the scoping stage Historic England identified the need to incorporate guidance set out in Historic Environment Good Practice Advice in Planning Policy Notes 2-3 into the assessment and it was also recommended that a single integrated Historic Environment ES chapter should be produced. The chapter should be cross referenced to other relevant chapters, including those addressing townscape and visual impact (Chapter 10). The Cultural Heritage assessment, which will be presented in the ES, will involve examination of photomontages, the locations of which are proposed in Chapter 10.

Site surveys

9.3.9 Walkover surveys were conducted on the 20th November 2015 and on the 30th June 2017. Sites of known heritage assets were visited to confirm their location and condition. During this walkover survey the preliminary study area was searched for previously unknown heritage assets which are not recorded on the HER. New assets which are not currently recorded on the HER are presented in the Gazetteer in Appendix 9A and solely consist of undesignated buildings present on the 1st edition Ordnance Survey (OS) maps.

9.3.10 An archaeological watching brief was undertaken in 2016 and is currently being completed during 2017 during Geotechnical Investigation (GI) comprising trial pitting along the route of the proposed scheme in accordance with a Written Scheme of Investigation (Appendix 9C). Included in Appendix 9D is a report detailing the findings of the 2016 GI and the findings of the watching brief of the 2017 GI will be presented within the ES.

9.3.11 A preliminary geoarchaeological deposit model was completed in February 2017 (see Appendix 9B) which included a review of historical borehole logs situated along the route and in proximity to the proposed scheme. A further two targeted geoarchaeological boreholes will be drilled and examined in accordance with the WSI (Appendix 9E) and the findings presented in the ES.

Evaluation of the predicted effects on cultural heritage assets

9.3.12 The evaluation of the predicted effects on the identified assets and areas of potential has involved consideration of the value (significance) of the assets and the magnitude of impacts on the assets taking into account the proposed mitigation.

Establishing the value of Heritage Assets

- 9.3.13 The assessment of the value (significance) of cultural Heritage Assets, as defined in the NPPF, has involved consideration of how far the asset(s) contribute to an understanding of the past, through their individual or group qualities, either directly or potentially. These are professional judgements guided by legislation, national policies, acknowledged standards, designation criteria and priorities.
- 9.3.14 The preliminary assessment of value has been informed by Historic Environment Good Practice Advice in Planning Policy Notes 2-3 and has referenced the ratings framework set out in Annexes 5, 6 and 7 of the DMRB, HA208/07 (Cultural Heritage) which recommends the adoption of six ratings for the value in relation to archaeology, built heritage and historic landscapes as presented in Table 9-1, Table 9-2 and Table 9-3 below.

Table 9-1 – Criteria for establishing the value of archaeological remains

Value	Example
Very High	World Heritage Sites (including nominated sites) Assets of acknowledged international importance Assets that can contribute significantly to acknowledged international research objectives
High	Scheduled Monuments (including proposed sites) Undesignated assets of scheduled quality and importance Assets that can contribute significantly to acknowledged national research objectives
Medium	Designated or undesignated assets that contribute to regional research objectives
Low	Designated and undesignated assets of local importance Assets compromised by poor preservation and/or poor survival of contextual associations Assets of limited value, but with potential to contribute to local research objectives
Negligible	Assets with very little or no surviving archaeological interest
Unknown	The importance of the resource has not been ascertained

Table 9-2- Criteria for establishing the value of built heritage assets

Value	Status and Definition
Very High	International importance i.e. World Heritage Sites.
High	National importance i.e. listed buildings at Grade I and II*, Scheduled Monuments with standing remains, conservation areas containing very important buildings and undesignated structures of clear national importance.
Medium	Regional importance i.e. listed buildings at Grade II, conservation areas containing buildings that contribute significantly to its historic character, historic townscape with important integrity in their buildings, or built settings and undesignated structures of clear regional importance.
Low	Local importance i.e. undesignated assets of modest quality in their fabric or historical association and historic townscape of limited historic integrity (including buildings and structures included in a local list prepared by the local authority).
Negligible	Assets of no architectural or historical note
Unknown	Assets with some hidden i.e. inaccessible potential for historic or architectural significance.

Table 9-3 – Criteria for establishing the value of historic landscapes

Value	Status and definition
Very High	World Heritage Sites inscribed for their historic landscape qualities. Historic landscapes of international value, whether designated or not. Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).
High	Designated historic landscapes of outstanding interest. Undesignated landscapes of outstanding interest. Undesignated landscapes of high quality and importance, and of demonstrable national value. Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).
Medium	Designated special historic landscapes. Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.
Negligible	Landscapes with little or no significant historical interest.

Magnitude of impact

9.3.15 The magnitude of impact has been informed by Historic Environment Good Practice Advice in Planning Policy Notes 2-3 and is presented using the ratings framework set out in Annexes 5, 6 and 7 of the DMRB, HA208/07 (Cultural Heritage). Table 9-4 below is an amalgamation of the three tables which are contained within these annexes. The annexes identify factors for consideration when evaluating magnitude. These include:

- The percentage destruction of an asset or group of assets;
- Analysis of the extent to which partial destruction affects the integrity and understanding of an asset or group of assets;
- The extent to which the proposed scheme and its associated traffic impinge upon factors that contribute to the setting of Heritage Assets – including views, topography, vegetation, sound environment, approaches and context, as experienced within the landscape or townscape; and
- The extent to which the proposed scheme and predicted changes in traffic flows throughout the preliminary study area impinge upon the form and understanding of the historic depth of landscapes.

9.3.16 DMRB HA208/07 recommends the adoption of five ratings for magnitude of impact for all three aspects, as described in Table 9-4 below.

Table 9-4 – Factors for assessing the magnitude of impacts

Magnitude of Impact	Criteria
Major	<p>Change to most or all key archaeological materials, such that the resource is totally altered.</p> <p>Change to most or all key historic landscape elements, parcels or components: extreme visual effects: gross change of noise or change to sound quality: fundamental changes to use or access: resulting in total change to historic landscape character.</p> <p>Comprehensive changes to setting.</p>
Moderate	<p>Changes to many key archaeological materials, such that the resource is clearly modified.</p> <p>Change to many key historic landscape elements, parcels or components: visual change to many key aspects of the historic landscape: noticeable differences in noise or sound quality: considerable changes to use or access: resulting in moderate changes to historic landscape character.</p> <p>Considerable changes to setting that affect the character of the asset.</p>
Minor	<p>Changes to key archaeological materials, such that the asset is slightly altered.</p> <p>Change to few key historic landscape elements, parcels or components: slight visual change to few key aspects of the historic landscape: limited differences in noise or sound quality: slight changes to use or access: resulting in limited changes to historic landscape character.</p> <p>Slight change to setting.</p>
Negligible	<p>Very minor changes to archaeological materials, historic building elements, or setting.</p> <p>Very minor changes to key historic landscape elements, parcels or components: virtually unchanged visual effects: very slight changes in noise levels or sound quality: very slight changes to use or access: resulting in very small changes to historic landscape character.</p>
No Change	<p>No change to fabric or settings.</p> <p>No change to elements, parcels or components: no visual or audible changes: no changes arising from in amenity or community factors.</p>

Significance of effects

- 9.3.17 The overall impact significance is assessed using the ‘significance of effects matrix’ from the DMRB to establish an indicative effect rating for each asset. The matrix uses value and magnitude to determine indicative ratings, as shown in Table 9-6 below.
- 9.3.18 The magnitude of an identified impact is dependent on the value/ sensitivity of the Heritage Asset and the nature of the identified impact (neutral, slight, moderate, large or very large adverse). Any adverse change (effect on) the cultural heritage resource could impact on its significance. For example, a change to the baseline that is a moderate, large or very large effect could be viewed as significant, and conversely a neutral or slight change could be interpreted as not significant.

Table 9-5 – Significance of Effects Matrix

Value	Magnitude of Impact					
		No change	Negligible	Minor	Moderate	Major
Very high	Neutral	Slight	Moderate or Large	Large or Very Large	Very Large	
High	Neutral	Slight	Moderate or Slight	Moderate or Large	Large or Very Large	
Medium	Neutral	Neutral or Slight	Slight	Moderate	Moderate or Large	
Low	Neutral	Neutral or Slight	Neutral or Slight	Slight	Slight or Moderate	
Negligible	Neutral	Neutral	Neutral or Slight	Neutral or Slight	Slight	

Mitigation

9.3.19 Where impacts have been identified, and subject to the nature of the asset and the potential impact, consideration has been given to a range of mitigation measures with a view to reducing the magnitude of impact. The nature of archaeological mitigation means that, in practice, measures may not be available to reduce or remove an unavoidable impact but they remain valuable tools for recording and preserving historical information. These include:

- Preservation in-situ;
- Investigations such as geophysical survey, trial trenching, shovel test pitting and controlled site stripping to determine the value of known assets and the presence/value of unproven assets, and subject to the findings, to inform the identification of any further investigations;
- Full archaeological excavation;
- Preservation by record involving part or all of the following: topographic survey, excavation of sections, detailed measurement, mapping and photographic recording of assets and their setting;
- Planting or earthworks to reduce impacts on the setting of known assets; and
- Interpretation and dissemination of information gathered as a result of any of the above to ensure that knowledge of local, regional or national significance is preserved or enhanced.

9.3.20 Preservation in situ of nationally important or highly significant remains is the preferred option should they be present, however, where this is not possible then alternative options will be investigated. Should no acceptable options be identified which would allow for the preservation of a site, detailed excavation (the scope of which will be agreed with the Suffolk County Council Archaeological Service and Historic England) will be carried out in order to further our understanding of the site affected.

9.3.21 In some instances mitigation may involve a progressive sequence of measures which will be dependent on the findings of initial measures which have been proposed. For example, where a watching brief, trial trenching, test pitting or controlled site stripping is to be undertaken there may be no findings of archaeological interest and further investigation may not be appropriate. Should the investigations identify features of interest it may be appropriate to progress the

investigations further by way of a combination of measures such as partial or full excavation, measurement, mapping or photographic recording. The appropriate measures will be agreed with the Suffolk County Council Archaeological Service and Historic England (where necessary), and the results of the archaeological investigations will be disseminated by means of analysis and report.

9.4 Baseline Environment

9.4.1 A total of 3 designated heritage assets, 57 undesignated heritage assets and archaeological events were identified within the study area that was proposed in the Scoping Report. The location of these are shown on Figure 9.1 and are presented in the Gazetteer (Appendix 9A). Where these heritage assets are identified in the text below they are referenced as a bold number in brackets.

9.4.2 The boundaries of the preliminary study area have altered slightly since scoping and three additional listed buildings situated within the South Lowestoft Conservation Area now need to be considered.

9.4.3 In addition examination of the ZTVI has brought into consideration of three locally listed buildings, which are situated slightly beyond the preliminary study area, and a small number of buildings of local architectural or historical interest.

Designated Heritage Assets

9.4.4 There are no World Heritage Sites, Scheduled Monuments, Registered Battlefields or Registered Parks and Gardens within the preliminary study area. There are three Listed Buildings (all Grade II) and one Conservation Area within the preliminary study area. Two other listed buildings (one at Grade II* and one at Grade II) are located just to the east of the preliminary study area, but have some degree of inter-visibility with the proposed scheme and are included in the baseline environment.

9.4.5 The designated assets are identified in Table 9-6 below, along with a classification of their value in accordance with Table 9-2, are described further in this chapter. The site number presented in the table is a scheme specific reference to allow ease of cross referencing to the figures and the gazetteer.

Table 9-6 – Designated Heritage Assets within the Preliminary study area

Site number	National Heritage List for England ref.	Site Name	Designation	Value
#	-	South Lowestoft	Conservation Area	Medium
#	1292405	9, 10 and 11 Waterloo Road and 16-28 Victoria Terrace	Listed Building, Grade II	Medium
#	1207048	Wellington Esplanade	Listed Building, Grade II	Medium
#	1207035	Ashurst	Listed Building, Grade II	Medium
60	1292511	Port House	Listed Building, Grade II	Medium
61	1207043	Royal Norfolk And Suffolk Yacht Club	Listed Building, Grade II*	High

Archaeological Remains

9.4.6 The following paragraphs describe the archaeology of the preliminary study area in a chronological framework extending from the prehistoric periods to the present day. The preliminary assessment has considered the following time periods:

- Prehistoric:
 - Palaeolithic c.800,000 – 10,000 BC
 - Mesolithic 10,000 – 4,000 BC
 - Neolithic 4,000 – 2,500 BC
 - Bronze Age 2,500 – 700 BC
 - Iron Age 800 BC – AD 43
- Roman AD 43 – 410
- Early Medieval AD 410 – 1066
- Medieval AD 1066 – 1540
- Post-Medieval AD 1540 – 1900
- Modern AD 1900 – present

Palaeolithic

9.4.7 The Palaeolithic era was a period of cold glaciations interspersed with warm interstadials and long interglacials. The successive glaciations removed the majority of archaeological evidence of this period at many parts of East Anglia, but rare survivals of scatters of flint tools or other evidence are recorded.

9.4.8 There are no known sites of this period within the preliminary study area, but five possible early Palaeolithic flints, including one identified as a handaxe, were recovered in the late 19th century from 'Cannon-shot' gravels at Normanston, c.300m to the north east. In the wider area well preserved evidence has been discovered within the Cromer Forest Bed Formation at Pakefield, c.2.5km to the south, comprising Lower Palaeolithic worked flints, associated palaeoenvironmental material and animal bone dated to c.700,000 BP.

9.4.9 Much further afield the Cromer Forest Bed Formation has revealed evidence of the earliest known presence of pre-modern humans in northern Europe, comprising footprints dated to c.800,000 BP, which were discovered in 2013 at Happisburgh Beach, Norfolk. This geological formation may be present beneath the proposed scheme, but will be deeply buried beneath later glacial, alluvial and marine deposits. The geoarchaeological investigation that will include two targeted geoarchaeological boreholes in accordance with the WSI (Appendix 9E) will seek to identify if evidence from this period is present and the findings will be presented in the ES.

Mesolithic

9.4.10 With the temperature increase after the end of the last glaciation the environment gradually changed from tundra to temperate grassland, then open woodland and finally mixed deciduous oak forest. Mesolithic people had a hunting, gathering and fishing economy; their former presence is usually evidenced by scatters of flint tools. The remains of the ephemeral types of structure used by Mesolithic hunter-gatherers are very rarely discovered.

9.4.11 The Mesolithic landscape of the Preliminary study area is poorly understood, but it may have been fen or marshland, an environment suitable for wildfowling and seasonal gathering of

other resources. The preliminary study area was subject to two episodes of marine transgression during later periods and evidence of transient Mesolithic activity could be preserved within or under later marine, alluvial and peat deposits, which lie at c.5m-15m below ground level.

- 9.4.12 No evidence of the period is recorded within the preliminary study area and extensive medieval and post medieval peat cutting, which created Lake Lothing, may have removed any Mesolithic evidence formerly present here.

Neolithic

- 9.4.13 The Neolithic period saw the development of agriculture and a more sedentary society. Areas of woodland were cleared for growing crops, animals were domesticated, pottery began to be used, ceremonial and communal funerary monuments were constructed.
- 9.4.14 Evidence for human activity of the period is relatively sparse, often comprising scatters of flint tools, or evidence of small scale burning and woodland clearance identified during palaeoenvironmental studies. Flint tool scatters of this period are not recorded in the preliminary study area although examples have been found slightly to the south west at Victoria Road, Lowestoft and Heath Road, Oulton. Isolated or small clusters of pits are also occasionally found, and a single pit discovered at Walton Road, Lowestoft (11) comprises the only Neolithic evidence recorded within the preliminary study area.
- 9.4.15 An episode of marine transgression affected lower lying parts of the preliminary study area during the latter part of this period and any early Neolithic evidence situated here may have been buried by deep marine, alluvial and peat deposits. Neolithic activity during the marine transgression may have been limited to exploitation of marine and wetland resources, which may have involved the construction of wooden trackways, use of dugout canoes and fish traps. However, medieval peat cutting, and the impact of modern land reclamation and development, may have adversely affected the survival of remains of this period at the majority of the preliminary study area.

Bronze Age

- 9.4.16 The Bronze Age marks the beginning of metallurgy in Britain. Woodland clearance intensified while pastoral and arable farming became the mainstay of the economy. A hierarchical society developed during this period and this is reflected in the construction of individual funerary monuments such as round barrows and cairns. Many lowland barrows have been ploughed out, but they remain the most visible monument of this period. Isolated finds or flint scatters are the most frequent evidence of Bronze Age human activity with recorded settlements remaining sparse.
- 9.4.17 Undated cropmarks (38) at Barnard's Meadow, an area of playing fields situated on slightly higher ground at the north west of the preliminary study area, have been tentatively interpreted as identifying Bronze Age settlement, but they have not been further investigated so could originate from later prehistoric periods. Other cropmarks, including a possible ring ditch of a Bronze Age burial mound, and Bronze Age worked flints (45) have been recorded c.300m south west of the preliminary study area, but this area was developed for housing in the 1960s without further investigation of the cropmarks.
- 9.4.18 A marine transgression continued to affect the lower lying parts of the preliminary study area during the earlier part of the Bronze Age. The majority of human activity may have been limited to exploitation of marine, estuarine and subsequent wetland resources, perhaps involving the construction of wooden trackways, use of dugout canoes and fish traps. Trackways of this period sometimes became foci for religious ceremonies which involved the deposition of bronze artefacts (known as votive offerings) into rivers, pools, meres and bogs. However, evidence of votive activity has not been recorded in the vicinity of Lake Lothing.

9.4.19 The late Iron Age and Roman periods saw a marine transgression which may have buried and preserved any Bronze Age evidence located at lower lying parts of the preliminary study area. However, medieval peat cutting, and the impact of modern land reclamation and development, may have adversely affected the survival of remains of this period at the majority of the preliminary study area.

Iron Age

9.4.20 The preliminary study area lay within the tribal territory of the Iceni during the Iron Age. Prevalent monument types include small, sometimes enclosed farmsteads and large hillforts. A few small towns or “Oppida” developed in the latter part of the period and East Anglian examples are present at Saham Toney, Thetford and Caistor St Edmund.

9.4.21 The lower lying parts of the preliminary study area probably remained as wet, marginal land until the end of this period when a second marine transgression began. The use of the majority of the preliminary study area was probably little changed from the previous periods with limited exploitation of wetland, estuarine and marine resources.

9.4.22 Iron Age heritage assets could be preserved under and within marine and alluvial deposits, but medieval peat cutting, combined with the impact of modern land reclamation and development, may have adversely affected the survival of remains of this period at the majority of the preliminary study area.

9.4.23 No Iron Age heritage assets are recorded within the preliminary study area.

Romano-British

9.4.24 The Romano-British era began with the invasion of the south east of Britain in AD 43. The following four centuries saw the establishment of roads, forts, villa estates, and towns, all supporting a central administration which cemented the Roman occupation of Britain.

9.4.25 A marine transgression affected the preliminary study area throughout this period and activity at the lower lying parts may have been limited to exploitation of marine and estuarine resources, with perhaps some agricultural use of slightly higher ground situated at the north and south.

9.4.26 The River Waveney is located c.3.4km west of the preliminary study area and is known to have been used as a communication and trade route during this period. Lake Lothing, Oulton Broad and a canal now connect Lowestoft to the River Waveney, but all were created during the medieval and post medieval periods and it is unlikely that a navigable route existed during the Roman period.

9.4.27 A possible Roman road from Colchester to Burgh Castle is said to have passed through Lowestoft and archaeological remains tentatively interpreted as part of this road, or an associated bridge, were found during 19th century excavation in the vicinity of the existing Bascule Bridge, c.100m east of the preliminary study area. The evidence comprised several large tree trunks, 10-12 feet in length, laid out parallel and approximately two feet apart.

9.4.28 The only recorded heritage assets of this period within the preliminary study area are three dispersed find spots of coins (**1, 4, 53**). The nearest settlement evidence comprises a coin hoard, a possible cremation urn and the skeletons of a number of horses found during the 19th century c.150m north east of the preliminary study area at a part of Lowestoft now known as “Roman Hill”.

Early Medieval

9.4.29 The Early Medieval period began as the Romans left Britain in AD 410. Heritage assets of the early part of the period are often difficult to detect as the prevailing settlement pattern was dispersed, short-lived, unenclosed farmsteads, which often focussed on river valleys.

- 9.4.30 The middle part of the period saw the establishment of longer lived settlements and the latter part saw the establishment of many historic English villages. The majority of the villages surrounding the preliminary study area, including Lowestoft and Kirkley, are recorded in the Domesday survey of 1086 and will have been founded by the latter part of this period.
- 9.4.31 The early medieval focus of Lowestoft is thought to have been located some distance away from the present town centre, perhaps c.900m north of the preliminary study area in the vicinity of St Margaret's church. Limited agricultural activity may have been carried out at higher ground situated at the north and south of the preliminary study area, but it is probable that activity elsewhere will have remained consistent with earlier periods, i.e. continued exploitation of marginal land for estuarine and wetland resources
- 9.4.32 No early medieval heritage assets are recorded in the preliminary study area.

Medieval

- 9.4.33 Until the latter part of this period the core of Lowestoft is thought to have retained its focus around St Margaret's church, c.900m north of the preliminary study area. The Domesday Survey of 1086 records rent for land being partly paid in herrings, which suggests that fishing already formed a significant part of the village economy.
- 9.4.34 Lowestoft was granted markets in 1308 and 1445 and by the end of the medieval period Lowestoft was a significant fishing port and the most important settlement in the area. The core of the town had moved east by this time to the area of the modern High Street. The southern limit of the medieval town was located c.600m to the north east of the preliminary study area.
- 9.4.35 Lake Lothing is a remnant of a turbary (**13**), an extensive area of medieval peat cuttings. The speed of the peat cutting and the development of Lake Lothing is currently uncertain, but the eastern end of Lake Lothing including Kirkley Ham inlet was open to the sea by the 14th century. The northern side of this end of Lake Lothing was known as the Inner Harbour by this time and ships were being constructed on the southern side to the east of Kirkley Ham inlet.
- 9.4.36 Kirkley Ham inlet and its immediate environs may have been the most important harbour at this part of the coast for a brief part of the 14th century, but the inlet began to silt during the 15th century and by the end of the medieval period the importance of the port at Kirkley had been superseded by that of Lowestoft.
- 9.4.37 Archaeological investigations at land located in the vicinity of Kirkley Ham inlet (**12, 15, 16, 57, 59**) have not revealed evidence of medieval activity and no medieval heritage assets are recorded elsewhere in the preliminary study area.

Post Medieval

- 9.4.38 In the post medieval period the port and town of Lowestoft continued to expand and in 1679 the town was granted Port Status, with certain specified rights of export and import. By the beginning of the 18th century up to 25% of men were involved in the fishing industry. The main catch of the fishing fleet comprised herring.
- 9.4.39 At the end of the 18th century Lowestoft was a moderately sized market town and fishing port with a population of about 2,300. Lowestoft had doubled in size by 1841 and by 1871 the population was over 13,000. Until the mid-19th century the majority of the preliminary study area was situated to the west and south of the town and port; it comprised a landscape of dispersed farms, enclosed fields and marginal land located along the shores of Lake Lothing.
- 9.4.40 The focus of the port had moved from the Inner Harbour to the seaward beaches from 1712 when the mouth of Lake Lothing was closed to the sea by drifting sand. Occasional flood tides broke through the sand bar until 1717, but Lake Lothing then remained separated from the sea until harbour works including construction of lock gates and a customs office known as The Port House (**60**) were completed in 1832.

- 9.4.41 The first phase of harbour works included land reclamation at both sides of the eastern end of Lake Lothing, this work involved the importation of large amounts of material to raise the ground level behind quay walls. Cartographic evidence shows that much of the land behind the current quaysides was low-lying and prone to flooding prior to this first episode of reclamation. The continued success of the port led to further episodes of reclamation during the 19th century, which gradually extended quays, wharves and other port related infrastructure further to the west.
- 9.4.42 However, the government forced the sale of the harbour in 1842 after the first phase harbour works failed to keep the Inner Harbour open to the sea and a loan could not be repaid. The harbour was eventually sold to Sir Samuel Morton Peto in 1844 after which mooring for 1,000 boats was provided through construction of the Outer Harbour and permanent access to the Inner Harbour was established.
- 9.4.43 From the middle of the 19th century Sir Samuel Morton Peto played a leading role in the expansion and success of Lowestoft. He opened a rail link between Lowestoft and Norwich in 1847, with the station located outside the preliminary study area slightly to the north of the existing Bascule Bridge. He subsequently built several other railways which linked Lowestoft to Ipswich and towns further afield.
- 9.4.44 The establishment of the London – Great Yarmouth toll road (now London Road) led to limited development of the area to the south of Lake Lothing as a seaside resort from the mid-18th century, but it was the improvement in access provided by the railway links which enabled Lowestoft to truly establish its position as a popular holiday resort. The focus of the resort was situated toward the south east of the preliminary study area; the esplanade (including two statues of triton), hotels, large townhouses and lodging houses were built from the late 1840s along the seafront and less substantial lodging houses were constructed inland. The Victorian seaside resort now forms the core of the South Lowestoft Conservation Area.
- 9.4.45 The character of the preliminary study area became increasingly urban and industrial during the second half of the 19th century when the town, port, maritime and other industries began to expand to the west. Ordnance Survey mapping shows that the bulk of 19th century industrial development spread along the northern side of Lake Lothing with many timber yards, iron foundries, mills, a dry dock and a ship yard present. Industrial development on a somewhat smaller scale also occurred at the southern side of Lake Lothing, but it generally maintained an earlier focus around Kirkley Ham inlet and mainly comprised two boat yards and the East Anglia Ice Company works. Very few of the 19th century industrial buildings are now extant, some were destroyed by wartime bombing, but the majority have been demolished since 1945 to make way for redevelopment.
- 9.4.46 A large detached house, with a formal garden and a lawn to the south (54), was built at the north west of the preliminary study area during this period. The house and garden are first shown on late 18th century mapping, and is named “Normanston Court” on 19th century Ordnance Survey maps. The house, garden and lawn appear to have survived intact during the first half of the 20th century, but the area of the estate fronting Normanston Drive saw piecemeal development for housing after the Second World War, and the lawn was also converted to use as playing fields. The main house appears to have survived until the late 1960s or early 1970s when it was demolished to make way for construction of detached houses.
- 9.4.47 Another large 18th century house set in a formal garden was present at the south of the preliminary study area. Colville Hall was situated to the west of Kirkley Ham inlet, in 1855 it became an “institution for the imbecile children of the middle and upper classes”. The institution was in the supervision of various superintendents until 1873 when it was converted back to a private house. The house was demolished in the early 1960s and the area was then developed for industrial use.

Modern

- 9.4.48 Lowestoft continued to grow into the early part of the 20th century with the fishing fleet, boat building, port and associated industries being the mainstay of its economy. By 1911 the population had reached 37,886, which reflects the peak in production for the British fishing industry. The Inner Harbour saw significant development during the early part of this period with many existing industries expanding and others, such as two large cannery and preserve works located near Kirkley Ham inlet, established.
- 9.4.49 The seaside resort remained successful during the early part of the 20th century and grand buildings, such as the Grade II* listed Royal Norfolk and Suffolk Yacht Club (61) continued to be built.
- 9.4.50 The First World War saw some of the more capable local boats requisitioned by the Admiralty for patrolling and minesweeping. The town was bombed on a number of occasions, and on 25th April 1916, the German High Sea Fleet shelled the town and harbour leaving forty houses destroyed, two hundred damaged and four people killed.
- 9.4.51 During the inter war period the port, holiday resort and fishing industry suffered a decline in fortunes, but the start of the Second World War saw Lowestoft transformed into an important naval base with an all-round defensive perimeter of trenches, pillboxes and dense belts of barbed wire (e.g. 6-10, 18-37, 43, 48). Only one of these sites may be directly impacted, a type 22 pillbox and civil defence site (43) is recorded at the southern end of the proposed scheme where a roundabout would be constructed on the A146; it is probable that post war works will have already removed most, if not all evidence of this site. None of the other defences survive, but many of their locations have been recorded by the HER and the Defence of Britain project.
- 9.4.52 Lowestoft was extensively bombed during the Second World War and significant redevelopment was necessary during the post war period. During the latter part of the 20th century the Inner Harbour remained a focus of shipbuilding and developed as a focal point for operations of the oil and gas industries in the southern North Sea. The Inner Harbour and Entrance Channel and the Inner Harbour – North retain coherent evidence of their late 19th and early 20th century character, with port related activities, road layout, some surviving buildings, including the Port House, contributing to the understanding of Lowestoft as a port and its development as a safe harbour during the 19th century. The early character of the part of the Inner Harbour – South situated within the preliminary study area is poorly preserved as it has been extensively redeveloped for modern retail purposes, or is awaiting redevelopment after demolition of earlier structures, but the quays flanking both sides of the Inner Harbour, in particular the North Quay, with its surviving dry dock, provide a link to understanding the expansion of 19th century port.

Areas of Archaeological Potential

- 9.4.53 Evidence of Lower Palaeolithic pre-modern human activity could be preserved within the Cromer Forest Bed Formation. This formation may be present beneath the preliminary study area, but will be deeply buried (c.20m bgl) beneath glacial, alluvial and marine deposits.
- 9.4.54 Areas of truncated peat deposits survive at either side of Lake Lothing. The peat will have accumulated during, or before the Bronze Age and is located beneath alluvial sediments and recent levelling deposits at depths of between 3m and 15m below ground level. The peat is likely to preserve evidence of the environment, and could preserve heritage assets of the later prehistoric periods.
- 9.4.55 Evidence of historic exploitation of the area flanking Lake Lothing may be preserved beneath the levelling deposits making up the modern quays and wharves. Any such evidence is likely to be restricted to heritage assets consistent with exploitation of marine, estuarine and marginal drier environments e.g. fish traps, salterns, mooring posts and perhaps the medieval peat cutting which led to the formation of Lake Lothing.

9.4.56 The 19th and 20th century growth of the port may be evidenced by artefacts or the remains of foundations of buildings within the levelling deposits forming the modern quaysides.

Built Heritage

Listed Buildings

9.4.57 There are three listed buildings within the preliminary study area; all are located within the South Lowestoft Conservation Area close to, or facing the esplanade and seafront, and none will have any intervisibility with the proposed scheme. All were built in the later 19th century as part of the expansion of the holiday resort. The listed buildings comprise:

- 9, 10 and 11 Waterloo Road and 16-28 Victoria Terrace (Grade II – LB no 1292405);
- Wellington Esplanade (Grade II – LB no 120704; and
- Ashurst (Grade II – LB no 1207035).

9.4.58 9, 10 and 11 Waterloo and 16-28 Victoria Terrace consists of a terrace of houses built specifically as lodging houses for sea-side leisure activities in 1869. The terrace is built of red brick with gault brick dressings and is shown in Plate 9-1.

9.4.59 Wellington Esplanade consists of a terrace of houses which was built in 1852 by John Louth Clemence for Sir Samuel Morton Peto. As shown in Plate 9-2 it is built of red brick with gault brick dressings. This terrace was part of the extensive plan for housing which was originally devised in 1846 by JL Clemence which had the aim of developing Lowestoft as a fashionable holiday resort. This aim was made possible by the building of the railway by Peto in the 1840s.

9.4.60 Ashurst (Plate 9-3) consists of a pair of houses which was built in 1864 by W.O. Chambers. The houses are built of brick which is rendered and whitewashed. The houses are now in use as flats but, like Wellington Esplanade, were originally part of the extensive plan for housing devised by JL Clemence.



Plate 9-1 – 9, 10 and 11 Waterloo and 16-28 Victoria Terrace



Plate 9-2 – Wellington Esplanade



Plate 9-3 – Ashurst

9.4.61 There are also two other listed buildings which are located to the east of the preliminary study area, but which may have some degree of inter-visibility with the proposed scheme. These are the:

- Port House (Grade II – LB no 1292511); and
- Royal Norfolk & Suffolk Yacht Club (Grade II* - LB no 1207043).

- 9.4.62 The Port House is located on the north side of Lake Lothing, adjacent to Town Quay. It was originally built in 1831 as a Customs House, but was most recently in use as offices although it is now disused. It is built of gault brick with slate roofs. The long frontage of the building faces south, towards the waterfront (Plate 9-4).
- 9.4.63 The Royal Norfolk and Suffolk Yacht Club is a purpose built Yacht Club, built in 1902-3 by G & F Skipper of Norwich. The building is built of rendered and whitewashed brick and is of a very advanced design for its date. The building is on an L shaped plan with an engaged tower in the inner angle opposing a square observation road at the top of the outer angle (Plate 9-5).



Plate 9-4 – The Port House



Plate 9-5 – The Royal Norfolk and Suffolk Yacht Club

Locally Listed Buildings

9.4.64 Located immediately to the east of the preliminary study area and within the South Lowestoft Conservation Area are a number of locally listed buildings, which have been identified by Waveney District Council as making a positive contribution to the character of Lowestoft. These sites are not nationally designated, however, they are included on a list of local heritage assets, which means that their conservation as a heritage asset is an objective of the NPPF.

9.4.65 Although located just outside the preliminary study area, it is considered that the proposed scheme will be visible from them, although often only from the side, rear and upper floors. The locally listed buildings comprise:

- Lowestoft Central Railway Station – The second station building on this site which was built by the Lucas Brothers (Petos - local building contractors) in 1855. Engravings and photos surviving of the building in its heyday show a grand building with three Italianate turrets along its principal (north) elevation. It is evident that what survives is a much reduced form of the original building. Built in gault brick the building is principally of one storey with parapet and moulded stone eaves cornice. A stringcourse and sillband run along all elevations of the building. The parapet has recessed rectangular panels along its length (see Plate 9-6);
- 7-11 Station Square – This building consists of a three storey gault brick building comprising a terrace of three properties each of two bays. The slate roof is pitches with a deep moulded dentil eaves cornice. The ground floor of each property contains a shopfront (Plate 9-7).
- 18-32 Station Square – This building is situated on the corner of Station Square and Waveney Road and was the premises of Tuttles Bon Marche Department Store from the late 19th century until its closure in 1981 (Plate 9-8).;
- 1-8 Pier Terrace – This comprises a terrace of late 19th century buildings which are constructed in gault brick with pitched slate roofs and rusticated pilasters separating the properties. All of these properties have shopfronts to the ground floor. Numbers 3, 7 & 8 retain early shopfronts of relatively good architectural quality (Plate 9-9)
- RNLI Statue, Pier Terrace – This statue is located between 1 Pier Terrace and the Bascule Bridge and commemorates Lowestoft's long association with the RNLI (Plate 9-10).



Plate 9-6 – Central Railway Station



Plate 9-7 – 7-11 Station Square



Plate 9-8 – 18-32 Station Square



Plate 9-9 – 1-8 Pier Terrace



Plate 9-10 – RNLi Statue

Other Historic Buildings and Structures

9.4.66 There are a small number of buildings within the context of the preliminary study area which are not listed, but which have limited architectural or historical interest. The buildings are not included on the Suffolk HER and have been identified during the walkovers or via cartographic studies.

- Three storey terraced houses (19th century) fronting the north side of Commercial Road from its junction with Station Square, which are within the South Lowestoft Conservation Area (Plate 9-11);
 - Several detached brick built 19th century warehouse buildings surviving on the north side of Commercial Road including a three-storey late 19th / early 20th century example at 41 Commercial Road. Gabled to the street, double-width goods doors in the street elevation. Windows and a single loading door are placed on the side elevation (Plate 9-12);
 - A two storey brick built 20th century industrial building located on the north side of Commercial Road. This building is marked as a “Goods Office” on the 1950 Ordnance Survey map and will have been associated with the former railway freight yard located immediately to the north (Plate 9-13);
 - A one storey brick built 20th century industrial building located on the north side of Commercial Road at the entrance to Associated British Ports land. First shown on the 1950 Ordnance Survey map, this building appears to have been associated with the railway freight yard (Plate 9-14); and
- A detached early 20th century two storey house at 42 Durban Road, which is first shown on Ordnance Survey mapping in 1927. The origin and history of this house needs further assessment. (Plate 9-15).



Plate 9-11 – Three Storey Terraced Houses, Commercial Road



Plate 9-12 – Warehouse at 41 Commercial Road



Plate 9-13 - Goods Office for Freight Yard, Commercial Road



Plate 9-14 – Freight Yard Building, Commercial Road



Plate 9-15 – 42 Durban Road

Historic Landscape and Conservation Area

- 9.4.67 Historic Landscape Characterisation (HLC) has been completed for Suffolk (Suffolk County Council, 2008 V3). The HLC shows that, excepting survival of some road alignments and partial preservation of the lawn boundary of Normanston Court, very little of the pre-19th century landscape character survives at the preliminary study area. The HLC defines the broad character of the area straddling Lake Lothing as current industrial; areas of modern leisure are identified at the north west of the preliminary study area and a small parcel of unimproved land at the south west; the remaining character comprising the urban area of the late post medieval and modern town.
- 9.4.68 Early mapping of the Lowestoft area, such as Hodskinson's Map of 1783 and Robert Barnes Map of 1830 (Appendix 9A), show the urban focus of the town located c.900m to the north of the preliminary study area and provide some detail of road layout and the location of isolated farmsteads. The early maps show little further detail, with the exception of the presence of the house and formal gardens at Normanston Court. A manorial survey of 1618 illustrates that the landscape of the preliminary study area had been enclosed by the early 17th century and the Lowestoft (1841), Carlton Colville (1842) and Kirkley Ham (1841) tithe maps show the enclosed agricultural fields bisected by two east-west aligned railway lines.
- 9.4.69 Ordnance Survey maps show that by the end of the 19th century a north-south aligned railway line had been constructed to the west of Lowestoft and the part of the town located to the north of Lake Lothing and the Inner Harbour had expanded slightly to the west toward the railway, although much of the preliminary study area remained in agricultural use. The preliminary study area saw gradual housing and industrial development during the first half of the 20th century, but it was almost completely developed for housing, industrial and commercial use during the second half of the 20th century. Lowestoft had reached its current size by the mid-1970s although limited infill development and regeneration has subsequently occurred.
- 9.4.70 The South Lowestoft Conservation Area was designated in 1978, extended in 1996, 2003 and again after reappraisal in 2007. The reappraisal describes the CA thus:
- 9.4.71 "It includes a small area at the north side of Lake Lothing, but mostly encompasses the part of the town situated to the south of Lake Lothing, which was constructed during its 19th century

expansion as a seaside resort. The area developed following the establishment of a harbour and river access through Lake Lothing in the early 19th century and grew into a pleasure resort from the mid-19th century onwards. The buildings of the conservation area comprise a small number of commercial premises focussed at the north around Lake Lothing, large townhouses, villas and lodging houses to the south along the seafront, with areas of lower status terraced housing inland. The area has a largely linear street plan, laid out parallel to the shore, which reflects the formal planning of the seaside resort, with pleasure gardens and promenades along the seafront, whilst a more curvilinear plan is apparent within the area of villas to the southwest. The dockside areas are of historic significance, continued importance to the local economy and contribute to the local sense of identity"

9.5 Predicted Impacts

- 9.5.1 This section identifies the impacts upon each of the Heritage Assets that have been identified in this assessment and categorises an impact based upon the parameters in Table 9-2 and Table 9-3.
- 9.5.2 The impacts on Heritage Assets will occur during the construction and operational phases, i.e. during groundworks, topsoil stripping, landscaping, ground compaction, service installation, stockpiling, storage, visual intrusion and through alteration to traffic volumes and associated noise. These activities could lead to the following impacts:
- Permanent complete or partial loss of a heritage asset as a result of ground excavation, including piling;
 - Permanent or temporary loss of the physical and/or visual integrity of a feature, monument, building or group of monuments; and
 - Damage to resources due to compaction, desiccation or waterlogging; and
 - Damage to resources as a result of ground vibration caused by construction.
- 9.5.3 All overall impacts are considered to be adverse and all are considered to be permanent although mitigation is proposed as necessary to reduce the magnitude of the impact. All overall impacts are considered to be adverse and all are considered to be permanent although mitigation is proposed as necessary to reduce the magnitude of the impact.
- 9.5.4 It should be emphasised that all impacts are based upon present understanding and knowledge and the overall impact and mitigation may need to be refined following the ground investigation and a full review of the implications of a revised ZVTI.

Table 9-7 – Impacts on cultural heritage assets

Site Number	Name/Asset type	Value	Type of Impact	Magnitude of Impact	Proposed mitigation	Overall Impact
1	Port House	M	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or Slight
20	Royal Suffolk and Norfolk Yacht Club	H	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Slight
43	World War Two pillbox and possible civil defence site	L	Direct (construction)	Moderate	Watching Brief	Slight
22	Palaeoenvironmental and prehistoric remains	M	Direct (construction)	Minor	Geoarchaeological assessment, analysis, deposit modelling and dissemination of results	Slight
23	South Lowestoft Conservation Area	M	Visual (construction and operation)	Minor	Sensitive design and/or screening	Slight
33	7-11 Station Square	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or slight
36	18-32 Station Square	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or slight
#	1-8 Pier Terrace	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or Slight
#	RNLI Statue, Pier Terrace	L	Visual (construction and operation)	Negligible	Building recording (subject to further	Neutral or Slight

Site Number	Name/Asset type	Value	Type of Impact	Magnitude of Impact	Proposed mitigation	Overall Impact
					assessment and review of quality of existing records)	
#	Terraced Houses (19th century). Commercial Road	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or Slight
#	Brick built 19th century warehouses on Commercial Road	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or Slight
#	Goods Office. Commercial Road	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or Slight
#	One storey brick built mid - 20th century industrial building. Commercial Road	L	Visual (construction and operation)	Negligible	Building recording (subject to further assessment and review of quality of existing records)	Neutral or Slight

9.5.5 In addition to the impacts on the known heritage assets listed in the above table, there may also be impacts upon currently unknown heritage assets. The impacts upon unknown remains cannot be assessed until any potential value is known. In the event of identifying such unexpected archaeology, relevant and suitable archaeological expertise would be sought by the contractor in liaison with SCC Archaeological Service and Historic England and mitigation would be identified as appropriate.

Archaeological Remains

9.5.6 The number and density of recorded archaeological assets within the preliminary study area is relatively low, but this is perhaps a consequence of the limited scale and distribution of recent archaeological work rather than an accurate reflection of the archaeological assets present. It is not expected that the proposed scheme would have a large adverse effect on identified archaeological assets. However, a large adverse effect may occur to unknown sub-surface archaeological assets due to construction related activities such as machine stripping of superficial deposits, deep excavation, such as piling, and as a consequence of compaction.

9.5.7 The proposed scheme could impact sub-surface archaeological assets and palaeoenvironmental evidence of the prehistoric periods, which may be preserved where deposits of alluvium and peat survive. The watching brief and geoarchaeological work will assess the degree to which assets of the prehistoric periods survive beneath the proposed scheme and the findings will be presented in the ES.

9.5.8 The proposed scheme may impact archaeological assets of the historic periods, either those associated with exploitation of a marginal wetland, estuarine environment, such as salterns and fish traps, or associated with the development of the port and related industries. The results of a watching brief on GI trial pits will be used to enhance current understanding of the presence and survival of assets of the modern periods.

9.5.9 The proposed scheme may impact the remains of one recorded archaeological asset; the site of a World War II Type 22 pillbox and possible civil defence site is recorded at the junction of Waveney Drive and Riverside Road. This heritage asset was demolished post-war and it is unclear if any sub-surface remains will survive.

9.5.10 The preliminary assessment process has identified that the proposed scheme has the potential to have a minor or moderate adverse impact upon archaeological remains. Based upon professional judgement, the overall conclusion is that the proposed scheme would have a **minor adverse** impact on archaeological remains.

Built Heritage

9.5.11 The proposed scheme does not directly impact designated built heritage assets. However, there will be a neutral or slight adverse indirect impact resulting from distant visual intrusion and severance of views from the introduction of a new bridge, signage and lighting upon the setting of two designated heritage assets, which comprise the Port House and Royal Norfolk and Suffolk Yacht Club.

9.5.12 There will be neutral or slight adverse indirect impacts to four locally listed buildings and several unlisted buildings of local historical interest. One building, which may be of local interest (42 Durban Road), could be subject to a direct adverse impact and will be examined in subsequent assessments.

9.5.13 The preliminary assessment process has identified that the proposed scheme would result in a number of potential minor adverse impacts upon Built Heritage. Based upon professional judgement, as per HE guidance, the overall preliminary conclusion is that the proposed scheme has the potential to have a minor adverse effect on Built Heritage.

Historic Landscape

9.5.14 The HLC data demonstrates that the preliminary study area has been subject to significant change over time, most notably during the late 19th and 20th century when the town and port

of Lowestoft began to expand and introduce new landscape unit types, including leisure, urban, transport and industrial, into a previously agricultural landscape.

- 9.5.15 The proposed scheme would introduce new earthworks and structures within an area dominated by modern industrial, commercial, port and transport activity. The majority of 19th and early 20th century buildings and infrastructure flanking Lake Lothing has been demolished since the mid - 20th century, but elements survive, especially at the northern side of the Lake, and provide a demonstrable link to the early development of the port.
- 9.5.16 The introduction of the proposed scheme could sever visual links along the quays and wharves of the Inner Harbour, especially as bridge approach roads are situated on solid embankments. However, views at each side of Lake Lothing are already interrupted by modern industrial, commercial and retail developments, and any embankment at the north side would be limited in scale due to the proposed scheme being on a bridge structure over the railway and the docks.
- 9.5.17 The impact at the majority of the South Lowestoft CA will be slight as the key views are within the CA itself and are focussed toward The Esplanade, rather than inland along Lake Lothing. However, as the CA is only c.400m from the proposed scheme views to the west and northwest from the CA will be impacted upon.
- 9.5.18 Based upon the parameters provided in Table 9-3 it is concluded that the proposed scheme would have a minor adverse effect on the historic landscape.

9.6 Proposed Mitigation

Archaeological Remains

- 9.6.1 A watching brief during GI trial pitting and geoarchaeological work is taking place during the GI of summer 2017 and the findings of this will inform the need for further archaeological work pre-construction.
- 9.6.2 In order to fully understand the nature of archaeological remains archaeological evaluation trenching may be required. However, the majority of the proposed scheme follows existing road alignments or crosses active rail lines and the port before linking in to Waveney Drive at the south and Denmark Road at the north via construction of new roundabout junctions and it would not be possible to trench these areas in advance of commencement of development.
- 9.6.3 A watching brief during construction is proposed at the site the site of a World War II Type 22 pillbox and possible civil defence site recorded at the junction of Waveney Drive and Riverside Road.

Historic Buildings

- 9.6.4 Subject to the results of further assessment and review of the quality of existing records basic photographic recording is considered appropriate mitigation for non-designated buildings, comprising structures of local interest and locally listed buildings or structures.
- 9.6.5 With regard to the listed buildings, screening of the proposed scheme would be difficult although some landscape treatment of areas of solid embankment could be considered. The most viable method of mitigation will be embedded mitigation through a sympathetic design so that it integrates into the surrounding built environment.

Historic Landscapes

- 9.6.6 Despite significant recent demolition and redevelopment the integrity of the late 19th and early 20th century industrial, commercial and urban landscape remains legible, especially on the northern side of Lake Lothing. The proposed scheme will introduce additional large infrastructure to this landscape although its past development will still be legible. The most viable method of mitigation will be embedded mitigation through a sympathetic design so that it integrates into the surrounding landscape.

9.7 Conclusions and Effects

9.7.1 Interim conclusions drawn from preliminary assessments carried out to date are that:

- In relation to archaeological assets the proposed scheme may have a slight adverse effect on one recorded asset. The baseline for archaeological remains is currently being enhanced and the assessment will be revised as further evidence becomes available but, the overall effect of the proposed scheme upon archaeological assets, after review of preliminary information, is deemed to be slight adverse and does not constitute a significant effect.
- In relation to the built heritage, the proposed scheme at the preliminary stage would have a minor indirect impact on two listed buildings. Overall, the effect of the proposed scheme upon built heritage assets is deemed to be slight adverse and does not constitute a significant effect.
- In relation to the historic landscape there would be a minor impact as a result of the introduction of the proposed scheme into the landscape. Overall, the effect of the proposed scheme upon the historic landscape is deemed to be slight adverse at the preliminary stage and does not constitute a significant effect.

9.8 Assessments still to be undertaken

9.8.1 The geoarchaeological assessment and watching brief will seek to identify the presence of archaeological evidence beneath the proposed scheme and findings will be presented in the ES.

9.8.2 The preliminary study area will be reconsidered during a full review of the implications of a revised ZVTI for the assessment of impacts on heritage assets.

9.8.3 The preliminary study area will be reconsidered during a full review of potential alteration to traffic flow and associated noise for the assessment of impacts on heritage assets.

The locations of the proposed additional photomontages (see Chapter 10) will be discussed with WDC and Historic England.

10 Townscape and Visual Impact Assessment

10.1 Scope of the Assessments

Introduction

- 10.1.1 This chapter describes the assessment of the likely significant effects of the proposed scheme on townscape character and visual amenity during the operational phases of the scheme. An assessment of construction impact will be included within the ES.
- 10.1.2 The assessment of this topic area considers potential impacts of the proposed scheme within the receiving environment. The assessment considers:
- Potential effects on the perception of local townscape character; and
 - Potential effects on visual amenity experienced by the surrounding visual receptors.
- 10.1.3 The assessment has incorporated the comments of the Secretary of State (SoS) in the Scoping Opinion included in Appendix 7B. The assessment should be read in conjunction with Chapter 9: Cultural Heritage.

Study Area

- 10.1.4 The study area has been defined as the area through which existing townscape character may change or be influenced as a direct result of construction and operation of the proposed scheme. This has been identified through a combination of 3-D modelling and site work within a pre-defined limited study area that was provisionally agreed with Waveney District Council (WDC) and SCC as a 3km radius around the proposed scheme (see Figure 10.1), beyond which the potential for significant effects are not anticipated to arise due to the scale and nature of the development.
- 10.1.5 The study area will be kept under review as the assessment of townscape and visual impact is finalised for the Environmental Statement (ES).

Limitations

- 10.1.6 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 10.1.7 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).
- 10.1.8 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

10.2 Directives, Statutes and Relevant Policy

10.2.1

- 10.2.2 Table 10-1 provides an outline of statutes, guidance, policies and plans considered relevant to the proposed scheme with respect to its impact on the townscape character and visual amenity.

Table 10-1 – Townscape/Landscape Regulatory and Policy Framework

Policy Summary	Scheme Summary
National Networks: National Policy Statement (NN NPS) (December 2014)	
<p>The Government’s vision and strategic objectives for national networks includes ‘supporting a prosperous and competitive economy and improving overall quality of life’ including delivering good design of infrastructure through:</p> <p>Applying “good design” to national network projects to produce sustainable infrastructure sensitive to place, efficient in the use of natural resources and energy used in their construction, matched by an appearance that demonstrates good aesthetics as far as possible.</p> <p>Paragraph 3.2 states that ‘The Government recognises that for development of the national road and rail networks to be sustainable these should be designed to minimise social and environmental impacts and improve quality of life’.</p> <p>Paragraph 5.149 states that ‘projects need to be designed carefully, taking account of the potential impact on the landscape. Having regard to siting, operational and other relevant constraints, the aim should be to avoid or minimise harm to the landscape (townscape), providing reasonable mitigation where possible and appropriate.’</p> <p>Paragraph 5.154 states that the aim for developments outside nationally designated areas but which might affect them there is a duty to have regard to the purposes of these area and should aim to ‘<i>avoid compromising the purposes of designation and such projects should be designed sensitively given the various siting, operational, and other relevant constraints</i>’</p>	<p>The proposed scheme has been designed to provide an enhancement of the crossing through the aesthetics and landmark nature of the proposed bridge structure.</p> <p>The proposed scheme will be assessed in accordance with current guidance and an agreed methodology. Adverse effects will be avoided where possible and mitigation and enhancements included where appropriate.</p> <p>The proposed scheme will be assessed in relation to The Broads National Park to understand any visual connections to the proposed scheme and whether they would compromise the purpose of this designated site.</p>
National Planning Policy Framework (NPPF)	
<p>The NPPF was published in March 2012 by the Government. The document streamlines national planning policy into a consolidated set of priorities, replacing most Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) notes. The NPPF sets out 13 core planning principles that should underpin decision taking including: the requirement for good design and conserving and enhancing both the natural and built environments.</p> <p>Paragraph 56 of the NPPF states that ‘The Government attaches great importance to the design of the built environment. Good design is a key aspect of sustainable development, is indivisible from good planning, and should contribute positively to making places better for people’.</p> <p>Paragraph 109 of the NPPF states that ‘the planning system should contribute to and enhance the natural and local environment’ including by protecting and enhancing valued landscapes.</p>	<p>The proposed scheme has been designed to provide an enhancement of the crossing of Lake Lothing and setting of the surrounding townscape through the form, aesthetics and landmark nature of the proposed bridge structure.</p>
Planning Practice Guidance (2014)	

Policy Summary	Scheme Summary
The Planning Practice Guidance provides practical guidance to support the NPPF. The policy document provides guidance to local authorities on consideration of the intrinsic character and beauty of the countryside, including both designated and undesignated landscapes.	Existing landscape/townscape character of the study area is considered as part of the proposed scheme design and development to ensure appropriate mitigation is in place to avoid or minimise any potential adverse impacts upon existing local character.

10.3 Methods of Assessment

10.3.1 The assessment is proposed to be undertaken in accordance with the Guidelines for Landscape and Visual Impact Assessment (Third Edition), published by the Landscape Institute and the IEMA (2013) (GLVIA3).

10.3.2 As the proposed scheme comprises a bridge structure and supporting link roads, reference has also been made to Highways England's Interim Advice Note (IAN) 135/10 that supersedes the relevant section of the Design Manual for Roads and Bridges. Reference has also been made to An Approach to Landscape Character Assessment (2014)²⁴.

10.3.3 The GLVIA3 acknowledges the relationship between the perception of landscape and townscape and the similarities in the approach to be undertaken in the assessment process. It also identifies the perception of townscape, and the experience of viewers (referred to as receptors - defined as residents, people in their workplace, attending school, using recreational facilities and using the countryside, shoppers etc.) and the development proposals.

Stages in the Assessment Process

10.3.4 There will be four key stages in the assessment:

- Recording and analysis of the existing townscape and visual context of the receiving environment (the baseline environment);
- Identification of changes and associated impacts that will be associated with the proposals and their significance in the context of the baseline townscape and visual context of the study area;
- Identification of mitigation where the assessment identifies potentially significant effects appropriate to the proposed scheme and the views of the receiving local area; and
- Description of the residual effects and their significance associated with the proposed scheme.

10.3.5 A methodology for the assessment of townscape character and visual amenity has been prepared and agreed with representatives from WDC and SCC. The key components of the methodology have been set out in sections 10.3.6 - 10.3.48.

- Highways England Interim Advice Note (IAN) 135/10 – Landscape Effects;
- An Approach to Landscape Character Assessment (2014);

²⁴ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/396192/landscape-character-assessment.pdf

- Landscape Character Assessment, Broads Authority²⁵ ; and
- Waveney District Landscape Character Assessment²⁶.

Baseline Environment and Sensitivity

10.3.6 The identification and evaluation of the existing townscape and visual context of the study area and wider area will involve the following tasks:

- Desk based analysis of OS mapping relating to landform, built form, vegetation, settlement patterns and the drainage regime in the wider area;
- Desk based analysis of aerial photography for the area;
- Preliminary review of the townscape units/types and relevant designations e.g. Conservation Areas, Registered Parks and Gardens;
- Site surveys and identification of townscape units/types. Site recording involving annotation of 1:1,250 and 1:25,000 scale OS plans defining the units and the key elements determining character;
- Development and agreement of representative/key viewpoints to be assessed for potential effects on visual amenity;
- Site photography to illustrate character units, notable views / viewpoints and key landscape elements; and
- Drafting and description of local townscape character units within the context of the broader assessment and associated with the proposed scheme and wider setting including an evaluation of their quality, value and sensitivity to change in the context of the proposed form of development.

Townscape Character

10.3.7 For townscape character, evaluation of the sensitivity to change will be based on the structure, quality and value of the existing townscape, and the extent to which it is considered as being capable of accepting change in the form of the proposed scheme. Sensitivity will be rated as being high, moderate or low. Magnitude of impact will be based on the extent to which the proposed scheme would be likely to emerge as a new component in the landscape and change the relationship between components that currently constitute character. The sensitivity of the receiving townscape and the magnitude of impact will be assessed to determine a significance of effect rating that will result from the construction, operation and de-commissioning of the proposed scheme and the effect that this will have on the perception of townscape.

Townscape Quality

10.3.8 Townscape quality relates to the intrinsic aesthetic appeal demonstrated by a character unit or feature / composition within the townscape, including the relative condition of the townscape and features therein.

10.3.9 A five point scale will be adopted to describe quality prior to development as shown in Table 10-2.

²⁵ <http://www.broads-authority.gov.uk/news-and-publications/publications-and-reports/planning-publications-and-reports/landscape-character-assessments>

²⁶ <http://www.eastsuffolk.gov.uk/planning/local-plans/waveney-local-plan/existing-waveney-local-plan/background-studies/natural-environment/landscape-character-assessment/>

Table 10-2 – Townscape Quality

Classification	Quality
Highest Quality	Areas comprising a clear composition of valued townscape components in robust form and health, free of disruptive visual detractors and with a strong sense of place. Areas containing a strong, balanced structure with distinct features worthy of conservation. Such areas would generally be internationally or nationally recognised, e.g. World Heritage Sites, Registered Parks and Gardens, and National Parks.
Very Attractive	Areas primarily of valued townscape components combined in an aesthetically pleasing composition and lacking prominent disruptive visual detractors. Areas containing a strong structure with noteworthy features or elements, exhibiting a sense of place. Such areas would generally be nationally or regionally recognised locations, e.g. Areas of historic townscapes, including Conservation Areas
Good	Areas primarily of valued townscape components combined in an aesthetically pleasing composition with low levels of disruptive visual detractors, exhibiting a recognisable townscape structure. Such areas would generally be regionally and locally recognised areas, e.g. Areas of Local Landscape Importance and areas fringing Conservation Areas
Ordinary	Areas containing some features of townscape value but lacking a coherent and aesthetically pleasing composition with frequent detracting visual elements, exhibiting a distinguishable structure often concealed by mixed land uses or development. Such areas would be commonplace at the local level and would generally be undesignated, offering scope for improvement.
Poor	Areas lacking valued townscape components or comprising degraded, disturbed or derelict features, lacking any aesthetically pleasing composition with a dominance of visually detracting elements, exhibiting mixed land uses which conceal the baseline structure. Such areas would generally be restricted to the local level and identified as requiring recovery.

Townscape Value

10.3.10 Townscape value relates to areas of particular scenic quality or those displaying important historic and cultural associations. Townscape value is frequently addressed by reference to international, national, regional and local designations. An absence of a formal designation does not, however, determine that a townscape is necessarily of low value; factors such as accessibility and local scarcity can render areas of unremarkable quality highly valuable as a local resource.

Capacity to Accommodate Change

10.3.11 Capacity to accommodate change is broadly derived from a combination and correlation of the quality, value and sensitivity of a given area.

10.3.12 Although there is common ground between the aspects of sensitivity and capacity, the relationship between the degree of sensitivity and capacity are not always directly related. A highly sensitive area should not, by definition, infer that it has little or no capacity to accommodate future change. Similarly, an area expressing low sensitivity to change does not automatically have a higher capacity to accommodate development.

Sensitivity to Change

10.3.13 Sensitivity to change relates to the quality and value of the townscape and the extent to which it is considered capable of accepting the type of development proposed. Three orders of sensitivity have been adopted as shown in Table 10-3:

Table 10-3 – Sensitivity to change criteria for townscape

Sensitivity	Criteria
High	a townscape displaying particularly distinctive character, of good or greater quality which is highly valued and considered susceptible to relatively small changes
Moderate	a townscape of good or ordinary quality which is moderately valued and considered reasonably tolerant of change
Low	a townscape of ordinary or poor quality which is of relatively low value and considered tolerant of substantial levels of change

Significance of Effect Assessment

10.3.14 The evaluation of effects will involve consideration of the sensitivity to change, derived during the baseline assessment, and the predicted magnitude of the impact that will occur in light of the construction and subsequent operation of the proposed scheme.

Magnitude of Impact

10.3.15 The magnitude of impact will be determined through a description of the changes likely to arise, such as changes to the grain of the built form, loss of vegetation, including green space and severance or modification to key townscape components and evaluation of the extent to which the proposed development will emerge as a new component in the townscape or change the balance between components that currently constitute baseline character. Four grades of magnitude will be adopted: high; medium; low; and no change as shown in Table 10-4.

Table 10-4 Magnitude of impact criteria for townscape

Magnitude of Impact	Criteria
High	Where the development would appear as a significant new component in the townscape and result in the total loss of or major alteration to the existing balance of components in the baseline context
Moderate	Where the development would appear as a distinctly noticeable new component in the townscape and result in a partial loss of or alteration to the existing balance of components in the baseline context
Low	Where the development would appear as a noticeable new component in the townscape and result in a minor loss of or alteration to the existing balance of components in the baseline context
Negligible	Where the development would appear as a barely perceptible component in the townscape and result in very minor loss of or alteration to the existing balance of components in the baseline context
No change	Where the development would have no direct effect on the components in the townscape resulting in no alteration to the existing balance of components in the baseline context

Townscape Character Significance of Effect Ratings

10.3.16 The identification of the resulting effects are to be established through an evaluation of the sensitivity of the baseline or receptor and the magnitude of the impact likely to occur as a result of the proposed scheme. An indication of the interactions between sensitivity and magnitude of impact and the likely resulting effects that are proposed are outlined in Table 10-5.

Table 10-5 – Townscape - Significance of Effect Categories

	Sensitivity		
	Low	Medium	High
High	Slight/Moderate	Moderate/Large	Large/Very Large
Medium	Slight	Moderate	Moderate/Large
Low	Neutral/Slight	Slight	Slight/Moderate
Negligible	Neutral/Slight	Neutral/Slight	Slight
No change	Neutral	Neutral	Neutral

10.3.17 This is only a framework to aid consistency of reporting and provide an initial indication of the likely effect, either beneficial or adverse, arising from the assessment of magnitude of impact and sensitivity of the resource. Given that the magnitude criteria of 'low/medium/high/negligible/no change' represent levels on a continuum or continuous gradation, application of the framework will also require professional judgement and awareness of the relative balance between sensitivity and magnitude.

10.3.18 The findings of the assessment will be represented using a descriptive, descending scale ranging from large - moderate - slight and adverse through neutral to an ascending scale of slight - moderate - large and beneficial. There is a further effect rating, very large adverse, used to indicate adverse effects on a very high quality townscape or on important and rare combinations of townscape features and their elements. Such a rating would indicate that the effect is considered highly prejudicial in relation to the specific topic of townscape character. Explanation of the significance of effect ratings that are proposed is provided below in a descending scale of significance.

- Large Beneficial Effect - The proposals:
 - Constitute a major restructuring of a degraded townscape or form an essential part of a townscape strategy to redevelop a major area of dereliction, leading to establishment of a new, attractive environment.
- Moderate Beneficial Effect - The proposals provide an opportunity to enhance the townscape because:
 - They fit very well with the scale, built form and pattern of the townscape;
 - There is potential, through mitigation, to enable the restoration of characteristic features, partially lost or diminished as the result of changes to the baseline context, e.g. from previous inappropriate development;
 - They will enable a sense of place and scale to be restored through careful design and appropriate mitigation measures, that is, characteristic features are perhaps enhanced through the use of local materials and appropriate scale of the development that fits well into the surrounding townscape;
 - They enable some sense of quality to be restored or enhanced through design features; and
 - They further government objectives to regenerate degraded urban areas.
- Slight Beneficial Effect - The proposals:
 - Fit well with the scale, built form and pattern of the townscape;

- Incorporate measures for mitigation to ensure they will complement the surrounding townscape structure;
- Will enable some sense of place and scale to be restored through careful design and appropriate use of materials as mitigation measures; and
- Maintain or enhance existing townscape quality and character.
- Neutral Effect - The proposals are well designed to:
 - Complement the scale, built form and pattern of the townscape;
 - Incorporate measures for mitigation to ensure that the scheme will blend in well with surrounding features and elements; and
 - Maintain existing townscape quality and character.
- Slight Adverse Effect - The proposals:
 - Do not quite fit the built form and scale of the townscape;
 - Although not very visually intrusive, will impact on certain views into and across the area;
 - Cannot be completely mitigated for because of the nature of the proposal itself or the character of the townscape in which the development would sit; and
 - May affect an area of recognised townscape quality.
- Moderate Adverse Effect - The proposals:
 - Are out of scale with, or at odds with, the local townscape pattern and built form;
 - Are not possible to fully mitigate for, that is, mitigation will not prevent the proposed scheme from scarring or detrimentally affecting the townscape in the longer term as some features of interest will be partly destroyed or their setting reduced or removed; and
 - Will have an adverse effect on a townscape of recognised quality or on vulnerable and important characteristic features or elements.
- Large Adverse Effect - The proposals are very damaging to the townscape in that they:
 - Are at considerable variance with the built form, scale and pattern;
 - Are visually intrusive and would disrupt fine and valued views of the area;
 - Are likely to degrade, diminish or even destroy the integrity of a range of characteristic features and elements of their setting;
 - Will be substantially damaging to a high quality or highly vulnerable townscape, resulting in fundamental change and be considerably diminished in quality; and
 - Cannot be adequately mitigated for.
- Very Large Adverse Effect - The proposals would result in exceptionally severe adverse effects on the townscape because they:
 - Are at complete variance with the built form, scale and pattern;

- Are highly visually and extremely intrusive, destroying fine and valued views both into and across the study area;
- Would irrevocably damage or degrade, badly diminish or even destroy the integrity of characteristic features and elements and their setting;
- Would cause a very high quality or highly vulnerable townscape to be irrevocably changed and its quality very considerably diminished; and
- Cannot be mitigated for, that is, there are no measures that would protect or replace the loss of a nationally important townscape.

Assessment of Visual Effects

10.3.19 The assessment of visual effects will involve the adoption of the four stages of assessment described in Section 10.3.4.

Baseline Environment

10.3.20 Establishment of the existing visual context for the proposed scheme would involve consideration of the information relating to existing townscape character established during the townscape character baseline assessment, the definition of a Zone of Theoretical Visibility (ZTV) for the proposed scheme, and the identification of key visual receptors (represented by key viewpoints) within the visual envelope.

Zone of Theoretical Visibility (ZTV)

10.3.21 The ZTV represents the extent of the area within which there would be potential for views of the proposed scheme.

10.3.22 An initial plotting of the ZTV to assist in key viewpoint selection (see 0) was based on a closed bascule bridge design and was undertaken by reviewing current OS mapping for the area to establish where landform, large scale established planting and areas of built development would be likely to define the availability of views. A subsequent visual analysis of the emerging rolling lift bascule bridge and highways design has been carried out to understand the potential extent of visibility within the study area of this form of structure (see Chapter 6 for the scheme description). The analysis considered three scenarios separately:

- HGV Traffic (4.5m vehicle height) – 16 points at 25m intervals along the bridge deck;
- Bridge Lowered - 2 points to represent the high point of each arm of the counterweight of the bridge when lowered; and
- Bridge Raised - 2 points to represent the high point of the deck of the bridge when raised.

10.3.23 The visual analysis was carried out using the Viewshed Analysis tool in ArcMAP 10.5 and was based on:

- 2008-2009 LiDAR Digital Surface Modelling (DSM) at 1m resolution (which includes surface features such as buildings and vegetation) and is accurate to +/-10cm for XY and +/-5cm for Z; and
- Observer points using XYZ co-ordinates to replicate the three scenarios (based on the details available at the time of the analysis and the bridge alignment).

10.3.24 The LiDAR information used to develop the ZTV includes all features within the townscape, including landform, vegetation and built form; whilst this is useful in developing the ZTV, it is not always reflected by what is visible on site. The mapping provided illustrates where there is the potential for the proposed bridge structure to be visible, however this is only theoretical

and includes all features with a degree of inter-visibility. The ZTV may therefore suggest that the structure would be visible over much broader extents than would be the reality.

- 10.3.25 The results of this analysis are shown on Figures 10.2 to 10.4 and have informed a preliminary ZTV. Those areas identified in 'green' indicate locations that are predicted to have direct views of all or part of the bridge structure. In areas that are more lightly shaded or at particular points these views may be highly constrained and/or comprise only the very highest sections of the bridge structure, which are likely to limit the degree to which a significant effect is anticipated to arise.
- 10.3.26 As a result the top of the structure will not be visible from all locations suggested by the software or are not representative of views experienced by the public. This can be for a number of reasons that may include:
- Rooflines of buildings or the tops of trees registering as having a view.
 - Intervening buildings and/or vegetation which were not recorded within the baseline data used (e.g. features built after the LiDAR data was collected); or
 - Upper floor windows from private dwellings or glimpses between buildings which in reality may be heavily constrained or orientated away from the structure.
- 10.3.27 Therefore some interpretation of the results is required. The prime objective is to establish an area within which key receptors or viewpoints, whose views may be influenced by the proposed scheme, can be identified to inform the assessment.
- 10.3.28 Further field surveys will be required to verify the actual extent of views and the likelihood that these will be subject to change. Therefore inclusion of an area within the ZTV is not an indicator that all potential receptors within the defined area will experience views of the proposed scheme.

Key Viewpoints

- 10.3.29 At the time of writing, early discussions with WDC and SCC identified a total of eleven key viewpoints to be used for assessment purposes. The key viewpoints have been selected on the basis that they provide representative views from a variety of receptors within the vicinity of Lake Lothing. Site surveys have subsequently been undertaken to establish the nature, location and actual availability of the anticipated view.
- 10.3.30 Following the subsequent visual analysis of the emerging design of the proposed scheme the preliminary ZTVs have indicated the potential for wider views within the 3km study area, particularly to the west, north and south of Lake Lothing. As such 4 additional key viewpoints are proposed to supplement the existing agreed key viewpoints to better reflect the potential changes in view throughout the study area (see Figure 10.5).

Identification of Key Viewpoints

- 10.3.31 The agreed 11 key viewpoints have been recorded by reviewing the settlement pattern, land use, topography, vegetation, access and transportation patterns contained within the boundaries of the initial ZTV. Key viewpoints plotted via the desk based review and validated through site survey include the following:
- Residential clusters and individual properties;
 - Roads with views of the proposed development site; and
 - Recreational and public access areas including footpaths and other rights of way.

10.3.32 These key viewpoints can be summarised as follows:

- Viewpoint 1 – view north from Waveney Drive, looking towards Lake Lothing and the tie in with the proposed scheme, representative of residential property anticipated to have direct views;
- Viewpoint 2 – view north west from Waveney Drive, looking towards Lake Lothing and representative of views experienced from one of the main highways to the south of the proposed scheme;
- Viewpoint 3 – view north west from the edge of Lake Lothing and the supermarket car park and associated open space on its northern edge, towards the main proposed bridge structure as it crosses the body of water;
- Viewpoint 4 – view west from the existing bridge crossing via the A12, representative of views experienced by people waiting to cross or crossing the existing Bascule Bridge;
- Viewpoint 5 – view south west from Denmark Road, representative of views experienced by a number of residential properties with oblique views towards the proposed scheme;
- Viewpoint 6 – view south east from Peto Way, representative of views afforded to users of the cycleway and the rear of property on Rotterdam Road;
- Viewpoint 7 – view south east from the upper slopes of Normanston Park and the rear of residential property on Normanston Drive;
- Viewpoint 8 – view east from identified development land (former Brooke Marine site, see Chapter 20) with views towards the main proposed bridge structure as it crosses Lake Lothing;
- Viewpoint 9 – view north east from proposed development land (former Jeld Wen site, see Chapter 20) on the edge of Lake Lothing, with views of the proposed bridge structure as it crosses the water body;
- Viewpoint 10 – view from Bridge Road, looking east with distant views towards the proposed scheme as it crosses Lake Lothing; and
- Viewpoint 11 - view east from Brooke Yachts and Jeld Wen County Wildlife site with views towards the main bridge structure as it crosses Lake Lothing.

10.3.33 The proposed additional key viewpoints would include:

- Viewpoint 12 – view east from a public footpath crossing the Carlton Marshes Nature Reserve within The Broads National Park at Oulton Broad;
- Viewpoint 13 – view south east from the convergence of two public footpaths in the urban fringe landscape at the north west extents of Lowestoft;
- Viewpoint 14 – view northeast from within a small local park off Britten Road in the residential area in south of the study area; and
- Viewpoint 15 – view south from within Lowestoft Cemetery to the north of Lake Lothing.

10.3.34 The location of the current and proposed additional key viewpoints are presented in Figure 10.5, and the verified photography that has been taken to date for the preparation of photomontages is presented in Figure 10.6.

Field Assessment of Key Viewpoints

10.3.35 The 11 agreed preliminary key viewpoints were visited and assessed. Factors considered during the visual assessment include:

- Associated receptor types and numbers where appropriate (e.g. dwelling / footpath);
- Existing view;
- Distance of view;
- Percentage and elements of the proposed scheme visible;
- Viewpoint position (view up / view down / level view);
- Angle of view (acute / perpendicular / oblique);
- Type of view (foreground / mid ground / background) and position of the proposed scheme in the view; and
- Analysis of potential impact.

Analysis of Visual Effects

10.3.36 Analysis of the likely visual impacts and evaluation of their associated effects will involve consideration of the sensitivity to change and magnitude of impact based upon information gathered through site surveys and analysis of the aesthetics of the proposals.

10.3.37 Evaluation of visual effects relates to the potential impacts during construction, subsequent opening of the facilities and ten years into operation (the end of the assessment period), for both summer and winter periods. The analysis will assume that the visual context applicable at the year of opening is that which would be experienced during winter months when the degree of visual exposure is potentially greatest.

10.3.38 The analysis at ten years into operation demonstrates the effectiveness of any landscape mitigation proposals associated with the scheme, allowing for its maturation. The analysis relates to each key viewpoint and concludes with an evaluation of the predicted significance of effect.

Sensitivity to Change

10.3.39 Sensitivity to change will consider the nature, location and context of the viewpoint or the associated receptor. Key viewpoints associated with less sensitive receptors are considered, for example, to be people engaged in work whose primary focus would not necessarily be on the surrounding landscape views. Conversely, more emphasis is placed upon receptors whose change in view or visual amenity is either the prime focus, greater in scale or potentially covers a wider area.

10.3.40 The degree and importance of the view gained from a key viewpoint by a receptor also contributes to an understanding of how sensitive a given receptor is towards change. Therefore, value of the view, scenic quality and visual expectations of the receptor are also taken into account in the assessment. In this assessment, sensitivity to change is proposed to be ranked as described in Table 10-6.

Table 10-6 Sensitivity of viewpoints

Sensitivity	Criteria
High	<p>This applies where a key viewpoint is associated with:</p> <ul style="list-style-type: none"> Individual dwellings or dwelling groupings with a view in which the proposed scheme would become an important focal element from either gardens or room windows, either from upper or lower storey. Roads, footpaths, bridleways and publicly accessible open spaces with a view in which the proposed scheme would be an important focal element in that view.
Moderate	<p>This applies where a key viewpoint is associated with:</p> <ul style="list-style-type: none"> Individual dwellings or dwelling groupings with a view from either gardens or room windows, either from upper or lower storey, in which the proposed scheme would not be a focal element but would be a notable element in the view. Roads, footpaths, bridleways and publicly accessible open spaces with a view in which the proposed scheme would not be a focal element but would be a notable element in the view. Industrial / commercial buildings with a view in which the proposed scheme would be a focal element in the view.
Low	<p>This applies where a key viewpoint is associated with:</p> <ul style="list-style-type: none"> Dwellings with a view from either gardens or room windows, either from upper or lower storey, in which the proposed scheme would not be a notable element in the view but would be discernible. Roads, footpaths, bridleways and publicly accessible open spaces with a view in which the proposed scheme would not be a notable element in the view but would be discernible. Industrial / commercial buildings with a view in which the proposed scheme would not be a focal element but would be a notable element in the view.

10.3.41 Magnitude of impact considers the extent of the development that is visible, the percentage of the existing view newly occupied by the proposed scheme and the viewing distance from the receptor to the development. In this assessment magnitude is proposed to be ranked as follows in Table 10-7.

Table 10-7 Magnitude of visual effect criteria

Sensitivity	Criteria
High	Where the proposed scheme would cause a substantial change to the existing view
Medium	Where the proposed scheme would cause a very noticeable change to the existing view
Low	Where the proposed scheme would cause a noticeable change to the existing view
Negligible	Where the proposed scheme would cause a barely perceptible change to the existing view
No change	Where the proposed scheme would cause no discernible change to the existing view

Significance of Effect Criteria

- 10.3.42 The prime criteria used to evaluate visual effects will relate to the extent to which existing views associated with key viewpoints (such as residents, users of public facilities and visitors to open space and public areas), will change, taking into account mitigation measures.
- 10.3.43 Other criteria proposed to be used to ascertain visual effect include the size, elevation and proportion of the proposed scheme in respect of the receiving environment and the degree to which activity within the receiving environment would alter, both during and post construction, and be visible. Cumulative visual effects on the baseline environment will also be taken account of in respect of the proposed scheme, where appropriate.
- 10.3.44 Effects can be detrimental where features or key characteristics such as established planting, old buildings or structures will have to be removed, directly affecting the view. Conversely, effects can prove beneficial where derelict buildings or poorly maintained landscape features are proposed to be restored, replaced or maintained, or where there is the introduction of new tree planting and a landscape structure where none currently exists, constituting an improvement in the current view.

Significance of Visual Effect Ratings

- 10.3.45 The identification of the resulting effects will be established through an evaluation of the sensitivity of the baseline and the magnitude of the impact likely to occur as a result of the proposed scheme. An indication of the interactions between sensitivity and magnitude of impact and the likely resulting effects are outlined in Table 10-8.

Table 10-8 – Significance of Visual Effect Categories

	Sensitivity		
	Low	Medium	High
High	Slight/Moderate	Moderate/Large	Large/Very Large
Medium	Slight	Moderate	Moderate/Large
Low	Neutral/Slight	Slight	Slight/Moderate
Negligible	Neutral/Slight	Neutral/Slight	Slight
No change	Neutral	Neutral	Neutral

- 10.3.46 The ratings presented in Table 10-8 is only a framework to aid consistency of reporting and provide an initial indication of the likely effect, either beneficial or adverse, arising from the assessment of magnitude and sensitivity. Given that the criteria high/ medium/ low/ negligible or no change represent levels on a continuum or continuous gradation, application of the framework will also require judgement and awareness of the relative balance between sensitivity and magnitude.
- 10.3.47 The findings are proposed to be represented using a descriptive scale ranging in a descending scale from large - moderate - slight and adverse through neutral to an ascending scale of slight - moderate - large and beneficial. There is a further effect rating, very large adverse, which is used to indicate effects on a receptor of very high sensitivity, significantly affecting an existing view of very high value and quality. Such a rating would indicate that the effect is considered highly prejudicial in relation to the specific topic of visual effect.
- 10.3.48 Explanation of the significance of effect ratings proposed is provided in Table 10-9 below along with an example description.

Table 10-9 – Significance of effect ratings

Rating	Example
Large Beneficial Effect	Lead to the removal of a significant eyesore such as a derelict site or buildings and incorporates landscape measures which substantially remodel and enhance the outlook for a large number of people, or where the proposal would cause a significant improvement in the existing view
Moderate Beneficial Effect	Visual intrusion associated with the existing view is noticeably relieved, or where the proposed scheme would result in a noticeable improvement. It would also apply where the proposed scheme includes provision for landscape proposals which would largely reduce the visual intrusion of the existing outlook and enhance views for a considerable number of people
Slight Beneficial Effect	Existing visual intrusion associated with the current outlook is slightly relieved, or where the proposed scheme would cause a barely perceptible improvement in existing receptor view.
Neutral Effect	Implementation of the proposed scheme not leading to a discernible improvement or deterioration in existing receptor view or outlook.
Slight Adverse Effect	The proposed scheme is at some distance from the viewpoint, or where the proposed scheme would not constitute a new point of principal focus. It would also occur where the proposed scheme is closely located to the viewpoint but is seen at an acute angle and at the extremity of the overall available view, or viewed from rarely occupied upper storey rooms or less sensitive receptor types
Moderate Adverse Effect	The proposed scheme resulting in a noticeable deterioration to the current outlook, involving removal of existing, visually screening elements in the view, exposing the scheme. It would also occur where large new structures are introduced as part of the proposed scheme which may appear at distance but be positioned as a focal point the field of view, or where the proposed scheme can only be partially mitigated
Large Adverse Effect	The proposed scheme would cause a significant deterioration in the current receptor view or outlook, be positioned prominently within an existing view of local interest in a valued landscape, or where only selected elements of the proposed scheme can be effectively mitigated
Very Large Adverse Effect	The proposed scheme would cause a highly prejudicial deterioration in the current view, be positioned prominently within an existing view of regional or national importance in a valued landscape, or where the proposed scheme cannot be effectively mitigated.

10.4 Baseline Environment

- 10.4.1 The urban, industrial water space that makes up Lake Lothing provides a link between The Broads National Park via Oulton Broad to the west and the North Sea via the Lowestoft Inner Harbour in the east. The linear body of water, which is central to the Port of Lowestoft is fringed by a variety of land uses that contribute to a varied character, represented primarily by industrial and maritime activity.
- 10.4.2 Maritime (recreational) activity is largely confined to the western end of Lake Lothing where numerous pontoons provide mooring to leisure craft. In contrast, the eastern end of Lake Lothing has a more industrial nature associated with it; in addition to the larger scale sea faring ships that routinely dock along the waterside, industrial, railway and large scale commercial development dominate.
- 10.4.3 Beyond the immediate environments associated with the banks of the Lake, the land use quickly reverts to residential development which extends to the north and south. To the north

in particular, the townscape is tight knit, small scale housing that is regular in pattern. This breaks down to the north east where older properties on a more irregular layout interrupt this pattern.

- 10.4.4 To the south of Lake Lothing the townscape is again characterised by a dense housing pattern which becomes more open in nature to the west, with larger gardens and less regular street patterns.
- 10.4.5 The townscape surrounding Lake Lothing is an area that within the Lowestoft Lake Lothing and Outer Harbour Area Action Plan is identified for regeneration aimed at delivering more diverse mixed use townscapes; improving access to the water's edge, with the frontage onto the Lake being a primary focus.
- 10.4.6 With the exception of the South Lowestoft Conservation Area, that encompasses the eastern end of Lake Lothing, Oulton Broad Conservation Area at the western extreme of Lowestoft, and the North Lowestoft Conservation Area (Figure 10.1) that extends northwards from Milton Road East, there are no designations that relate to the topic of townscape.
- 10.4.7 A national cycle route circumvents Lake Lothing to the east, crossing at the existing A12 Bascule Bridge to the east; this affords transitional but periodic views of the body of water where the route ties into the edges of the lake.

Townscape Character

- 10.4.8 This section describes the baseline for the identified Local Character Areas (LCA) within the townscape of Lowestoft which are identified in Figure 10.1. The preliminary study area has been set at a 3km buffer in line with the preliminary Zone of Theoretical Visibility (ZTV) within which potential views of the bridge structure may exist and potentially influence the perception of the local townscape character. As such the first iteration of the LCAs account for the scale of the study area and the study area will be reviewed and refined for the ES to account for the ZTV presented in Figure 10.6.

LCA 1 North Lowestoft and Town Centre

- 10.4.9 This area covers the town centre of Lowestoft, located between the coastal margin to the north of the harbour and the arterial routes of Jubilee Way and Katwijk Way to the west. It associates with the town's historic core and encompasses the distinctive townscapes of the North Lowestoft Conservation Area, the outer harbour, commercial districts and maritime industry.
- 10.4.10 The town centre, developed around road, rail and maritime linkages is a diverse commercial hub of mostly 19th and 20th century development (see Plate 10-1). Its outer harbour area is a focal point of Lowestoft's coastal townscape, with an active and animated character augmented by the railway. The open aspect of Lake Lothing from the harbour crossing provides a far reaching inland vista which, though not remarkable in townscape composition affords a strong sense of place in defining Lowestoft as a point of gateway to the inland waters of Norfolk and Suffolk (see Plate 10-2).
- 10.4.11 The retail spine of London Road runs north from the harbour towards High Street, positioned along the hilltop above the coastal Lowestoft Denes. Road layout and built frontages (see Plate 10-3) reflect the town's historical development as a fishing port with frequent and narrow "scores" that run between the escarpment and Whapload Road, affording vistas out to the sea and access to the coast. More recent 20th century industrial development occupies much of the low lying Denes, now eroding the character relationship between the High Street and the early fishing industry/settlement pattern that previously existed on the coast. The retail frontage of High Street ultimately gives way to a residential setting around the grade II listed Belle Vue Park. Here the Denes remains open and retains the link between the town and the open coastal fringe.

10.4.12 This is a diverse townscape, reflective of the formative coastal industry that is central to Lowestoft's development. The area has a good townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be medium.



Plate 10-1 – Commercial areas on London Road North



Plate 10-2 – View across the marina towards the bascule bridge and the entrance to Lake Lothing



Plate 10-3 – View along the High Street in the North Lowestoft Conservation Area

LCA 2 South Lowestoft and Seafront

- 10.4.13 This area covers the linear recreational seafront of south Lowestoft, from the Outer Harbour to Kirkley Cliff and between London Road South and South Beach. This narrow strip of terraced housing, hotels and shops derives from its peak as a Victorian coastal resort and falls within the South Lowestoft Conservation Area.
- 10.4.14 South of the harbour, the area is formed of a largely continuous townscape frontage to the seafront (see Plate 10-4), where recreational associations between the linear layout of housing and hotels parallel with South Beach have been maintained. The area developed following the establishment of the harbour and river access through Lake Lothing in the early 19th century and grew into a pleasure resort. The buildings of the conservation area comprise of commercial premises focussed at the north around Lake Lothing, three to four storey terraced townhouses and villas to the south along the seafront, and areas of lower status generally terraced housing to the west away from the seafront. This area is representative of the coastal resort legacy of Lowestoft and is still functioning as a holiday destination.
- 10.4.15 In the north of the area at South Pier a large expanse of public space exists in front of the grade II* listed Royal Norfolk and Suffolk Yacht Club alongside the marina. This open plaza provides a gathering space for seaside visitors, linking with entertainment facilities on and around South Pier, the esplanade and to South Beach itself. This area has maintained an entertainment function since the establishment of the early pleasure resort of South Lowestoft in the mid-19th century. South Beach is a long stretch of accessible sandy beach extending from the harbour southwards (see Plate 10-5). The beach gradually becomes separated from the esplanade towards the rise of Kirkley Cliffs south of Claremont Pier, where colourful beachside huts line the base of the cliff.
- 10.4.16 This is a distinct area of Lowestoft, derived from the recreational focus that developed along South Beach and important to the town's historical and contemporary identity. The area has a good townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be medium.



Plate 10-4 – The Victorian seaside terraces along Marine Parade



Plate 10-5 – View south along The Esplanade from South Pier towards Claremont Pier

LCA 3 Roman Hill

10.4.17 This area covers a largely residential development around Roman Hill between the arterial routes of Jubilee Road and Katwijk Way and a former disused line of the Great Eastern Railway.

- 10.4.18 It initially began as an expansion of the older areas of Lowestoft to the east and is mainly formed of compact late 19th century, terraced housing in a grid pattern of streets. Frontages are typically very close to footpaths leaving little or no space for gardens, which creates a stark and often confined townscape (see Plate 10-6). As such it is in contrast with the more diverse composition of the town core and seafront areas. This disconnection from the seafront areas is apparent in both the street layout and style and type of buildings, creating a uniform residential character with no visual link to the sea. The uniformity of townscape extends south to Denmark Road, bordering the railway and Lake Lothing. Here, areas of extension dating from the late 19th century are evident along Stevens Street, Clemence Street and Selby Street as early examples of the style and layout that has prevailed elsewhere in the district (see Plate 10-7).
- 10.4.19 By the mid-20th century development had extended to the western fringe of the LCA and the former line of the Great Eastern Railway. In this a part of the LCA the uniformity of residential scale and layout diversifies to a more fragmented and open townscape form. This includes campuses and open space associated with Lowestoft College, some commercial outlets, schools, playing fields, allotments and Lowestoft Cemetery.
- 10.4.20 This is a largely uniform and unremarkable townscape that creates a distinct area within the wider Lowestoft townscape. Despite the residential nature of this area there is a relationship, and frequent visual links, to the industrial context of Lake Lothing. The area has an ordinary townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be low.



Plate 10-6 – Compact terraced housing along Maidstone Road with Lake Lothing in the background



Plate 10-7 – One of the early areas of residential expansion in this LCA along Clemence Street

LCA 4 Kirkley and Pakefield

- 10.4.21 This area extends south from the industrial fringes of Lake Lothing, encompassing the shore line beyond south Lowestoft and west to Tom Crisp Way (A12). This largely residential area includes the suburbs of Kirkley and Pakefield. Originally two separate outlying hamlets, they have now become a part of Lowestoft as the town has grown.
- 10.4.22 Residential expansion along the older routes of London Road, Kirkley Run, Carlton Road (see Plate 10-8) and Stradbroke Road/Pakefield Street has led to gradual infill development, associated with the coastal resort expansion along South Beach and the more recent residential street arrangements in Pakefield. Accordingly there is a diversity of residential townscape character, ranging from the remnants of the early village cores to 19th and 20th century development. The majority of this area is primarily residential in character and formed of a mix of generally two storey semi-detached or terraced properties in a range of condition and styles (see Plate 10-9).
- 10.4.23 The townscape pattern and scale is fragmented by blocks of flats, educational facilities and commercial areas, the most prominent being the Cefas laboratory building on the sea cliff at the southern edge of South Beach. Open green space forms a regular aspect of the townscape pattern, mostly associated with school grounds and sports fields, small coastal and public parks, cemeteries and a narrow linear recreational park following Kirkley Stream in the west.
- 10.4.24 Though disparate in nature, the broadly residential spread of development provides a commonality across the varied urban grain. The geographic constraints of the coast and Kirkley Stream form defined extents. The area has an ordinary townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be medium.



Plate 10-8 – View along one of the traditional routes on Carlton Road



Plate 10-9 – View of the housing and diverse road layouts along Lorne Road and St Leonard's Road

LCA 5 Lake Lothing

10.4.25 Lake Lothing is a large urban industrial water space. It represents an important and formative spatial aspect of the town's layout, linking the wider inland waterway network with the coastal townscape (see Plate 10-10). It forms a transitional gateway to The Broads National Park,

providing passage and haven for a range of private and commercial craft travelling between Oulton Broad, the wider inland waterway network and the coastal waters of the North Sea.

- 10.4.26 Lake Lothing is linear in form, fringed by a mainly industrial and maritime townscape. Its western length hosts working boatyards and marine related infrastructure, with extensive pontoon moorings that accommodate a mix of vessels. By contrast, the eastern part of the lake through North Quay and the Inner Harbour is more open and regular in form, frequented by larger sea-going craft and flanked by a mix of prominent waterside industry, railway and contemporary retail and commercial development (see Plate 10-11).
- 10.4.27 The quality of urban form surrounding Lake Lothing assumes a more disparate and fragmented pattern. Its northern edge is flanked by the railway, which separates a prominent industrial lake margin from the residential and retail fringes of north Lowestoft. To the south of the lake is a mix of maritime related industry, large tracts of vacant land and areas of new commercial development. It is a townscape in transition, the area having been identified for major regeneration within the Lowestoft Lake Lothing and Outer Harbour Area Action Plan. The distinctive waterfront of Lowestoft and the presence of boat activity are a major part of the town's cultural character. The bascule road bridge crossings at either end of Lake Lothing offer a further sense of townscape animation and a cultural link with boat passage as a part of the town's character.
- 10.4.28 Lake Lothing and the surrounding industrial setting is an important cultural component of Lowestoft, despite being frequently in poor repair and appearance. The area has an ordinary townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be low.



Plate 10-10 – View towards the Outer Harbour from the waterfront on the south side of Lake Lothing



Plate 10-11 – Industrial areas fringing Lake Lothing

LCA 6 Normanston/Gunton

- 10.4.29 The area is comprised of established medium density residential development to the north of Lake Lothing. This predominantly residential townscape is formed largely of late 20th century suburban development character in the Normanston and Gunton areas. In the north of Lowestoft the topography rises gently from the margins of Lake Lothing, affording occasional views across the lake and its industrial setting.
- 10.4.30 The residential expansion formed around the older areas of settlement at Normanston and Oulton, with ribbon development along the main routes, particularly on Normanston Drive between Normanston and Oulton Broad. Later residential development pattern is typically comprised of a series of linked avenues and cul-de-sacs within a broader network of historic through roads. One of the earlier areas of mid-20th century suburban expansion can be found off Foxburrow Hill at Gunton in the north between Spashett Road and Montgomery Avenue, around the highest part of the town.
- 10.4.31 Properties are typically of one and two storey, with large garden spaces. The townscape exhibits a more established character where mature trees and larger areas of open space are more prevalent (see Plate 10-12). Normanston Park (see Plate 10-13) and Leathes Ham LNR form large areas of established open green space to the north of Lake Lothing, which have a distinct townscape quality and recreational emphasis. The wooded Bond's Meadow provides a further tract of green space, following a drainage line leading to Oulton Broad. To the west there are numerous recreational links and open space networks providing access to the nearby Oulton Broad, the surrounding farmland and The Broads National Park.
- 10.4.32 The suburban expansion set within a more undulating and treed context creates sense of an established suburban character. The area has an ordinary townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be medium.



Plate 10-12 – View along Higher Drive in Normanston in a more established part of the townscape



Plate 10-13 – Normanston Park to the north of Lake Lothing

LCA 7 Whitton / Carlton Colville

10.4.33 The area is comprised of medium density residential development along the lower lying land to the south of Lake Lothing. This residential townscape extends to the southern margins of the town, and westwards from Tom Crisp Way to Beccles Way. Areas of early settlement are

evident in the outlying village centres of Carlton Colville and Whitton Green. Early residential expansion was in the form of ribbon development along the network of through roads with later, more extensive developments occurring in the east off Kirkley Run and Long Road (see Plate 10-14).

10.4.34 As with residential expansion to the north of the town, the pattern of infill development typically comprises a series of linked avenues and cul-de-sacs within the broader network of historic routes, interspersed by local community facilities to create a townscape of domestic scale. Properties are typically of one or two storey, but with less mature tree cover and smaller garden spaces than those to the north (see Plate 10-15). The townscape pattern has fewer areas, and diversity, of open space. Rosedale Park and a park off Clarkes Lane form the largest areas of formal parkland, with the rest of the open space linked to schools or playing fields. Overall the area presents a less established and diverse townscape character than the comparable areas of residential expansion to the north.

10.4.35 The regular pattern of suburban expansion has a broadly similar townscape quality and scale. The area has an ordinary townscape quality of local value. Sensitivity to change in relation to the type of development proposed is considered to be medium.



Plate 10-14 – View along Edgerton Road, an early area of 20th century residential expansion



*Plate 10-15 – Mixed housing along Planters Grove in Coleville in the south of the LCA
LCA 8 Oulton Broad*

- 10.4.36 Oulton Broad is situated to the west of the town, located within The Broads National Park. In contrast with the industrial townscape of Lake Lothing it is a landscape typical of the Norfolk Broads, comprising a large body of water fringed by mature woodland and waterside residential development and yacht/cruiser moorings. It is markedly more domestic in scale and character than the setting of Lake Lothing, with the Mutford bridge crossings forging a divide between the recreational focus of Oulton Broad to the west and the more industrial maritime townscape of Lake Lothing and Lowestoft to the east.
- 10.4.37 The northern shore of Oulton Broad, much of which falls within a conservation area, maintains a sense of separation and seclusion from wider urban development due to the limited access and privacy created by a combination of mature private gardens and the wooded railway corridor. Large and established residences dating from the late 19th to early 20th century along Borrow Road and Romany Road feature large gardens which often extend to the water's edge (see Plate 10-16). Public access and recreational use is more prevalent along the south side of Oulton Broad, Nicholas Everitt Park forming a focus for recreational activity (see Plate 10-17). The western extent of Oulton Broad, set within low lying marshes and open grazing fields is characteristic of the inland Broads landscape.
- 10.4.38 Recreational access between Lowestoft and the Oulton Broad landscape is enabled by several rights of way, the primary link being the "Angles Way" long distance footpath. The accessible natural landscapes and wildlife havens of the Carlton and Oulton Marshes Nature Reserves on the urban fringe of Lowestoft, provide a community and environmental resource.
- 10.4.39 The appealing waterfront setting of Oulton Broad is well established, providing Lowestoft with a direct link to the wider, characteristic Broads landscape and a range of recreational activities. The area has a very attractive quality of regional value. Sensitivity to change in relation to the type of development proposed is considered to be high.



Plate 10-16 – View across Oulton Broad towards the housing on the north side and The Broads beyond



Plate 10-17 – View from Nicolas Everitt Park towards the moored leisure craft

Summary

10.4.40 Table 10-10 provides a summary of the identified sensitivity to change for each of the LCAs.

Table 10-10 – Summary of LCA sensitivity to change

Local Character Area (LCA)	LCA 1 North Lowestoft and Town Centre	Medium
	LCA 2 South Lowestoft and Seafront	Medium
	LCA 3 Roman Hill	Low
	LCA 4 Kirkley and Pakefield	Medium
	LCA 5 Lake Lothing	Low
	LCA 6 Normanston/Gunton	Medium
	LCA 7 Whitton/Carlton Colville	Medium
	LCA 8 Oulton Broad	High
	Sensitivity to Change	

The Adjusted Baseline

10.4.41 It is acknowledged that there is high degree of certainty that the future townscape will change as a result of known proposed development. The assessment will incorporate these areas of development within the future baseline in order to understand the changes to the identified LCAs, the future setting of the proposed scheme, and how it may affect these areas.

10.4.42 Known development includes the following Site Specific Allocations as described in the Lowestoft Lake Lothing and Outer harbour Area Action Plan:

- SPP1 PowerPark (24.7ha) – Proposed energy related employment located within and to the north of the Outer Harbour (LCA1);
- SPP2 Peto Square (9.04ha) - Proposed Retail, Leisure, Tourism and Port Related Activities located at the eastern end of Lake Lothing (LCA 5);
- SPP3 Kirkley Waterfront and Sustainable Urban Neighbourhood (59.76ha) - Proposed Housing, Industrial and Community Facilities located on the southern margins of Lake Lothing (LCA 5);
- SPP5 Kirkley Rise (8.31ha) - Proposed Housing, Employment and Community Facilities located south of lake Lothing and the A12 (LCA 4);
- SPP6 Western End of Lake Lothing (4.87ha) - Proposed Mixed Use Regeneration located at the south western margins of Lake Lothing (LCA 5);
- SPP7 Oswald’s Boatyard (0.82ha) - Proposed Housing and Community Facilities western margins of Lake Lothing (LCA 5/6); and
- SPP9 Peto Way / Denmark Road Corridor (3.14ha) - Proposed Employment located between Peto Way/Denmark Road and the rail corridor to the north of Lake Lothing (LCA 5).

10.4.43 These proposals would be located around Lake Lothing and would form the basis of the future baseline that will be discussed in the ES where the proposed scheme would have the potential for direct influence of the setting, townscape character and views from these areas.

10.5 Predicted Impacts

- 10.5.1 Until such time as the assessment of potential effects on townscape and visual amenity has been undertaken, predicted impacts have not been identified.
- 10.5.2 A preliminary study of the ZTV, based on the analysis of three scenarios of the emerging bridge and highway design, has been carried out to confirm the extent of potential views within the study area (see section 10.3.21 to 10.3.28 for details). The three scenarios are presented in Figures 10.2 to 10.4 and include:
- HGV traffic on the bridge deck;
 - Bridge lowered; and
 - Bridge raised.
- 10.5.3 The results of this study have demonstrated that the bridge deck and HGV traffic would be visible in the immediate open setting around Lake Lothing with views extending to the east to the outer harbour crossing and to Harbour Road in the west. Existing built form around Lake Lothing largely contains views and prevents wider visibility from within the surrounding areas. However where a combination of higher topography and street layouts allow there are potential views towards the bridge that penetrate within immediate surrounding urban context. This is particularly evident around the north/south street layout to the north of the proposed scheme between Essex Street and Stevens Street. To the south the residential housing along Waveney Drive limits the extent of views in this direction, while to the south east potential views extend beyond the A12 largely due to the broader scale of intervening development which allows for indivisibility within the townscape. In addition there are potential views from area around the western and northern extents of Normanston Park where the topography rises.
- 10.5.4 The analysis of the two scenarios representing the highest points of the bridge structure when raised and lowered produce almost contiguous results. This is due to height of the highest points of the structure being almost identical in either scenario, and with these high points approximately 18m apart. As such the two preliminary ZTVs for these two scenarios are discussed as one.
- 10.5.5 The visibility of highest points of the bridge structure (when raised or lowered) would be prominent new visual elements within both the immediate setting of Lake Lothing and the surrounding urban areas. From the open margins of Lake Lothing to the surrounding built development the structure would be a dominant feature in un-obstructed open views. As such it would be frequently viewed in relative isolation above the open body of water and drawing the eye.
- 10.5.6 Beyond these immediate direct views from the margins there would be a range of potential views from the edges of the surrounding built development and further within the urban grain. Here the bridge structure is likely to be visible above the intervening development in partial views. The bridge structure, comparable in height to the tallest building on the north of Lake Lothing, would form somewhat of a landmark in views – indicating the location of the otherwise discreet Lake Lothing within the urban context of views.
- 10.5.7 The analysis shows that these mid-range partial views are likely to be present mostly from the areas around and contained within Normanston Drive in the north and Denmark Road through to the outer harbour in the east. In the south the potential mid-range partial views would be possible from upper storeys of properties lining South Beach in the south east, and from the numerous isolated pockets of open space in a broad arc between Beaconsfield Road in the south east and Kirkley Run to the south. To the west and south west the potential for mid-range views is less, due to larger scale buildings and the more level elevation. However there

would be views possible from Harbour Road Industrial Estate on the North West margins of Lake Lothing to the west as far as the rail corridor.

- 10.5.8 The analysis has shown that there would be potential for long range views of the bridge structure from areas of open space. These views would typically be minor partial views of the tops of the structure in the skyline or in distant contextual views from elevated areas of the town. These views would include potential views from within The Broads National Park in the west. The analysis suggests views would be possible from the northern fringes of Oulton Broad, Oulton Broad itself, and from the Carlton Marshes Nature Reserve to the south of Oulton Broad. Other notable potential distant views include the urban fringe landscape to the North West as far as Hall Lane and from the open spaces typically associated with playing fields and school grounds that exist throughout Lowestoft.
- 10.5.9 Mitigation will be refined prior to the submission of the ES, although it is likely that the most viable method will be embedded mitigation through a sympathetic design so that it integrates into the surrounding landscape.

10.6 Conclusions and Effects

- 10.6.1 Until such time as the assessment of potential effects on townscape and visual amenity has been completed and analysed, conclusions on significant effects have not been identified.
- 10.6.2 These conclusions are dependent upon the need of several aspects of the scheme and the assessment to be agreed or finalised. These include:
- Additional key viewpoints and baseline photography required following the updated ZTV;
 - The need to validate the findings of the updated ZTV through further site work; and
 - The need to agree the scope of the adjusted baseline.

10.7 Studies still to be undertaken

- 10.7.1 The following activities will be undertaken within the ES:
- Undertake appropriate site work to support the assessment of potentially significant effects;
 - Complete assessment of Townscape effects;
 - Prepare photomontages at additional key viewpoint locations to be agreed with WDC, SCC and the Broads Authority;
 - Identify potential views from the water;
 - Complete assessment of visual effects including an assessment of lighting and night time effects (see Chapter 16 for lighting effects upon harbour operations);
 - Undertake assessment of visual effects during construction;
 - Complete a review of potential cumulative effects; and
 - Prepare and agree appropriate mitigation measures aimed at reducing or avoiding significant effects.

11 Nature Conservation

11.1 Scope of the Assessments

Introduction

- 11.1.1 This chapter describes the assessment of the likely significant effects of the proposed scheme on biodiversity and nature conservation during the construction and operational phases of the scheme. It is supported by Figures 11.1 to 11.6 and Appendices 11A to 11G.
- 11.1.2 The assessment of this topic area considers potential impacts relating to the following aspects:
- Statutory and non-statutory designated sites;
 - Important or protected habitats; and
 - Legally protected species and/or species of conservation importance.
- 11.1.3 The assessment has incorporated the comments of the Secretary of State (SoS) in the Scoping Opinion included in Appendix 7B. The assessment should be read in conjunction with Chapter 8: Air Quality; Chapter 12: Geology and Soils, Chapter 13: Noise, Chapter 17: Road Drainage and the Water Environment and Chapter 19: Traffic and Transport.

Study area

- 11.1.4 The study area for the proposed assessment is comprised of 3 different levels as informed by legislation and guidance (see Section 11.2 below);
- Main – 500m from the proposed scheme. This study area has been used for assessing habitats and suitability for protected species;
 - Broad – 2km from the works red-line. This study area is used for biological records and data searches (Figure 11.1); and
 - Extended – 30km from the works red-line, in order to take into account internationally important sites of interest (Figure 11.2).
- 11.1.5 The survey areas for specialist species surveys can be viewed in Figures 11.3 to 11.6.

Limitations

- 11.1.6 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 11.1.7 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).
- 11.1.8 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

11.2 Directives, Statutes and Relevant Policy

- 11.2.1 Ecological features receive protection through legislation and planning policy. Legislation and planning policy relevant to the proposed scheme will be identified following a determination of ecological receptors relevant to the scheme following completion of the surveys that are proposed.

11.2.2 The appraisal has been compiled with reference to the following relevant nature conservation legislation, planning policy and the UK Biodiversity Framework from which the protection of sites, habitats and species is derived in England.

- The Conservation of Habitats and Species Regulations (Habitats Regulations) 2010 (as amended);
- The Wildlife and Countryside Act (WCA) 1981 (as amended);
- Countryside Rights of Way (CRoW) Act 2000;
- The Natural Environment and Rural Communities (NERC) Act 2006;
- The Wild Mammals (Protection) Act 1996;
- The UK Post-2010 Biodiversity Framework (2011-2020) (JNCC and DEFRA, 2012);
- Biodiversity 2020: A strategy for England's wildlife and ecosystem services (DEFRA, 2011);
- The National Planning Policy Framework (NPPF) 2012 (DCLG, 2012);
- The National Policy Statement for National Networks;
- UK Biodiversity Action Plan (UKBAP)²⁷; and
- Suffolk Biodiversity Action Plan (2012).

11.3 Methods of Assessment

11.3.1 The assessments will be based on the methods outlined in the following guidance:

- The DMRB Volume 11, Section 3, Part 4 Ecology and Nature Conservation;
- IAN 130/10 – Ecology and Nature Conservation: Criteria for Impact Assessment, Highways Agency (2010);
- Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland published by the Chartered Institute of Ecology and Environmental Management (CIEEM) (2016)²⁸; and
- Guidelines for Ecological Impact Assessment in Britain and Ireland: Marine and Coastal published by Chartered Institute of Ecology and Environmental Management (CIEEM) (2010).

11.3.2 Establishment of the baseline environment for nature conservation has involved a review of the existing information relating to designated and non-designated sites, habitats and fauna and consultation with SCC.

²⁷ The UK BAP has now been replaced by the UK Post-2010 Biodiversity Framework, however, it contains useful information on how to characterise important species assemblages and habitats which is still relevant.

²⁸ Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, freshwater and Coastal. 2nd Edition, Chartered Institute of Ecology and Environmental Management, 2016

- 11.3.3 A number of surveys have been, or will be, undertaken (Table 11-2) and are proposed to verify and update baseline information related to habitats and fauna and where the results of these surveys are available they are presented in this PEIR chapter. The species specific surveys are:
- Reptile surveys;
 - Wintering bird surveys;
 - Breeding bird surveys;
 - Black Redstart breeding surveys;
 - Benthic ecology survey;
 - Bat roost surveys; and
 - Invertebrate survey.
- 11.3.4 The surveys proposed to be undertaken have been discussed with Natural England and SCC and additional representation has been made in the Scoping Opinion (Appendix 7B). Phase 2 surveys were recommended through the scoping process, but it has been considered that the information received through the original Phase 1 habitat survey is sufficient due to the lack of priority habitats within the survey area and impacts from the proposed scheme can be adequately addressed with the information presently gathered. Habitats that have greater importance due to supporting protected species will be assessed in terms of those species present.
- 11.3.5 A meeting to discuss scope and progress with SCC Ecologists from the Natural Environment Team occurred on the 19th June 2017. During this meeting, the results from surveys to date were presented and further bat surveys were recommended. It was felt that all other survey information that had already been undertaken, or was scheduled, was sufficient for the ES.
- 11.3.6 Assessment of the significance of impacts on sites, habitats and species will be based on the guidance provided in the Guidelines for Ecological Impact Assessment²⁸. These define the ecological value of identified assets based on their geographic influence, which ranges in definition from sites of international importance down to those within the local and immediate zone of influence of the proposed scheme. Those assets with a geographic value at the local level or above will be subject to detailed assessment other than where receptors of lesser value are subject to some form of legal protection or can act in combination to lead to a cumulative impact. To that end, the determination of whether a significant effect is likely is a matter of professional judgement having considered a number of factors as to how the proposed scheme will interact with the baseline ecological environment.
- 11.3.7 Criteria relating to confidence, magnitude, extent, duration, reversibility and timing will be considered in combination with value to define impact significance. The guidelines define a significant effect as 'an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features'. The assessments have accordingly, using professional judgement, taken into account the composition and status of sites, habitats and species under consideration, including their importance relative to the geographical context and nature of the predicted impact to enable an evaluation of significance to be made.
- 11.3.8 Based on the findings of the assessments mitigation measures relating to avoidance, reduction or compensation of impact will be identified prior to an evaluation of the consequent effects of the impacts.

11.4 Baseline Environment

11.4.1 A desk study, Phase 1 Habitat survey and species specific surveys for reptiles, wintering birds, black redstarts and bats have been undertaken to date to identify changes to known biodiversity resources and include both designated and non-designated sites.

11.4.2 The surveys have been undertaken with reference to the following guidance:

- TAG Unit A3 Chapters 5 and 9 (which also references DMRB Volume 11 Section 3 Part 4);
- 'Guidelines for Ecological Impact Assessment in the UK' (Chartered Institute for Ecological and Environmental Management (CIEEM), 2016);
- DMRB Volume 11 Section 4 Assessment of the Implications (of Highways and/or Road Projects) on European Sites (including Appropriate Assessment); and
- Bibby C., N. Burgess, D. Hill & S. Mustoe (2000). *Bird Census Techniques: 2nd edition*. Academic Press.

Desk-Based Studies

Nationally and Locally Designated Sites

11.4.3 The desk-based search established there is one nationally designated site within the broad study area of the proposed scheme. This is the Leathes Ham Local Nature Reserve (LNR) (see Figure 5.2).

11.4.4 In the Scoping report (Appendix 7A) the following designated sites were identified as requiring consideration:

- The Broads SAC;
- Broadland SPA;
- Broadland Ramsar;
- Southern North Sea cSAC; and
- Outer Thames Estuary SPA and pSPA Extension.

11.4.5 In the Scoping Opinion (Appendix 7B) the following were also identified as worthy of consideration and this has informed the area of the Extended Study Area:

- Alde-Ore Estuary SPA;
- Benacre to Easton Bavents SPA;
- Barnby Broad and Marshes SSSI; and
- Sprat's Water and Marshes, Carlton Colville SSSI.

11.4.6 Local Nature Reserves (LNR) are sites of local or district-wide importance, designated for the enjoyment, study or conservation of wildlife, geological features and landforms. Leathes Ham LNR is a freshwater lake with a mix of wooded and grassland habitat that is home to many bird species.

11.4.7 Three County Wildlife Sites (CWS) exist within the study area, namely:

- Brooke Yachts and Jeld-Wen Mosaic County Wildlife Site;
- Kirkley Ham County Wildlife Site; and
- Harbour Kittiwake Colony County Wildlife Site.

11.4.8 Leathes Ham LNR and the three CWSs are identified on Figure 11.1.

Species Records

11.4.9 The review of existing records of species within the Broad Study Area of the proposed scheme has established the following: Records of brown long-eared bat *Plecotus auritus*, pipistrelle *Pipistrellus* sp., water vole *Arvicola amphibius*, grey seal *Halichoerus grypus* and common lizard *Zootoca vivipara* exist within 2km of the proposed scheme. Approximately 150 species of birds have been recorded within 2km, including notable species such as barn owl *Tyto alba*, black redstart *Phoenicurus ochruros*, green sandpiper *Tringa ochropus*, hen harrier *Circus cyaneus*, kingfisher *Alcedo atthis*, little tern *Sternula albifrons*, peregrine *Falco peregrinus* and red throated diver *Gavia stellate*.

11.4.10 Biological records show several priority species (S41 NERC Act as amended) that have been recorded within 2km. Species recorded include hedgehog *Erinaceus europaeus*, common toad *Bufo bufo*, common frog *Rana temporaria* and smooth newt *Lissotriton vulgaris*. These species are afforded no formal protection within the UK but must be taken into consideration during the planning phase.

The Suffolk County Biodiversity Action Plan

11.4.11 Included in Appendix 11C is a list of the Biodiversity Action Plan (BAP) species that have been considered and informed the species specific surveys that are proposed.

Field Studies

Habitats

11.4.12 The types and extent of habitats identified within the Main Study Area of the proposed scheme alignments are described in Table 11-1 and shown in the Lake Lothing Third Crossing – Extended Phase 1 Habitat Survey Report (2015) (Appendix 11A). This Extended Phase 1 Habitat Survey will be updated for the ES submission.

Table 11-1 – Habitats Survey

Habitat	Description
Amenity Grassland	There is an area of amenity grassland on the corner of Rotterdam Road and Denmark Road comprising a playing field and recreational area. This habitat is of low ecological value and is not an ecological constraint to the proposed works.
Hard Standing	Several areas of old hard standing are present, containing numerous cracks within which vegetation has become established. Species present include buddleia <i>Buddleja davidii</i> , gorse, willow herb and several species of grasses. This habitat is of little ecological value and is not a constraint to the proposed works.
Tall Ruderal	Small isolated areas of this habitat were present to the north of the railway line adjacent to Denmark Road. These areas were dominated by bramble, with willow herb, common nettle, ragwort <i>Senecio jacobaea</i> , common hogweed <i>Heracleum sphondylium</i> , ivy, bindweed <i>Convolvulus arvensis</i> , broom <i>Cytisus scoparius</i> and dog rose <i>Rosa canina</i> . This habitat is of little ecological value and is not a constraint to the proposed works.

Habitat	Description
Unimproved Neutral Grassland	Small areas of grasses were interspersed within the tall ruderal, and these consisted of perennial rye grass <i>Lolium perenne</i> , timothy-grass <i>Phleum pratense</i> , false oat grass <i>Arrhenatherum elatius</i> and willow herb. There were also some woody species within the tall ruderal, including elm, hawthorn and sycamore. This habitat is found throughout the UK and is not an ecological constraint to the works.
Standing / Tidal Water	Lake Lothing is a saltwater lake, which at the western extent is connected to Oulton Broad and the River Waveney. The lake is tidal and exposes mudflats at some locations at low water. There is no emergent vegetation and the lake is subject to considerable disturbance through its use as a port. Mudflats and saline lagoons are both priority habitats, however Lake Lothing is a poor example of these habitats.

11.4.13 No Groundwater Dependent Terrestrial Ecosystems have been identified within the main study area and as identified in Chapter 17, impacts upon these habitats are scoped out of the assessment.

Species

11.4.14 A summary of species potential, and results of surveys undertaken to date within the study area is provided in Table 11-2.

Table 11-2 – Species surveys proposed and undertaken

Species	Description
Invertebrates	<p>An area of rough grassland centred on grid reference TM538925 is a dedicated wildlife area for the five-banded weevil wasp <i>Cerceris quinquefasciata</i>. This nationally rare and UK BAP Priority Species is a sand-burrowing insect and there is additional habitat associated with the sandy substrate associated with amenity planting on the south side of Lake Lothing.</p> <p>Invertebrate surveys are scheduled for summer 2017 in locations shown on Figure 11.6 and the findings of these surveys will be presented in the ES.</p>
Reptiles	<p>The mosaics of tall ruderal vegetation, grasslands and hard standings provide suitable habitat for reptiles, which include common lizard, slow worm, and grass snake. Any populations are likely to be of no more than local biodiversity value.</p> <p>Surveys have been undertaken on the southern side of Lake Lothing across three areas of suitable habitat in late summer 2016 and no reptiles have been recorded. Further studies to the south of Lake Lothing in spring 2017 did not record any reptiles.</p> <p>Surveys on suitable habitat in spring 2017 to the north of Lake Lothing on land adjacent to the railway has identified a population of common lizards. Further surveys are planned for late summer 2017 to identify the extent of this population.</p> <p>These areas are all shown on Figure 11.4 and greater information is provided in the Reptile survey report (Appendix 11F).</p>
Bats	<p>Assessment of structures for bat roost potential was undertaken in August 2016.</p> <p>Structures considered to have bat roost potential were considered in the context of their proximity to the location of the proposed scheme to determine the requirement to undertake appropriate surveys. Structures which were not located immediately adjacent to the proposed route alignment were scoped out of any further surveys.</p> <p>Five sites were identified as requiring further surveys for bat roost presence and are numbered B1 to B5 on Figure 11.3.</p> <p>No evidence of roosting bats was recorded from any of the buildings surveyed during the surveys undertaken during 2016 at buildings B1, B3 and B5 or in early summer 2017 at B2. Further surveys will be undertaken at B5 in summer 2017.</p> <p>Activity levels recorded during the emergence surveys and the walked transect surveys was generally low, typically with just a single bat pass recorded.</p> <p>Summer surveys undertaken at the car garage (location B1 on Figure 11.3) on the northern side of Lake Lothing recorded activity by <i>Nathusius' pipistrelle</i>. This species, although widespread, is rare within the UK. Further surveys in the form of a transect will be undertaken during 2017 to obtain more information on the use of the habitats within the scheme by this species. This is shown as the purple line on Figure 11.3.</p> <p>No evidence of hibernation behaviour was recorded during static recorder surveys during winter 2016/7 at location B1.</p> <p>The findings to date of the Bat survey is included in Appendix 11B.</p>

Species	Description
Birds	<p>There are trees and areas of vegetation that provide suitable habitat for breeding birds. The former industrial sites associated with the south side of Lake Lothing provide excellent foraging and nesting habitat for black redstarts. Dedicated surveys for this species were undertaken in 2017 and this species was not found to be breeding within the survey area. Peregrine falcons are known to have nested on the grain silo building to the north of Lake Lothing and peregrine falcons sightings have been confirmed by WSP in 2017. Peregrines are protected under Schedule 1 of the Wildlife and Countryside Act 1981.</p> <p>Twenty five species were recorded inhabiting the Lake Lothing foreshores during winter. The majority of the survey area is comprised of open water, with large proportions of the banks being modified, with wooden or concrete clad vertical faces. A small area (Jeld Wen) is more natural, with areas of sand, gravel and mud bordering the lake. Please refer to Appendix 11D for a report on the wintering bird survey and the location of surveys to date is shown in Figure 11.5.</p> <p>Overall the area is considered to be of local value to wintering birds due to the small number of birds using it, with the area predominantly providing a feeding area for gulls with occasional use by a small number of waders.</p>
Badgers	<p>No field signs of badger <i>Meles meles</i> were found during the surveys. Suitable habitat is available for this species adjacent to the railway line, however, there is little connectivity to the wider area and it is considered unlikely that this species is present.</p>
Otters and Water Voles	<p>Lake Lothing provides low quality habitat for otters and water voles. No evidence of these species was found during the surveys, and it is therefore unlikely that these species could be affected by the proposed scheme.</p>
Fish	<p>Fish trawl surveys are to be undertaken as part of the proposed benthic ecology survey and a proposed methodology is included in Appendix 11G.</p>
Other Species	<p>There are suitable habitats within the main study area that may support species that are recognised as UK and Suffolk Priority Species (also known as Biodiversity Action Plan (BAP) species). These include hedgehog <i>Erinaceus europaeus</i>, as well as additional invertebrate and fish species.</p>

11.5 Predicted Impacts and mitigation

Statutory Designated and Non-Statutory Protected Sites

- 11.5.1 A screening study, or threshold assessment, for Habitats Regulations Assessment for the Internationally Designated sites identified in Section 11.4.4 is presented in Appendix 11E. This concludes that there are no likely significant effects as a result of the proposed scheme.
- 11.5.2 The assessment to date at this PEIR stage upon SSSIs, LNRs and CWS's has identified, that as no land take from these sites is required for the proposed scheme, and as no species of concern that use these sites will be adversely affected, there will be a neutral impact during both the construction and operational phase.
- 11.5.3 However, the effects of a change in the sediment transport, and the movement of potentially contaminated materials could adversely affect these sites and this will be assessed in the ES following sediment sampling and modelling as described in Chapter 17.
- 11.5.4 Please refer to Section 8.5.8 where construction dust emissions are considered with regard to the CWS's.

Habitats

- 11.5.5 The site is largely urban, interspersed with areas of improved grassland, scattered trees, scrub and standing water. These habitats are of low biodiversity value and are not a constraint to the scheme.
- 11.5.6 A benthic ecology survey is proposed to be undertaken later in 2017. This will confirm the value of that habitat and hence an assessment of whether significant effects are likely as a result of the proposed scheme can be included within the ES. A methodology for this is included in Appendix 11G.

Species

- 11.5.7 The predicted impacts upon protected species likely to be affected by the proposed scheme is shown below in Table 11-3.
- 11.5.8 Likely sources of impacts upon these species could arise from:
- the loss of suitable habitats during both construction and operation;
 - disturbance during construction in the form of light, dust or noise;
 - discharge of pollutants into watercourses;
 - mobilisation of contaminated materials; and
 - permanent or temporary severance of a route travelled by protected species.
- 11.5.9 Mitigation measures within Table 11-3 will be included within the interim CoCP that will accompany the ES and will be secured through the full CoCP. Table 11-3 also identifies opportunities for enhancements and the opportunity for these will be considered following consultation and will be presented within the ES.

Table 11-3 – Impacts upon protected species

Species	Recommended Mitigation & Enhancements	Impacts after Mitigation & Enhancements
Invertebrates	Invertebrate surveys are being undertaken during Summer 2017 and have not been completed at the time of this report. Mitigation and enhancement will be assessed after these surveys.	Unknown
Reptiles	<p>No evidence of large populations of reptiles have been recorded. During construction it is possible, though unlikely, that individual animals may be present in these isolated areas of suitable habitat. Precautionary measures are recommended as follows to ensure that individual animals are not affected during the works.</p> <ul style="list-style-type: none"> • Reptiles should be excluded from the proposed works area through habitat manipulation and natural refugia removal. • Habitat manipulation should involve strimming the vegetation within the works area prior to commencement of works to reduce the vegetation to a sward height that would encourage reptiles to move offsite and into adjacent areas. This should be undertaken when reptiles are active, i.e. between mid-April to mid-October when the temperature is at least 12°C. • The strimming should cut vegetation to a height of approximately 150mm to avoid reptiles present and should be completed in phases. All clearance works should be carried out using hand tools. <p>Common lizards will be targeted for enhancements as part of the proposed scheme detailed design. This could be through the creation of suitable grassland habitat on land adjoining the railway land to the north of the proposed scheme.</p>	Permanent Positive at the Local scale should enhancement opportunities be available.
Bats	<p>At this PEIR stage, it can be concluded that there would be no significant effects upon roosting bats based upon the structures that have been assessed to date. However, with further emergence and activity surveys to be undertaken in summer 2017 it is not possible to finalise the nature of any effects upon bats. Mitigation and enhancement measures will be informed as appropriate by the results of these surveys and presented in the ES.</p> <p>Pre-construction surveys will be undertaken on any building with the potential for roosting bats that could be disturbed during construction to ascertain whether they have colonised since the surveys that have informed this PEIR. The need for these surveys will be included within the interim CoCP and secured through the full CoCP.</p>	Unknown

Species	Recommended Mitigation & Enhancements	Impacts after Mitigation & Enhancements
Breeding Birds	<p>In order to minimise the risk of disturbing breeding birds, the removal of woody vegetation should ideally be undertaken outside of the breeding season (typical breeding bird season is March to July inclusive). If tree and vegetation removal has to take place during this period, the vegetation should be checked prior to removal for the presence of nests by an appropriately experienced ecologist. If nests that are in use are present, it may be necessary to delay work in immediate proximity the nest until the young have fledged.</p> <p>Black redstart surveys were undertaken in Spring 2017. This species was not found to be breeding within the survey area, but evidence, in the form of mimic calls from other species, from the survey suggested that the species is present within the wider area.</p> <p>Swifts and black redstarts are species for which enhancement may be possible, subject to further design work</p>	Permanent Positive at the Local scale should enhancement opportunities be available.
Peregrine	<p>Peregrines are known to nest close to the proposed works and this is anecdotally known to be on the opposite side of the grain silo to the proposed scheme. However, Peregrines are known to alter their nest locations and it is possible that, come construction, the nest could have moved to the closest side of the grain silo to the proposed scheme and therefore there may be a greater noise disturbance from the construction than otherwise.</p> <p>The extent to which peregrines are sensitive to noise disturbance, however, is unlikely to be a concern given their nesting location adjacent to the port operations which are inherently noisy themselves. Impacts upon peregrines are therefore more likely should there be a disruption to their food source (predominantly pigeons, but also other birds including Kittiwakes, of which there is a population at Outer Lowestoft Harbour). The proposed scheme is unlikely to affect the population of these prey species due to the very small amount of land take of the proposed scheme relative to the wider suitable habitat that is present.</p>	Neutral
Wintering Birds	The proposed scheme is likely to be a source of additional noise and visual disturbance to wintering birds. This will only be temporary, however, within an area already subject to high levels of disturbance. There will be land take of both terrestrial and riparian habitats, but the habitats were found to support low levels of wintering bird activity, with large areas of similar habitat which will remain unaffected by the proposals.	Neutral
Hedgehogs	The habitats within the site, and the surrounding residential gardens, are suitable to support hedgehogs. It is recommended that a watching brief is maintained during the works to protect individual hedgehogs that may be present.	Neutral
Eels	The habitats within Lake Lothing provide suitable habitat for eels. Consultation will be undertaken to gather baseline information in 2017.	Unknown
Fish	Fish trawl surveys are scheduled to take place in 2017. The effect of the proposed scheme upon fish passage will be presented in the ES and a proposed survey methodology is included in Appendix 11G.	Unknown
Marine mammals	The habitats within Lake Lothing provide some suitable habitat for marine mammals. Consultation will be undertaken to gather baseline information in 2017.	Unknown

11.6 Conclusions and Effects

- 11.6.1 No habitats of ecological importance or with legal protection have been identified within the Main Study Area., although as stated in 11.5.6, a benthic ecology survey is still to be undertaken.
- 11.6.2 A screening, or threshold assessment, for Habitats Regulation Assessment has been undertaken (Appendix 11E) and this has concluded that no significant effects are likely as a result of the proposed scheme.
- 11.6.3 An assessment of the effects upon SSSIs, LNRs and CWSs will be provided in the ES when sediment modelling within Lake Lothing has been undertaken.
- 11.6.4 At this current stage of assessment, there is insufficient information available to assess the impacts upon several protected species, as identified in Table 11-3 with an unknown impact.
- 11.6.5 No wintering birds were identified that are likely to be significantly affected by the proposed scheme. The breeding bird surveys established an assemblage in line with what would be expected within an urban-industrial location and no significant negative effects are expected.
- 11.6.6 No reptiles have been recorded on the south side of Lake Lothing, however a small population has been recorded along the railway line to the north and further surveys are scheduled in 2017 to assess impacts upon this protected species. However, the assessment undertaken with the survey data collected to date has not identified any significant effects upon reptiles.

11.7 Assessments still to be undertaken

- 11.7.1 Surveys for the following species and habitats are ongoing and will be presented within the ES along with conclusions on the nature of any significant effect upon them:
- Additional reptiles;
 - Additional bats (emergence surveys and transects);
 - Benthic ecology;
 - Fish trawls; and
 - Invertebrates.

12 Geology, Soils and Contamination

12.1 Scope of the Assessments

Introduction

- 12.1.1 This chapter describes the preliminary assessment of the likely significant effects of the proposed scheme on geology, soils and contamination during the construction and operational phases of the scheme. It is supported by Appendix G within Appendix 7A, Appendix 12A and Figure 12.1.
- 12.1.2 The assessment of this topic area considers potential impacts relating to the following aspects:
- The potential for disturbance of existing contaminated land (including Lake bed sediments);
 - the potential that construction could establish pathways between pollutants and receptors;
 - Effects on users/adjacent users of the proposed scheme;
 - Effects on buried infrastructure (including buried services and foundations);
 - Effects on controlled waters (from the mobilisation of contaminants). The water environment is specifically dealt with in Chapter 17.
- 12.1.3 The impact on ecological receptors are assessed in Chapter 11 and sediment modelling is addressed in Chapter 17. The minor comments received through scoping (see Appendix 7B) have been addressed in this chapter.

Study Area

- 12.1.4 The initial study area for which the Desk Study Report was prepared comprised a larger area than is presently being consulted upon due to the uncertainty at the time (September 2016) as to the amount of land that would be necessary to build the proposed scheme. The decision was taken at that time to assess a wider area in order to ensure all possible constraints and issues in relation to geology, soils and contamination were investigated and assessed.
- 12.1.5 The initial study area covers an area of approximately 21ha, centred at National Grid Reference 653884, 292755 and this is shown in Appendix 7A (Appendix G).
- 12.1.6 The study area for this PEIR is the proposed scheme boundary (Figure 6.1).

Limitations

- 12.1.7 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment processes.
- 12.1.8 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential impacts as a result of the proposed scheme on individual sensitive receptors will be undertaken at subsequent stages to inform the ES.
- 12.1.9 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

12.2 Directives, Regulations, and Relevant Policy

12.2.1 The assessment has been undertaken in accordance with and in reference to legislation specific to geology, hydrogeology and human health as follows:

National Legislation

- The Environmental Protection Act 1990,
- Water Resources Act 2003,
- Water Act 2003.

National Policy

- National Planning Policy Framework 2012; and
- National Policy Statement for National Networks 2014.

12.2.2 Further information on these is provided in Table 12-1 below:

Table 12-1 – Relevant legislation to the assessment of Geology, Soils and Contamination

Legislation	Summary
The Environmental Protection Act 1990	<p>The Environmental Protection Act 1990 defines, within England, Wales and Scotland, the fundamental structure and authority for waste management and control of emissions into the environment. The Act was intended to strengthen pollution controls and support enforcement with heavier penalties.</p> <p>Part 2A of the Environmental Protection Act 1990 was inserted into that Act by section 57 of the Environment Act 1995 and contains a regulatory regime for the identification and remediation of contaminated land. In addition to the requirements contained in the primary legislation, operation of the regime is subject to regulations and statutory guidance.</p> <p>The main objective underlying the introduction of the Part 2A contaminated land regime was to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment, assessed in the context of the current use and circumstances of the land.</p> <p>It provides a means of identifying and remediating land that poses a significant risk to health or environment, where there is no alternative solution. It also works alongside planning rules to help ensure that this land is made suitable for use following development.</p> <p>Development of land will have to take into account Part 2A because a change in the use of the land may bring the development inside the statutory definition of contaminated land by creating a pollutant linkage.</p>
Water Resources Act 2003	<p>The Water Resources Act 1991 replaced the corresponding sections of the Water Act 1989. The Act sets out the responsibilities of the Environment Agency in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The Act regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwaters. To prevent pollution of controlled waters, planning policies and decisions should ensure that new development is appropriate for its location.</p> <p>The risks at site need to be adequately characterised.</p>
Water Act 2003	<p>Under the Water Act it is an offence to cause or knowingly permit a discharge of poisonous, noxious or polluting matter into any Controlled Waters without the proper authority.</p>

Legislation	Summary
National Planning Policy Framework 2012	<p>NPPF (paragraphs 120-122) provides guidance on land contamination issues. These include local policies and decisions that ensure development sites are suitable for use, taking account of ground conditions and pollution arising from previous uses, as well as any proposals for land remediation.</p> <p>Paragraph 120 of the NPPF states that:</p> <ul style="list-style-type: none"> • To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner. • To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. • The risks at site need to be adequately characterised.
National Policy Statement for National Networks 2014	<p>NPS NN provides some guidance on assessing geology, soils and contamination in relation to biodiversity and ecological conservation, coastal change, noise and vibration, water quality and resources, land use and sets out how the impacts should be considered.</p>

12.3 Methods of Assessment

- 12.3.1 An Environmental Desk Based Study (Appendix 12A) has been prepared, using information from historical Ordnance Survey maps, environmental data reports, previous ground investigation and remediation reports together with published and internet based information sources.
- 12.3.2 An understanding of the likely existing environmental setting in terms of geology, soils and contamination has been established with reference to the following sources of information:
- British Geological Survey, www.bgs.ac.uk;
 - Environment Agency; <https://www.gov.uk/government/organisations/environment-agency>;
 - Historical Ordnance Survey maps and environmental data reports obtained from GroundSure;
 - Environmental Review and Desk Study Report, reference 13578DS prepared by RSA Geotechnics Ltd dated June 2013;
 - Interpretative Report, Ground Investigation Report Number 13578GI prepared by RSA Geotechnical Ltd dated July 2013;
 - Phase III Remediation Method Statement, reference NG13/015/RMC prepared by JPC Environmental Services dated October 2013; and
 - Phase IV Environmental Remediation and Validation Report, reference NG13/015/RMC/v1.1, prepared by JPC Environmental Services dated April 2015.

- 12.3.3 The assessment will be based upon the guidance presented in DMRB Volume 11 Section 3 Part 11 Geology and Soils²⁹ and be supplemented by the assessment procedures contained within BS10175:2011³⁰ and CLR11³¹.
- 12.3.4 Following comments from the Environment Agency that were provided along with the Scoping Report (Appendix 7A), the Desk Study Report has been updated and version B is presented in Appendix 12A. As the appendices to the Desk Study Report have not changed, these have not been appended again in Appendix 12A and can be found as an appendix to the Scoping Report (Appendix 7A).

Ground Investigation

- 12.3.5 A ground investigation commenced in late July 2017 and is expected to comprise:
- 32 onshore cable percussion / rotary boreholes;
 - 10 offshore cable percussion / rotary boreholes;
 - 27 machine excavated trial pits;
 - Soil and groundwater sampling and chemical testing;
 - Gas and groundwater monitoring wells constructed in selected boreholes; and
 - Gas and groundwater monitoring.
- 12.3.6 The works proposed above will be reviewed by the site team as the investigation progresses and scope changes will be implemented if required depending upon the ground conditions encountered during the works.
- 12.3.7 An interpretative report will be prepared that will include a risk assessment to human health and controlled waters undertaken in accordance with:-
- CLR and SR (SC050021 series) (DEFRA) guidance as well as CL:AIRE guidance on Comparing Soil Contamination Data with a Critical Concentration, May 2008; and
 - Environment Agency Remedial Targets Methodology, Hydrogeological Risk Assessment for Land Contamination, 2006.
- 12.3.8 These two risk assessments will assess the potential contaminant linkages identified in the desk study report (Appendix 12A) and will allow the development of an updated site conceptual model to clarify potential source-pathway-receptor linkages, and assist with the assessment of potential impacts on human health and controlled waters.
- 12.3.9 Specific consultation with the Environment Agency and Environmental Health Officers (EHOs) will be undertaken to identify any potentially contaminated sites.
- 12.3.10 In terms of geological and geomorphological resources as well as contaminated land, DMRB does not provide any specific methods of assessment or scales of measurement for either the value / sensitivity of the receptor or the magnitude of the impact. Assessment will therefore be based on professional judgement, using a phased approach, taking into account the assessment procedures

²⁹ The Highways Agency et al, (1993), Design Manual for Roads and Bridges, Volume 11, Section 3, Part 11, Geology and Soils.

³⁰ British Standards Institution (2011). BS 10175:2011 Code of Practice for the Investigation of Contaminated Land.

³¹ The Environment Agency (2004). Model Procedures for the Management of Land Contamination. Contaminated Land Report 11.

detailed in CLR11 to inform a quantitative risk assessment using the source-pathway-receptor protocol.

12.4 Baseline Environment

Designated Sites

- 12.4.1 No geological designated sites exist within 500m of the proposed scheme.

Bedrock Geology

- 12.4.2 As indicated on the British Geological Survey (BGS) website³² the bedrock geology across the study area comprises the Crag Group. This is a sedimentary green to orange sandstone containing haematite. In the lower deposits, the material predominantly comprises flint gravel.

Superficial Geology

- 12.4.3 The BGS website indicates that the edges of the site is underlain by sand of the Happisburgh Glacigenic Formation while the central parts of the site immediately adjacent to the watercourse are underlain by alluvium deposits comprising clay, silt, sand and gravel.

Soils and Sediment

- 12.4.4 The nature of onsite soils and sediments is undetermined. A ground investigation will be undertaken to characterise these. The Soilscales website³³ indicates the soils at the site comprise the following: fen peat soils, freely draining slightly acidic sandy soils and freely draining slightly acidic loamy soils. However, due to previous development across the site, it is unlikely that significant amounts of naturally occurring soils are present and made ground is more likely to be prevalent.

Potentially Contaminated Sites

- 12.4.5 The Environmental Desk Study presented in Appendix 12A includes a review of information from a GroundSure report. This records that no locations within the study area are determined as contaminated land under Part 2A legislation, but does record a number of historical ground workings, as well as industrial uses; all of which may have introduced contaminated material onto site, including ponds, unspecified pits, lake, unspecified wharf, quay and a refuse heap, rail, ship building and an ice works.
- 12.4.6 There are records relating to an historic Environment Agency landfill within the south east corner of the study area as shown on Figure 12.1. GroundSure does not provide any further information on the waste types accepted or licence numbers. In addition, two refuse tips (marked on 1963 historic mapping and recorded by GroundSure (see Appendix 7A) as Local Authority Landfills) are also recorded at this location within the study area but not marked on Figure 12.1.

Existing Ground Investigation / Remediation Information

- 12.4.7 Ground investigation and remediation verification has been undertaken within the study area on the site of the Council Offices, Canning Road (south west corner of the site) by RSA Geotechnics Ltd and JPC Environmental Services. Details are presented in the Environmental Desk Study included in Appendix 12A. The ground investigation undertaken by RSA Geotechnics Ltd identified the presence of elevated polyaromatic hydrocarbons, Total Petroleum Hydrocarbons (TPH), Asbestos and Lead

³² British Geological Survey [online]. Available from: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html> [Accessed 12 December 2016].

³³ Soilscales. Available from: <http://landis.org.uk>

within soils which posed a potential risk to human health. It was concluded that there was negligible risk to controlled waters and to the site from ground gas. No ground investigation information has been made available for elsewhere on the site.

- 12.4.8 Remedial works comprising clean cover capping of landscaping areas, removal of all underground fuel storage tanks, and removal of asbestos containing material (ACM) were undertaken.
- 12.4.9 The site currently occupied by the Register Office on Canning Road, was part of the same site as the Council Offices but was not included in previous ground investigation or remediation works. It is likely that similar contamination will exist on this site as was found on the site of the Council offices pre-remediation.

Proposed Ground Investigation

- 12.4.10 As detailed in Section 12.3 above, a ground investigation will be undertaken and the subsequent Contaminated Land Ground Investigation Report will include human health and controlled waters risk assessments, gas risk assessments and waste classification assessments to inform the need for remedial measures.

12.5 Predicted Impacts

Construction Impacts

- 12.5.1 This section assesses the potential effects, using the information that is available at the PEIR stage, of the construction phase on the receptors identified in the Environmental Desk Study (Appendix 12A) and on the underlying and surrounding geology and soils. Construction work is likely to cause disturbance to the geology and soils and this includes potentially contaminated ground which could then impact upon identified receptors.

Geology and Soils

- 12.5.2 Contamination is anticipated to be site wide and present as discontinuous pockets associated with the differing historic site uses. During construction, contaminants could be mobilised resulting in cross contamination of uncontaminated ground or controlled waters. Controlled waters are discussed in Chapter 17.

Water Environment

- 12.5.3 Impacts to the water environment are discussed in detail in Chapter 17. Ground investigations at design stage will include chemical sampling and testing of both silts within Lake Lothing and soils / water within the surrounding sites and the reporting aspect will include assessment of the potential risks to the water environment from soil and water based contaminants.

Site Users and Adjacent Site Users including Construction Workers

- 12.5.4 Site users, adjacent site users and construction workers could be impacted during construction through direct contact, ingestion and inhalation of contaminated soils and possibly also contaminated ground water.

On Site Infrastructure

- 12.5.5 The works will include the construction of below ground structures that will interact with the geology and soils and potentially contaminated ground which has the potential to impact the integrity of buried structures.

Operational Impacts

Geology and Soils

- 12.5.6 Once the scheme has been constructed, all necessary remediation will have been undertaken and given the urban environment surrounding the site, geology and soils are not expected to be impacted by the operational highway.

Water Environment

- 12.5.7 Impacts to the water environment are discussed in detail in Chapter 17.
- 12.5.8 Remedial mitigation measures will have been completed during the construction phase. Therefore no additional mitigation measures would be required as part of the operational phase of the development.

Site Users and Adjacent Site Users including Construction Workers

- 12.5.9 In areas such as landscaping where human could interact with the geology and soils, operational impacts could arise through direct contact, ingestion or inhalation of contaminated soils.

On Site Infrastructure

- 12.5.10 Onsite infrastructure could be impacted through direct contact with geology, soils and contamination and onsite infrastructure could also impact geology and soils through the creation of new pathways for migration of contamination.

12.6 Proposed Mitigation

Construction Impacts

- 12.6.1 This section summarises the proposed mitigation for the above predicted impacts, using the information that is available at the PEIR stage.
- 12.6.2 The proposed scheme will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the full CoCP. An interim CoCP will be prepared for submission with the ES and subsequently a full CoCP will be prepared by the Contractor.

Geology and Soils

- 12.6.3 Good working practices and housekeeping during construction such as sealing or covering stockpiles of contaminated soils and treating water removed from excavations prior to discharge are considered likely to reduce the risks.
- 12.6.4 A piling risk assessment will be prepared once the findings of the ground investigation are known and will assess the potential risks to the site and surrounding geology and soils from piling activities during construction.
- 12.6.5 Controlled waters are further discussed in Chapter 17.

Water Environment

- 12.6.6 Where contaminated soils / waters are identified as posing unacceptable risks to controlled waters, consideration will be given to remediation in those areas to minimise the risks.
- 12.6.7 As indicated in 12.6.2 above, the proposed scheme will adhere to pollution prevention guidance and best practice during the construction works which will be incorporated into and managed via the full CoCP. An interim CoCP will be prepared for submission with the ES and subsequently a full CoCP will be prepared by the Contractor.

- 12.6.8 Silt pollution caused by working within Lake Lothing will be minimised by keeping water out of the works area using appropriate isolation techniques, such as coffer dams, pile jackets, by-pass channels, silt curtains or the use of special excavation plant.
- 12.6.9 Water removed from any excavations will be disposed of in accordance with Environment Agency requirements.
- 12.6.10 During construction, any soil stockpiles will be located away from Lake Lothing and will be sealed and if necessary covered to minimise runoff during heavy rainfall.
- 12.6.11 A piling risk assessment will be prepared once the findings of the ground investigation are known and will assess the potential risks to the water environment from piling activities during construction.

Site Users and Adjacent Site Users including Construction Workers

- 12.6.12 Risks can be mitigated through the CDM Regulations and development of method statements and risk assessments for the various construction activities and use of good construction practices which will be included within the interim CoCP and would include;-
- Use of appropriate PPE for construction workers;
 - Good hygiene practice including wearing gloves and washing hands before eating, drinking or smoking when working with potentially contaminated soils or water; and
 - Damping down during periods of dry weather to reduce dust generation.

On Site Infrastructure

- 12.6.13 Assessment of the ground conditions during the ground investigation and at detailed design stage together with the implementation of appropriate remediation measures and design specifications such as clean inert trench fill and sulphate resistant concrete are likely to minimise the risk to onsite infrastructure.

Operational Impacts

Water Environment

- 12.6.14 Mitigation for the water environment is discussed in detail in Chapter 17.
- 12.6.15 A suitable drainage system will be incorporated into the proposed scheme to mitigate to acceptable levels the risk of contamination that could arise from traffic emissions entering the water environment.

Site Users and Adjacent Site Users including Construction Workers

- 12.6.16 Appropriate remedial measures, informed from the results of the GI, will be undertaken where required in areas such as landscaping where humans could interact with the geology and soils. The remedial measures will be designed to break the contaminant linkage by treating or removing the contamination source or pathway thereby reducing the potential risks to receptors to appropriate levels.

On Site Infrastructure

- 12.6.17 The findings of the ground investigation will inform detailed structural design and structures such as concrete foundations will be designed accordingly so that onsite infrastructure will not be impacted by the geology and soils during the operational phase. Conversely, the findings of the ground investigation will also inform the detailed design of structures to ensure they do not impact geology and soils such as introducing new contamination pathways through piled foundations.

12.7 Conclusions and Effects

- 12.7.1 A preliminary assessment has been undertaken of the impact of the scheme on the geology and soils, including potentially contaminated soils and the subsequent impacts on human health, controlled waters and the environment.
- 12.7.2 At the submission of this PEIR only desk based assessments have been undertaken which have identified the potential for contamination to be present across the site. This contamination could be mobilised during and after construction, leading to potentially unacceptable impacts on geology and soils, controlled waters, human health and the environment.
- 12.7.3 Intrusive ground investigation commenced in late July 2017 and will gather information on the ground conditions and will allow a qualitative assessment of the potential risks and likely remedial measures to be undertaken.
- 12.7.4 Impacts upon human receptors are considered likely during the construction phase without appropriate remediation and management of potential risks through the CDM Regulations, the development of Method Statements and Risk Assessments and the use of good construction practices.
- 12.7.5 On completion of the ground investigation works and subsequent assessment of the potential contamination sources, the potential construction and operational impacts will be further assessed and appropriate mitigation developed to minimise the potential impacts although with the mitigation measures outlined above, it is not considered at this time that residual significant effects upon geology, soils and contamination will result.

12.8 Assessments still to be completed

Ground Investigation

- 12.8.1 A ground investigation along the proposed scheme corridor commenced in July 2017 with the purpose of further informing the design of the proposed scheme and to provide further information that will inform this geology, soils and contamination assessment.
- 12.8.2 The ground investigation works will include chemical testing of soil and groundwater samples and a subsequent interpretative report will include human health and controlled waters risk assessments, culminating in a revision of the preliminary conceptual site model presented in the Environmental Desk Study report (Appendix 12A) and an assessment of the potential contaminant linkages that can be discounted and those that are considered to pose an unacceptable risk.
- 12.8.3 The findings of these studies will be provided in a stand-alone contaminated land report and a piling risk assessment.
- 12.8.4 The ES will summarise the assessments within the Interpretative Report including the areas where remediation is necessary to minimise potential risks.

Sediment Sampling

- 12.8.5 Within Lake Lothing itself, sediment sampling and chemical testing is proposed to enhance the knowledge and understanding of likely environmental effects and potential construction phase cost implications.
- 12.8.6 For outline design and to improve cost certainty, information on the contamination status of the sediments is required to assess the potential impact on controlled waters if sediment is mobilised and for assessing potential disposal routes should sediments require excavation during construction.

12.8.7 The movement of potentially contaminated sediment is of potential concern to those seeking to understand the risk of disturbing contaminated sediment and it being transported elsewhere; either to ecologically designated sites or to locations where it could affect ongoing dredging operations within Lake Lothing particularly with regard to off shore disposal of dredgings.

13 Noise and Vibration

13.1 Scope of the Assessments

Introduction

- 13.1.1 This chapter describes the assessment of the likely significant effects of the proposed scheme during the construction phase of the scheme. The assessment of this topic area considers potential impacts relating to noise and vibration on Noise Sensitive Receptors (NSR) during construction.
- 13.1.2 An assessment of the operation phase of the scheme will be presented in the ES.
- 13.1.3 The operation phase assessment will be based on the detailed assessment methodology of the Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, HD 213/11 Revision 1 (DMRB HD213/11).
- 13.1.4 At the PEIR stage, where the level of information for a detailed assessment of construction noise is not yet available, the assessment of construction related noise associated with working areas has involved:
- Identification of working areas;
 - Description of likely construction activities and associated equipment;
 - Identification of NSRs close to the working areas boundary;
 - Calculation of noise levels at sample NSRs associated with construction activities;
 - Evaluation of the significance of noise impact at the sample NSRs; and
 - Identification of mitigation as appropriate.
- 13.1.5 At the PEIR stage, where the level of information for a detailed assessment of construction vibration is not yet available, the assessment of construction related vibration associated with working areas has involved:
- Identification of areas where piling, ground stabilisation, demolition, blasting or extended periods of breaking out of hard ground may be required;
 - Identification of the closest NSRs to the identified areas;
 - Evaluation of the significance of vibration impact at the closest NSRs; and
 - Identification of mitigation as appropriate.

Study Area

Construction Phase Noise and Vibration

- 13.1.6 The assessment of construction noise and vibration is based upon calculating construction noise levels at sample NSRs. The NSRs directly correlate with the noise monitoring locations, and shown in Figure 13.1. The sample NSRs are selected as they are the closest receptors to the proposed scheme boundary and representative of surrounding receptors.

Operation Phase Noise

- 13.1.7 The study area for the operational noise assessment been determined using the guidance contained within paragraph A1.11 of DMRB HD213/11.
- 13.1.8 The DMRB study area requires calculations of noise impacts within 600 m of both the proposed scheme, and within 600 m of any other affected routes within 1 km. This includes all new, improved or bypassed routes. This extent is referred to as the 'calculation area'.
- 13.1.9 The DMRB also requires consideration beyond the calculation area. The wider road network being identified as 50m either side of the carriageway of identified affected routes beyond 1 km of the scheme. The total extent of the calculation area plus the wider road network, is the study area for the operational phase assessment. The study area is shown in Figure 13.2 and is constrained by the traffic reliability area (TRA), as calculated from the traffic model (see Chapter 19).
- 13.1.10 Paragraph A1.11 of DMRB HD213/11 details the methodology by which the affected routes are identified. An affected route is one where it is predicted to experience a change in noise of more than 1 dB(A) in the short term (i.e. in the baseline year), or 3 dB(A) or more in the long term (i.e. in the future assessment year).
- 13.1.11 At this PEIR stage, a preliminary study area is presented in Figure 13.2. A full operational traffic assessment will be included within the Environmental Statement.
- 13.1.12 There are three Defra Noise Important Areas IAs within the operational phase noise study area (ref. 5003, 5004 and 11285) (See Figure 13.1)

Operation Phase Vibration

- 13.1.13 A vibration study area has been determined based on guidance contained within paragraph A1.35 of DMRB HD213/11.
- 13.1.14 Calculations of vibration nuisance will be completed for residential NSR within 40m of new or improved roads within the noise study area.

Limitations

- 13.1.15 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 13.1.16 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified NSRs will be undertaken at subsequent stages to inform the ES.
- 13.1.17 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

13.2 Directives, Statutes and Relevant Policy

- 13.2.1 This section provides an outline of statutes, guidance and policy considered relevant to the proposed scheme with respect to its noise and vibration impact.

The Control of Pollution Act 1975 (CoPA)

- 13.2.2 The CoPA provides legislation that Local Authorities can implement in order to control the noise from construction sites and prevent the occurrence of disturbance to surrounding residents (Section 60, Part III, Chapter 40 - Control of noise on construction sites).

13.2.3 Furthermore Section 61, Part III of Chapter 40 (prior consent for work on construction sites) provides a method by which a contractor can seek consent to undertake construction works in advance of their commencement.

Environmental Protection Act (EPA)

13.2.4 The Environmental Protection Act (EPA) (Section 79, Part III of Chapter 43, Statutory Nuisances and Inspections) contains a definition of what constitutes a "statutory nuisance" with regard to noise and places a duty on Local Authorities to detect any such nuisances within their area. Section 79 also considers best practicable means which is defined as steps "reasonably practical having regard, among other things, to local conditions and circumstances, to the current state of technical knowledge and to the financial implications".

13.2.5 Section 80, Part III of Chapter 43 of the EPA - "Summary proceedings for statutory nuisances" provides LAs with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

Noise Policy Statement for England, 2010

13.2.6 The Noise Policy Statement for England, 2010 (NPSE) contains three planning objectives to help achieve sustainable development:

- avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise;
- mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise;
- where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise.

13.2.7 The NPSE introduces the concept of LOAEL (Lowest Observed Adverse Effect Level) and SOAEL (Significant Observed Adverse Effect Level).

- LOAEL is the level above which adverse effects on health and quality of life can be detected; and
- SOAEL is the level above which significant adverse effects on health and quality of life occur.

13.2.8 The NPSE does not give values for LOAEL and SOAEL as "*It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations.*"

National Planning Policy Framework, 2012

13.2.9 Paragraph 123 of the National Planning Policy Framework, 2012 (NPPF) contains four aims relating to noise in order to help to achieve sustainable development:

- avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable


restrictions put on them because of changes in nearby land uses since they were established; and

- identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

Planning Practice Guidance: Noise

13.2.10 Planning Practice Guidance: Noise (PPG) contains advice on noise exposure hierarchy and advice on how LOAEL and SOAEL should be interpreted, this is summarised in Table 13-1.

Table 13-1: PPG Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action	Increasing noise level
	No Effect	No Observed Effect	No specific measures required	
	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required	
		Lowest Observed Adverse Effect Level		
	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum	
		Significant Observed Adverse Effect Level		
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid	
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent	

National Policy Statement for National Networks

- 13.2.11 The National Policy Statement for National Networks details, in terms of noise and vibration, the elements which should form part of the environmental statement.
- 13.2.12 The policy describes the decision making process and the requirement for mitigation with regard to the relevant sections of the Noise Policy Statement for England, NPPF and the Government's associated planning guidance on noise.

13.3 Methods of Assessment

Construction phase

- 13.3.1 An assessment of noise and vibration impacts due to construction works has been undertaken based on guidance detailed in British Standard (BS) 5228 Part 1: Noise and Part 2: Vibration:
- BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Part 1: Noise' (BS 5228-1); and
 - BS 5228-2:2009 'Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration' (BS 5228-2).
- 13.3.2 Part 1 of BS 5228 contains guidance on the prediction of noise levels from the operation of fixed and mobile noise sources found on construction and open sites. It provides source sound level data for various machinery and tasks associated with the construction phase of a site.
- 13.3.3 Example criteria are presented for the assessment of the significance of noise effects. Such criteria are concerned with fixed noise limits and ambient noise level changes.
- 13.3.4 With respect to fixed noise limits BS 5228-1 discusses those included within Advisory Leaflet 72: 1976: *Noise control on building sites*. These limits are presented according to the nature of the surrounding environment for a 12-hour working day. The presented limits are:
- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise; and
 - 75 dB(A) in urban areas near main roads and heavy industrial areas.
- 13.3.5 The standard goes on to provide methods for determining the significance of construction noise levels considering the change in the ambient noise level brought about by the construction work. Two example assessment methods are presented, these are the 'ABC method' and the '5 dB(A) Change Method'.
- 13.3.6 The ABC Method is based upon threshold noise levels defined by both time of day and existing ambient noise level. The method requires the ambient pre-construction noise level to be determined and rounded to the nearest 5 dB. This ambient noise level is then compared to the construction noise level. If the construction noise level exceeds the appropriate category value then a potential significant effect is indicated. An assessment shall consider the number of NSRs affected, duration and character of noise; in order to determine significance. The ABC method is presented in Table 13-2.

Table 13-2: BS 5228-1 Example Method 1 – The ABC Method

Assessment Category and Threshold Value Period	Threshold Value, in decibels (dB) ($L_{Aeq,T}$)		
	Category A ^{A)}	Category B ^{B)}	Category C ^{C)}
Night-time (23:00 - 07:00)	45	50	55
Evenings and Weekends ^{D)}	55	60	65
Daytime (07:00 - 19:00) and Saturdays (07:00 - 13:00)	65	70	75
<p>NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.</p> <p>NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3dB due to construction activity.</p> <p>NOTE 3 Applied to residential NSR only</p>			
<p>A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values</p> <p>B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values</p> <p>C) Category C: threshold values to use when ambient noise levels (when rounded to nearest 5 dB) are higher than Category B values.</p> <p>D) 19:00 - 23:00 weekdays, 13:00 - 23:00 Saturdays and 07:00 - 23:00 Sundays.</p>			

- 13.3.7 The '5 dB(A) Change' method is based upon the premise that a significant effect is deemed to occur if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more.
- 13.3.8 This method is subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$ from construction noise alone, for the daytime, evening and night-time periods respectively. The criteria further requires that, for a significant effect to occur, the total noise level must exceed the pre-construction ambient noise for a duration of one month or more, unless works of a shorter duration are likely to result in significant impacts.
- 13.3.9 Part 2 of BS 5228 gives recommendations for basic methods of vibration control relating to construction and open sites. The standard also describes the legislative background to vibration control and offers advice regarding the establishment of effective liaison between developers, site operators and local authorities.
- 13.3.10 The standard also contains guidance on measuring and assessing the effects of vibration. With regard to the assessment of significance of vibration relating to human response BS 5228-2 refers to BS 6472-1:2008 'Guide to evaluation of human exposure to vibration in buildings Vibration sources other than blasting' (BS 6472).
- 13.3.11 With respect to BS 6472's guidance on human response to vibration in buildings, BS 5228-2 notes that: "... Whilst the assessment of the response to vibration in BS 6472 is based on the Vibration Dose Value (VDV) and weighted acceleration, for construction it is considered more appropriate to provide guidance in terms of the Peak Particle Velocity (PPV), since this parameter is likely to be more routinely measured based upon the more usual concern over

potential building damage. Furthermore, since many of the empirical vibration predictors yield a result in terms of PPV, it is necessary to understand what the consequences might be of any predicted levels in terms of human perception and disturbance..."

13.3.12 BS 5228-2 presents the guidance on vibration levels and effects referenced to PPV criteria as reproduced below in Table 13-3.

Table 13-3: BS 5228-2 Guidance on Effects of Vibration Levels

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with the construction. At lower frequencies, people are less sensitive to vibration
0.3 mm/s	Vibration might be just perceptible in residential NSRs
1.0 mm/s	It is likely that vibration of this level in residential NSRs will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10.0 mm/s	Vibration is likely to be intolerable for any more than very brief exposure to this level

13.3.13 With regard to structural response to vibration, BS 5228-2 refers to the damage threshold criteria presented in the (now superseded) *BS 7385 - 'Evaluation and Measurement for Vibration in Buildings'. Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings* (BS 7385). However, BS 5228-2 does provide limits for transient vibration above which cosmetic damage could occur in terms of the component PPV, which are summarised in Table 13-4.

Table 13-4: Transient vibration guide values for cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
NOTE 1: Values referred to are at the base of the building.		
NOTE 2: At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

13.3.14 It should be noted that the values presented within the above table are applicable to cosmetic damage only. It is stated within BS 5228-2 that minor structural damage is possible at vibration magnitudes which are greater than twice those given in Table 13-4.

13.3.15 The assessment focuses on potential impacts associated with the following works that occur throughout construction:

- Site preparation and earthworks;
- Road pavement construction;
- Compound construction; and
- Bridge construction, including piling.

13.3.16 An assessment of construction phase traffic flows has been scoped out of this assessment following constructability advice from Kier Infrastructure (see Section 6.6) which identifies very low movements compared to existing traffic flows.

13.3.17 The assessment of potential construction phase impacts is used to define appropriate mitigation measures that will be implemented through a Code of Construction Practice (CoCP), which are commensurate to the scale and duration of the activities. If appropriate, the Contractor may request prior consent from WDC under Section 61 of the Control of Pollution Act 1974 (CoPA). This consent would include details of the works and the method; and proposed noise and vibration mitigation.

Operation Phase

13.3.18 An assessment of noise and vibration impacts due to the operational phase will be undertaken based on guidance detailed in DMRB 213/11.

13.3.19 The assessment will examine the noise and vibration impacts with and without the proposed scheme in place, referred to as the Do-Something and Do-Minimum scenarios respectively.

13.3.20 The assessment will consider impacts in the short and long term. The short term assessment is completed in the baseline year, this is the predicted opening year of the scheme, 2022. The assessment considers the long term, termed the future assessment year, and is the year between opening and the plus 15th year where the highest impact would occur, which is 2037.

13.3.21 Traffic noise predictions are made for NSRs within the calculation area for the following scenarios:

- Do-Minimum scenario in the baseline year;
- Do-Minimum scenario in the future assessment year;
- Do-Something scenario in the baseline year; and
- Do-Something scenario in the future assessment year.

13.3.22 The following scenario comparisons will be made:

- Do-Minimum scenario in the baseline year against Do-Minimum scenario in the future assessment year (long term Do-Minimum);
- Do-Minimum scenario in the baseline year against Do-Something scenario in the baseline year (short term scheme impacts);
- Do-Minimum scenario in the baseline year against Do-Something scenario in the future assessment year (long term scheme impacts).

13.3.23 Night time impacts will be assessed, these are considered in the long term only, for residential NSRs in the study area.

- 13.3.24 Noise nuisance impacts will be assessed for all residential NSR in the study area.
- 13.3.25 Vibration nuisance impacts will be assessed for all residential NSR within 40 m of new or improved roads.

Noise Sensitive Receptors

- 13.3.26 NSRs considered for this assessment of noise and vibration include, in line with BS 5228 and DMRB HD213/11, occupiers and users of residential dwellings, schools, churches, hospitals, children’s nurseries and care homes.
- 13.3.27 It is noted that there are some commercial properties are close to the proposed scheme that may be adversely affected due to noise during the construction phase.
- 13.3.28 Therefore, an evaluation of noise levels during construction at commercial properties close to the proposed scheme, including any sound reduction that can be anticipated from the fabric of their construction, will be provided within the ES.
- 13.3.29 The location of NSRs in the vicinity of the proposed scheme have been identified using Ordnance Survey (OS) AddressBase Premium data.
- 13.3.30 A classification of NSRs based on sensitivity to noise is given in Table 13-5 below. Based on BS 5228 and DMRB HD213/11, the assessment considers impacts at NSRs classified as having a high sensitivity.

Table 13-5 Classification of NSR sensitivity

Sensitivity	Description
High	Receptors sensitive to noise and vibration, including residential, schools (daytime), hospitals and places of worship
Medium	Receptors with moderate sensitivity to noise and vibration, hotels, including sports facilities, offices, cafes/restaurants
Low	Receptors not sensitive to noise, including industrial premises, transient receptors

Significance of effect

- 13.3.31 Based on guidance given in NPSE and NPPF, the rating of significance of effect applies the following levels:

- No Impact – No Observed Effect. Below this level noise cannot be heard;
- NOAEL – No Observed Adverse Effect Level. Below this level there is no detectable effect on health and quality of life;
- LOAEL – Lowest Observed Adverse Effect Level. Above this level adverse effects on health and quality of life can be detected; and
- SOAEL – Significant Observed Adverse Effect Level. Above this level significant adverse effects on health and quality of life occur.

- 13.3.32 For the purposes of the 2009 Regulations, a significant effect is defined as SOAEL in Table 13-10. However, LOAEL is also capable of having a significant effect on a receptor and as such where such an effect level is identified, further analysis as to whether the effect is actually significant will be undertaken.

Construction phase

13.3.33 Given the proximity of the proposed scheme and the closest NSRs to main roads, industrial areas, and railways lines, the predicted noise levels have been assessed against a noise threshold criterion of 75 dB $L_{Aeq,T}$ (façade level), applicable to the core working day. BS 5228-1 states this to be an appropriate limit for urban areas close to main road traffic sources, and is therefore considered to be appropriate for this assessment.

13.3.34 The significance of construction noise for NSRs is presented in Table 13-6. A 5 dB step has been used based on the guidance contained within BS 5228-1.

Table 13-6: Construction noise levels and significance

Construction Noise Level, $L_{Aeq,T}$ (dB)*	Effect Level
≤70 dB(A)	No Impact
70.1 dB(A) to 75 dB(A)	NOAEL
75.1 dB(A) to 80 dB(A)	LOAEL
≥80.1 dB(A)	SOAEL
* Façade level, week days (07:00hr - 19:00hr) and Saturdays (07:00hr - 13:00 hr)	

13.3.35 The significance of construction vibration for NSRs has been determined according to the scale presented in Table 13-3, which is based on the guidance contained within BS 5228-2 for human perception.

Table 13-7: Construction vibration levels and significance

Vibration Level (PPV)*	Effect Level
<0.3 mms^{-1}	No Impact
0.3 to 1.0 mms^{-1}	NOAEL
1.0 to 10.0 mms^{-1}	LOAEL
>10.0 mms^{-1}	SOAEL

Operation phase

13.3.36 The magnitude of noise impacts that are proposed for the ES are defined in line with DMRB HD213/11 and detailed in Table 13-8.

Table 13-8: Classification of magnitude of noise impacts

Short term noise change $L_{A10,18h}$ (dB)	Long term noise change $L_{A10,18h}$ (dB)	Magnitude of Impact
0.1 - 0.9	0.1 - 2.9	Negligible
1.0 - 2.9	3.0 - 4.9	Minor
3.0 - 4.9	5.0 - 9.9	Moderate
≥5.0	≥10.0	Major

13.3.37 The Government policy and guidance do not state values for the LOAEL and SOAEL, rather, it considers that they are different for different noise sources, for different receptors and at different times and should be defined on a strategic or project basis taking into account the specific features of that area, source or project.

13.3.38 To consider the impacts of road schemes in the context of the NPSE, it is necessary to define noise levels above which noise effects are regarded as significant.

13.3.39 Table 13-9 shows the proposed thresholds for the daytime and night-time. Both the $L_{A10,18h}$ façade noise level and $L_{Aeq,16h}$ free-field noise level are shown due to the different parameters used in different sources. Conversion from $L_{A10,18h}$ to $L_{Aeq,16h}$ uses the relationship as set out in TAG unit A3 ($L_{Aeq,16h} = L_{A10,18h} - 2$ dB) with a further subtraction of 2.5 dB for conversion from façade to free-field. Values of 67.5 dB $L_{A10,18h}$ would be rounded up to 68 dB $L_{A10,18h}$ for the purposes of the Noise Insulation Regulations and, hence, 67.5 dB is referenced below.

Table 13-9: Thresholds for consideration of operational traffic noise levels

Daytime threshold	Night-time threshold	Threshold Level
54.5 dB $L_{A10,18h}$ (façade) 50.0 dB $L_{Aeq,16h}$ (free-field)	40 dB $L_{night,outside}$ (free-field)	Lower Threshold
67.5 dB $L_{A10,18h}$ (façade) 63.0 dB $L_{Aeq,16h}$ (free-field)	55 dB $L_{night,outside}$ (free-field)	Upper Threshold
Source: Night-noise guidelines for Europe, WHO, 2009 for night-time values. Noise Insulation Regulations Relevant Noise Level for daytime Upper Threshold (assumed to represent the level below which reasonable internal noise levels can be achieved in living rooms with single glazed windows closed). Guidelines for community noise, WHO, 1999 for daytime Lower Threshold (from the 50 dB $L_{Aeq,16h,outdoors}$ for the onset of moderate community annoyance).		

13.3.40 When combined with the magnitude of noise changes which take into account the specific impact of the proposed scheme, the following operational significance criteria are adopted for this assessment, as shown below in Table 13-10. As acknowledged in the NPSE, there is further research needed to increase understanding of what is an adverse impact on health. Therefore the assessment does incorporate professional judgement in the application of LOAEL and SOAEL figures.

Table 13-10: Significance criteria combining magnitude of change and noise threshold levels

Magnitude of Impact	< Lower Threshold	> Lower Threshold and < Upper Threshold	> Upper Threshold
Negligible	Not significant	Not significant	Not significant
Minor	Not significant	Not significant	SOAEL
Moderate	Not significant	LOAEL	SOAEL
Major	Not significant	LOAEL	SOAEL

- 13.3.41 Ground borne vibration is not anticipated to be an issue associated with the proposed scheme, as the new road surface will be smooth and ground borne vibrations from traffic are only generally perceptible where the road surface is uneven.
- 13.3.42 The DMRB HD213/11 assessment method does not predict levels, rather it calculates the change in vibration nuisance and therefore significance criteria have not been defined for operational vibration levels.

13.4 Baseline Environment

Existing Noise Climate

- 13.4.1 Noise monitoring locations were selected to be representative of sensitive receptors located close to the development. The survey positions and measurement timings were agreed with SCC/WDC. The survey dates were chosen to be representative of normal conditions, local road works and bascule bridge maintenance activities were avoided.
- 13.4.2 Attended noise measurements were made at five selected locations around the site to establish the existing background noise levels during the week and weekend on the 28th June and 1st July 2017. Further, unattended noise measurements were carried out at one location between 28th June to 2nd July 2017 to collect continuous week days and weekend noise levels. These locations are shown in Figure 13.1.
- 13.4.3 Summaries of the day, evening and night-time noise levels are provided in Table 13-11 to Table 13-22 for the attended and unattended noise measurements.

Table 13-11: Receptor A, weekday measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	28/06/2017	10:00 - 13:00	3 x 15mins	68.3	76.5	57.1	71.7
Evening	27/06/2017	20:19 - 20:33	1 x 15 mins	61.8	73.2	44.1	66.7
Night	28/06/2017	01:08 - 01:22	1 x 15 mins	51.5	76.9	33.8	48.7

Table 13-12: Receptor A, weekend measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	02/07/2017	10:30 - 13:30	3 x 15mins	67.8	88.4	55.4	70.7
Evening	02/07/2017	22:18 - 22:32	1 x 15 mins	58.4	78.5	41.2	59.9
Night	03/07/2017	01:49 - 02:03	1 x 15 mins	44.4	73.6	40.7	44.8

Table 13-13: Receptor B, weekday measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	27/06/2017	10:30 - 13:30	3 x 15mins	68.3	92.9	53.3	71.2
Evening	27/06/2017	20:41 - 20:55	1 x 15 mins	63.2	77.9	42.6	68.6
Night	28/06/2017	01:27 - 01:41	1 x 15 mins	44.1	74.2	34.9	44.8

Table 13-14: Receptor B, weekend measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	01/07/2017	11:40 - 14:40	3 x 15mins	65.6	81.8	52.8	69.5
Evening	01/07/2017	21:59 - 22:13	1 x 15 mins	59.4	80.2	43.1	62.7
Night	02/07/2017	01:32 - 01:46	1 x 15 mins	51.3	73.6	39.7	45.1

Table 13-15: Receptor C, weekday measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Evening	27/06/2017	19:00 - 23:00	4 hr	60.0	85.3	43.0	63.6
Night	27/06/2017	23:00 - 07:00	8 hr	57.7	81.3	42.2	55.3
Day	28/06/2017	07:00 - 19:00	12 hr	65.1	97.8	50.0	68.9
Evening	28/06/2017	19:00 - 23:00	4 hr	61.5	83.1	45.0	66.0
Night	28/06/2017	23:00 - 07:00	8 hr	56.3	85.2	38.8	54.2
Day	29/06/2017	07:00 - 19:00	12 hr	64.9	90.3	51.1	68.4
Evening	29/06/2017	19:00 - 23:00	4 hr	61.3	91.9	40.5	65.4
Night	29/06/2017	23:00 - 07:00	8 hr	55.6	81.3	34.1	54.1
Day	30/06/2017	07:00 - 19:00	12 hr	64.3	96.2	48.1	67.8
Evening	30/06/2017	19:00 - 23:00	4 hr	60.8	86.5	42.5	65.5
Night	30/06/2017	23:00 - 07:00	8 hr	56.4	82.7	38.0	56.9

Table 13-16: Receptor C, weekend measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	01/07/2017	07:00 - 19:00	12 hr	62.2	94.5	46.2	66.1
Evening	01/07/2017	19:00 - 23:00	4 hr	60.6	86.2	42.1	65.5
Night	01/07/2017	23:00 - 07:00	8 hr	55.8	82.5	37.1	55.9
Day	02/07/2017	07:00 - 19:00	12 hr	60.6	90.8	43.4	64.4
Evening	02/07/2017	19:00 - 23:00	4 hr	59.5	84.1	40.4	62.9
Night	02/07/2017	23:00 - 07:00	8 hr	54.6	81.2	38.0	52.7

Table 13-17: Receptor D, weekday measurements, Wednesday 27/06/17

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	27/07/2017	13:00 - 16:00	3 x 15mins	65.8	89.2	51.7	70.0
Evening	27/07/2017	21:43 - 21:58	1 x 15 mins	59.7	79.1	44.9	63.6
Night	28/07/2017	02:27 - 02:42	1 x 15 mins	48.1	75.2	43.3	49.3

Table 13-18: Receptor D, weekend measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	02/07/2017	14:30 - 16:30	3 x 15mins	62.7	82.0	46.3	67.7
Evening	02/07/2017	21:13 - 21:28	1 x 15 mins	60.2	84.5	43.5	62.8
Night	03/07/2017	02:34 - 02:49	1 x 15 mins	49.5	73.4	35.1	49.3

Table 13-19: Receptor E, weekday measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	28/07/2017	10:00 - 13:00	3 x 15mins	70.4	84.7	53.6	74.7
Evening	27/07/2017	21:00 - 21:15	1 x 15 mins	65.0	90.0	47.0	69.3
Night	28/07/2017	01:46 - 02:01	1 x 15 mins	47.0	75.7	36.6	42.6

Table 13-20: Receptor E, weekend measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	02/07/2017	11:15 - 14:15	3 x 15mins	67.4	92.4	54.1	71.0
Evening	02/07/2017	21:37 - 21:51	1 x 15 mins	63.2	78.9	47.2	67.3
Night	03/07/2017	01:14 - 01:28	1 x 15 mins	51.7	74.0	41.6	49.5

Table 13-21: Receptor F, weekday measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	27/06/2017	13:30 - 16:30	3 x 15mins	70.1	91.8	60.2	73.2
Evening	27/06/2017	21:22 - 21:36	1 x 15 mins	68.9	86.6	52.0	72.4
Night	28/06/2017	02:08 - 02:22	1 x 15 mins	64.1	86.6	45.5	58.8

Table 13-22: Receptor F, weekend measurements

Period	Date	Time of measurements	Duration	Noise level (dB)			
				L_{Aeq}	L_{AFmax}	L_{A90}	L_{A10}
Day	02/07/2017	14:00 - 17:00	3 x 15mins	71.0	101.4	55.9	73.2
Evening	02/07/2017	20:54 - 21:08	1 x 15 mins	66.7	87.9	47.0	70.8
Night	03/07/2017	02:15 - 02:29	1 x 15 mins	58.3	79.3	38.1	54.7

Defra Noise Important Areas

- 13.4.4 Defra Noise Important Areas (NIA) are locations where 1% of the population are affected by the highest noise levels from major roads according to the results of Defra's strategic noise maps.
- 13.4.5 There are three NIAs within the operational phase noise study area (ref. 5003, 5004 and 11285). They are located on Bridge Road and Normanston Drive to the west of the proposed scheme. The NIAs are all associated with traffic using the Mutford Lock crossing, and are shown in Figure 13.2.

13.5 Predicted Impacts

Construction Noise Propagation

- 13.5.1 BS 5228-1 contains guidance on the prediction of noise levels from the operation of fixed and mobile noise sources found on construction and open sites. Prediction is based on detailed information, including type and number of plant items, their location, and the length of time they are in operation and phasing. The precise construction techniques and programme to be used for the proposed still are still to be finalised at this PEIR stage, however, an estimate of the likely effects of noise from the main construction activities has been made based upon the constructability advice discussed in Section 6.6.
- 13.5.2 The main construction phases have been identified as follows:
- Site preparation and earthworks;
 - Road pavement construction;
 - Compound construction; and
 - Bridge construction, including piling.
- 13.5.3 The main construction activities are identified in section 6.6.
- 13.5.4 For construction noise, a worst case assumption is made that the plant would be situated at the centre of the closest working areas to the nearest NSRs. In reality, noise sources are likely to be spread more evenly across the construction sites resulting in lower noise levels than presented in this assessment.

Construction Programme

- 13.5.5 Subject to approval, it is anticipated that construction of the proposed scheme would commence in late 2019 and be completed in 2-3 years.

Appendix 13A details the assumed plant type, quantity, L_{Aeq} at 10 m and total sound power level for each construction phase. A summary of the combined sound power levels for each construction phase are given in

13.5.6 Table 13-23.

Table 13-23: Combined Construction Phase Noise Levels

Construction Phase	Sound Pressure Level at 10m dB(A)	Overall Sound Power Level, dB(A)
Site preparation and earthworks	92	120
Road pavement	88	116
Compound construction	88	116
Bridge construction	98	126
Bridge construction night-time	90	118

13.5.7 It should be noted that in calculating the overall sound power level for each construction activity it is assumed all plant and equipment is running concurrently for 80% of the time representing a conservative worst case scenario. It is assumed that each of the main construction activities will take place separately, without overlap.

13.5.8 In practice, the plant items identified for each stage will move around the site, operating at different times, for different durations and at different locations on any one day for the duration of the works. As a consequence, noise levels at any receptor may vary considerably day-on-day. Hence, it is necessary to rationalise the geographic and temporal spread of activities to obtain a meaningful prediction (and subsequent assessment) and to this end, various assumptions have necessarily been made as described in the following paragraphs.

13.5.9 The most important assumptions relate to the location of construction plant and their operational 'on-time' during the period of interest.

13.5.10 With respect to the geographical location of the plant, the full complement of plant for each phase, as identified in Appendix 13A is assumed to operate together at a single point at the centre of the closest working area. The assumed single point operating distance for each construction phase and NSR is summarised in Table 13-24 below.

Table 13-24: Single point operating distances assumed for prediction of construction

Construction Phase	Receptor A	Receptor B	Receptor C	Receptor D	Receptor E	Receptor F
Site Preparation and Earthworks	10 m	105 m	50 m	25 m	330 m	80 m
Road Pavement	15 m	110 m	50 m	20 m	330 m	80 m

Construction Compound	100 m	105 m	220 m	300 m	330 m	450 m
Bridge Construction	150 m	105 m	150 m	280 m	330 m	330 m
Night-time Lake Bridge Construction	240 m	160 m	330 m	340 m	330 m	460 m

13.5.11 Other assumptions which have been made with respect to the construction noise predictions are:

- No temporary or permanent noise barriers have been included;
- Acoustically hard ground cover has been assumed between the noise source and NSR (which therefore reduces absorption);
- No atmospheric absorption has been included;
- Predicted levels are quoted as equivalent free field levels at the location of the NSR façade where appropriate (i.e. 3 dB has not been added to account for façade reflections);
- Sources and receptors have both been taken to be 1.5 metres high; and
- Meteorological conditions have been taken to be 'neutral'.

13.5.12 On the basis described above, construction noise levels have been determined at six of the closest NSRs located around the construction site. These locations are the nearest NSR to the noise monitoring locations shown on Figure 13.1. A summary of predicted noise levels during each construction phase is given in Table 13-25.

Table 13-25: Predicted Unmitigated, Construction Noise Levels, $L_{Aeq,T}$ dB

Construction Phase	Receptor A	Receptor B	Receptor C	Receptor D	Receptor E	Receptor F
Site Preparation and Earthworks	91	71	77	83	61	73
Road Pavement	83	66	73	81	56	69
Construction Compound	67	67	60	58	57	54
Bridge Construction	73	77	73	68	67	67
Night-time Lake Bridge Construction	62	64	58	59	59	56

13.5.13 Standard working hours have been assumed to be between 07:00 and 19:00 hours, Monday to Friday, 07:00 and 13:00 on Saturdays. Exceptions to the standard hours will be necessary, however they are expected to be non-typical. For example, construction activities which would impact rail movements shall be completed during the night.

13.5.14 There may be a requirement for some delivery of materials to be undertaken outside of the standard hours, but such instances are expected to be uncommon, and it is assumed that working on bank holidays will not occur.

13.5.15 On this basis the assessment of significant effects from construction noise have been assumed for a worst case daytime scenario.

Evaluation of the Significance of Construction Noise

13.5.16 The significance of the potential construction noise impacts for each phase have been assessed based on the magnitude of the impact and the receptor sensitivity. The results of the assessment are presented in Table 13-26.

Table 13-26: Significance of Daytime Construction Noise Impacts

Construction Phase	Receptor A	Receptor B	Receptor C	Receptor D	Receptor E	Receptor F
Site Preparation and Earthworks	SOAEL	NOAEL	LOAEL	SOAEL	No Impact	NOAEL
Road Pavement	SOAEL	No Impact	NOAEL	SOAEL	No Impact	No Impact
Construction Compound	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
Bridge Construction	NOAEL	LOAEL	NOAEL	No Impact	No Impact	No Impact

Evaluation of the Magnitude of Construction Vibration

13.5.17 Groundborne vibration calculations have been performed for typical activities during construction based on the empirical prediction procedures presented within BS 5228-2, TRL report 246:1990 'Traffic induced vibration in buildings' (applicable to HGV induced vibration), and TRL report 429:2000 'Groundborne vibration caused by mechanised construction works' (applicable to vibratory rollers).

13.5.18 Such predictions have been performed in order to determine the possible distances at which the adopted magnitude of effect criteria may be registered. In this regard, groundborne vibration levels and associated distances have been identified for a sample of typical vibration sources which may be associated with the construction phase as shown in Table 13-27.

Table 13-27: Predicted Groundborne Vibration Levels Applicable to Typical Vibration Generating Construction Activities

Construction Activity	Distance (m)	PPV (mms ⁻¹)
Contiguous or secant bored piling	48	0.3
	19	1.0
	3.3	10.0
Rotary bored piling – auguring	20	0.3
	6	1.0
	0.6	10.0
Rotary bored piling – driving casing	75	0.3

Construction Activity	Distance (m)	PPV (mms ⁻¹)
	23	1.0
	2.3	10.0
Vibratory rollers – start & end ¹	60	0.3
	23	1.0
Vibratory rollers – steady state	3.3	10.0
HGVs ²	50	0.3
	17	1.0
	2.5	10.0
¹ Assumes 2 rollers, 0.4 mm amplitude, drum width of 1.3 m, e.g. heavy duty ride on roller. ² Assumes max height/depth of surface defect of 50 mm, max speed of 30 km/h, and that surface defect occurs at both wheels.		

13.5.19 It should be noted that the data presented within Table 13-27 is general in nature and is not specific to any one site. Furthermore, there may be a variety of different potential vibration generating activities employed other than those listed. However, the vibration levels and associated distances can be used to determine the typical distances at which specific impacts could be registered (within an associated confidence limit).

13.5.20 At this PEIR stage we have assumed that the closest distances from a NSR to any potential piling location is 105 m to receptor B north of the lake; and 190 m to receptor C to the south. For any vibratory rollers or HGV activity, the assumed distance to the closest NSR is 6 m for the NSR at receptor B. Additionally the single point distances assumed for the construction noise activities for each phase, as previously presented in Table 13-24 have been assumed for the assessment of construction vibration impacts.

Evaluation of the Significance of Construction Vibration

13.5.21 The significance of the potential construction noise impacts for each phase have been assessed based on the magnitude of the impact and the receptor sensitivity. The results of the assessment are presented in Table 13-28.

Table 13-28: Significance of construction vibration impacts

Construction Phase	Receptor A	Receptor B	Receptor C	Receptor D	Receptor E	Receptor F
Site Preparation and Earthworks	LOAEL	No Impact	NOAEL	NOAEL	No Impact	No Impact
Road Pavement	LOAEL	No Impact	NOAEL	LOAEL	No Impact	No Impact
Construction Compound	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact

Bridge Construction, including piling	No Impact	No Impact	No Impact	No Impact	No Impact	No Impact
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13.5.22 As a worst case, NSRs are predicted to experience a LOAEL construction vibration impact due to potential for HGV movements to occur at a distances between 6 and 17 m. However, these impacts will be transient.

13.5.23 The predicted impacts from other construction activities, including piling are predicted to be below the LOAEL, attributable to the distance between NSRs and other vibration generating construction works.

Evaluation of the Magnitude of Construction Traffic Noise

13.5.24 An assessment of off-site construction traffic is not considered necessary, this is based on the low numbers of vehicles that require compound access, see Section 6.6 and Figure 6.6.

13.5.25 Construction traffic will introduce a small increase in traffic numbers relative to existing flows, therefore as such, noise and vibration impact will be negligible and as such does not represent a significant effect that warrants further consideration.

Operation

13.5.26 An operational assessment will be presented in the ES based on the final traffic flows.

13.6 Mitigation

Construction phase noise mitigation

13.6.1 Legislative safeguards are available to reduce the effects of noise during the construction of a development such as the proposed scheme. These include:

- EC Directives and UK Statutory Instruments that limit noise emissions of a variety of construction plant;
- Guidance set out in BS 5228-1; and
- Sections 60 and 61 of the CoPA.

13.6.2 A full CoCP will also be prepared and implemented to control noise emissions from the construction site and will include the following:

- Arrangements for communicating construction details, and likely noisy activities, with local communities and residents, including points of contact;
- Detailed methodologies for each construction activity;
- Detailed programmes for each phase of construction;
- Identification of the construction activities likely to generate the highest levels of noise, based on working areas;
- Prediction of noise levels from these activities following method given in BS 5228-1;
- Identification, in consultation with WDC, of appropriate hours of working and construction noise limits;
- An assessment of predicted impacts against the agreed construction noise limits;
- Identification of appropriate noise mitigation measures; and

- Noise monitoring and reporting procedures.

13.6.3 Appropriate noise mitigation measures will include the implementation of Best Practicable Means (BPM). Typical practices defined as BPM that will be implemented during construction, and detailed in the full CoCP for the proposed scheme include:

- Maintaining good public relations with local residents that may be affected by noise from the construction works. Effective communication should be established, keeping local residents informed of the type and timing of works involved. Effective methods of keeping local residents informed include leaflet drops, posters, public meetings, exhibitions and guided site visits;
- Provision of contact details for a site representative so that noise and vibration complaints arising from construction works are dealt with pro-actively and that subsequent resolutions are communicated to the complainant;
- Careful planning of construction activities and selection of plant to reduce noise emissions;
- The use of temporary acoustic barriers where appropriate;
- Locating static noisy plant in use as far away from NSRs as is feasible for the particular activity;
- Using suitable equipment and ensuring such equipment is properly maintained and operated by trained staff;
- Using silenced equipment where possible, in particular silenced power generators if night-time power generation is required for site security or lighting;
- Ensuring that vehicles and mobile plant are well maintained such that loose body fittings or exhausts do not rattle or vibrate;
- Engine compartments should be closed when equipment is in use and the resonance of body panels and cover plates reduced through the addition of suitable dampening materials.
- Ensuring plant machinery is turned off when not in use;
- Speed limits on access roads for HGVs and ensuring that vehicles do not park or queue for long periods outside NSRs with engines running unnecessarily;
- Generators and water pumps required for 24-hour operation should be silenced and/or screened as appropriate;
- Crane spindles, pulley wheels, telescopic sections and moving parts of working platforms should be adequately lubricated in order to prevent undue screeching and squealing;
- Where possible, the use of mains electricity rather than generators;

13.6.4 In addition, where works are necessary outside standard hours, the use of silenced equipment and plant is suggested, or temporary barriers installed in order to reduce noise at NSRs to below BS 5228-1 threshold values where practicable.

Construction Vibration Mitigation

- 13.6.5 In order to reduce the potential impact of vibration on nearby receptors, a Vibration Management Plan will be prepared prior to the commencement of construction works, including the following:
- Arrangements for communicating construction details and high vibration activities, with local communities and residents, including points of contact;
 - Detailed methodologies for each construction activity;
 - Detailed programmes for each phase of construction;
 - Identification of the construction activities likely to generate the highest levels of vibration;
 - The location of NSRs closest to these activities;
 - Details of vibration management that will be undertaken; and
 - Details of any vibration monitoring or pre- and post-construction condition monitoring.

13.6.6 Typical vibration mitigation measures include:

- Operate earthmoving equipment within the working areas as far from NSRs as possible;
- Phase vibration works (piling, blasting, stabilisation & demolition) such that plant does not operate in the same time period. The total vibration level resulting from works can be significantly reduced when each source operates separately;
- Avoid night-time vibration activities, when people are more likely to be at home, and more sensitive to vibration;
- Select alternative construction methods. Where available, the use of a drilled or sonic pile driver can cause lower vibration levels than impact pile driving; and
- Avoid vibratory packers and rollers near NSRs.

13.6.7 As indicated in BS 6472, it is likely that vibration of over 1.0 mm/s in residential NSRs will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.

Operational phase noise mitigation

13.6.8 Any mitigation for noise impacts associated with the operational phase will be determined following the conclusion of the operational noise assessment, having regard to the significance of effect on an NSR and the feasibility of mitigation options available.

13.7 Conclusions and Effects

Construction phase

Construction noise

13.7.1 Predicted unmitigated noise impacts during the day time are considered to be conservative worst-case, as calculations for each phase of construction have assumed that all plant will operate simultaneously with an 80% 'on-time', at a single point at the centre of the closest working areas to the NSR without mitigation.

- 13.7.2 However, with appropriate noise mitigation in place, including compliance with the full CoCP, as much as a 10 dB noise attenuation can typically be achieved. Applying a 7.5 dB(A) correction to the predicted construction noise levels presented in Table 13-25, resultant construction noise levels at the NSRs, with the exception of receptor D, fall below 80 dB(A) and the predicted impact is typically of LOAEL significance or lower. The worst case scenario occurs at receptor D where the mitigated construction noise levels could exceed 80 dB(A) during the Site Preparation and Earthworks construction phase, which would result in an impact of SOAEL significance.
- 13.7.3 Where a SOAEL impact is predicted after an allowance for mitigation is taken into account it is recommended that a Section 61, prior consent is applied for although a significant effect from construction noise would remain.

Construction vibration

- 13.7.4 As there is potential to give rise to impacts of LOAEL significance, albeit only for short periods, consideration has been given to appropriate good practice mitigation measures that will be employed during the construction phase.
- 13.7.5 The identified mitigation measures include general good practice working operations, and the undertaking of a vibration survey during initial vibration generating construction operations. The measurement results would then be used to establish the distances at which vibration levels will be acceptable for the specific techniques employed.
- 13.7.6 The survey results will subsequently be used, as necessary, to advise where alternative construction techniques that are to be adopted (e.g. for works close to local receptors).
- 13.7.7 The application of the Vibration Management Plan, within the full CoCP will manage, control and reduce ground borne vibration levels. If impacts are expected to exceed a LOAEL, then liaison with the affected community will be undertaken and the impact will be reduced as much as is practical, through the timing, duration and magnitude of the works.
- 13.7.8 As a worst case, NSRs are predicted to experience a construction vibration impact of LOAEL significance due to the potential for nearby HGV movements and vibratory rollers. However, these impacts will be transient and with the adoption of mitigation measures in section 13.6.6, the levels of vibration will be reduced as much as practically possible and due to the limited duration will not constitute a significant effect.

13.8 Assessments still to be undertaken

- 13.8.1 Further consultation with Waveney District Council (WDC) will be undertaken in order to agree an appropriate level of assessment for the construction phase within the ES, based upon the background noise measurements and the degree of information that is available on the construction program, activities and plant which will be employed.
- 13.8.2 An assessment of operational road traffic noise will be presented in the ES.

14 Materials

14.1 Scope of the Assessments

14.1.1 This Materials Chapter focusses on the material resources required during the construction phase of the proposed scheme and the generation, management and disposal of waste from site. The SoS in their Scoping Opinion (Appendix 7B) stated that an assessment of materials during both the construction and operation phase was a requirement for the ES, and hence a preliminary materials assessment has been included within this PEIR based upon the information available to date.

Study area

14.1.2 The study area for this assessment is defined as the area of the proposed scheme construction as well as any sites that have been identified as suitable for accepting waste from the proposed scheme which includes facilities in both Norfolk and Suffolk.

Limitations

14.1.3 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.

14.1.4 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).

14.1.5 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

14.2 Directives, Statutes and Relevant Policy

EU Directives

The Waste Framework Directive

14.2.1 Council Directive 2008/98/EC (the Waste Framework Directive) provides a framework of waste management requirements and sets out the basic waste management definitions for the EU. The Waste Framework Directive includes a target to recover 70% of construction and demolition waste by 2020.

National Legislation and Policy

14.2.2 The following UK legislation / policy documents are also relevant to the proposed scheme:

The Waste (England and Wales) Regulations 2011

14.2.3 The Waste (England and Wales) Regulations 2011 transposes the requirement of the Waste Framework Directive into UK law. It also requires the application of the waste management hierarchy in preventing or reducing the adverse impacts of the waste generation.

The Environmental Protection Act, 1990

- 14.2.4 The Environmental Protection Act 1990 requires all producers of controlled waste to ensure that they only transfer wastes that they produce to authorised carriers or to operators with suitable permits for the management of these wastes.

The Landfill (England and Wales) Regulations, 2002

- 14.2.5 The Landfill (England and Wales) Regulations 2002 overall objective is to supplement the requirements of the Waste Directive to prevent or reduce as far as possible the negative effects of landfilling on the environment as well as any resultant risk to human health.

The Hazardous Waste (England and Wales) Regulations, 2005

- 14.2.6 The key implications of The Hazardous Waste (England and Wales) Regulations, 2005 are that the list of Hazardous Wastes will be defined by the European Waste Catalogue under the List of Wastes Regulations 2005 and that each hazardous waste producing site, unless exempt, is required to be pre-registered with the Environment Agency before waste can be collected.

Environmental Permitting Regulations (England and Wales), 2011

- 14.2.7 The Environmental Permitting Regulations (England and Wales) 2011 produces a single regulatory framework by streamlining and integrating a number of regimes including waste management licensing, pollution prevention and control, water discharge consenting and groundwater authorisations.

The NPS for National Networks

- 14.2.8 The NPS re-iterates the waste hierarchy as a method of achieving sustainable waste management. It also states that an applicant should provide “*Evidence of appropriate mitigation measures (incorporating use of materials) in both design and construction should be presented.*”

Local Planning Policy

Suffolk

- 14.2.9 The Suffolk Waste Core Strategy (2011) highlights that applicants need to demonstrate proposals according to set principles. Policy WDM17 states that demonstrate that proposals accord with:

- Construction and demolition methods that minimise waste generation and reuse/recycle materials, as far as practicable on site; and
- Design principles and construction methods that minimise the use of primary aggregates and encourage the use of high quality building materials made from recycled and secondary sources.

Norfolk

- 14.2.10 The Norfolk Minerals and Waste Development Framework Core Strategy (2010) sets out mineral extraction and waste management in Norfolk. The strategy for waste management conforms to the Waste Strategy for England 2007 and the national waste hierarchy.

14.3 Methods of Assessment

- 14.3.1 The Secretary of State in the Scoping Opinion (Appendix 7B) stated that a materials assessment was a requirement for the construction phase of the proposed scheme and that this should include information on the likely volume of waste and the materials required during construction. An assessment has therefore been undertaken with reference to DMRB Volume 11, Section 2, Part 5, HD205/08 and IAN 153/11 and focuses on the construction phase.
- 14.3.2 The IAN identifies that materials assessment is a developing area of practice and hence no significance of effect criteria or magnitude of impact matrices are included. The assessment of significance has therefore been a matter of professional judgement based upon the nature of the materials used or disposed of based upon the capacity of the environment to absorb their loss and disposal using a descending scale of Major Adverse, Moderate Adverse, Minor Adverse and Negligible and an ascending scale of Minor Beneficial, Moderate Beneficial and Major Beneficial.
- 14.3.3 Waste strategy documents relating to the management of waste within Suffolk and Norfolk have been identified in order to understand the available capacity for the treatment of construction and demolition waste in proximity to the proposed scheme.
- 14.3.4 The operation of the proposed scheme has been scoped out of this Materials assessment as maintenance is not likely require a significant amount of materials.

14.4 Baseline Environment

14.4.1 The proposed scheme will require raw materials and will create waste. This could result in potentially significant environmental effects associated with the extraction of primary raw materials, the manufacture of products, and their use on construction sites. Key considerations can be grouped under two main areas:

- Material Resources – this includes materials required to construct the proposed scheme, for example key infrastructure such as safety barriers, CCTV cameras, cables ducts, steel and concrete and imported materials for construction such as aggregates.
- Waste – excavated materials from infrastructure locations, excess excavated materials, road planings, and contaminated materials to be excavated and disposed of. Some of these “waste” materials could be re-used on site and may therefore be considered as material resources.

Ground conditions

14.4.2 At this PEIR stage, prior to the ground investigation being complete, there is limited information available on the nature of the ground conditions of the proposed scheme and therefore to what extent it is reusable on site or whether it will require offsite disposal.

14.4.3 The baseline conditions relating to contamination will be presented in the ES (please see Chapter 12 for greater information).

Waste Capacity in Suffolk

14.4.4 The Waste Core Strategy (2011), part of the Minerals and Waste Development Framework, states that no sub-regional apportionment for inert waste exists. Inert waste includes

construction, demolition and excavation waste. However, at current rates of filling the existing inert capacity will not be filled at current rates until 2032.

- 14.4.5 The Waste Core Strategy highlights that there are Recycled Aggregate Facilities to the south of the proposed scheme at the Brick and Pipe Works in Gisleham, approximately 9.5km away, and the Industrial estate in Ellough, which is approximately 16km from the proposed scheme.

Waste Capacity in Norfolk

- 14.4.6 The Minerals and Waste Core Strategy states the strategy for waste management in Norfolk is to provide sufficient waste management capacity to meet the arisings of commercial and industrial waste and to ensure there is capacity to provide for inert waste.

- 14.4.7 The Waste Site Specific Allocation Development Plan Document (2013) states that the quantity of additional landfill/quarry void space for inert material will increase by 2,060,000m³. Estimations of capacity for a further five sites at existing or proposed quarries increased the total capacity of inert landfill by 3,375,000 tonnes.

Combined Waste Capacity of Suffolk and Norfolk

- 14.4.8 In assessing potential waste arisings from the proposed scheme it is necessary to evaluate local waste capacity potential. Utilising the Environmental Agency (EA) ‘What’s in your back yard’ tool it was not possible to locate any authorised landfill sites within 5km of the proposed scheme as all licenses returned as either closed or not under license. A wider search extended to across both counties recorded seven sites within a 65km journey of the proposed scheme. These are shown in Table 14-1 below. Should hazardous landfill disposal be required, the nearest facility is believed to be in Peterborough 185km from the proposed scheme.

Table 14-1 List of landfill sites in Suffolk and Norfolk within 65km

Site Remediation	Material Use	Distance from the proposed scheme
Postwick Waste	Waste landfilling	40km
Mayton Wood Landfill	Co-Disposal Landfill Site (A01)	53km
Costessey	Landfill taking and Non- Biodegradable Wastes (A05)	62km
Wangford Landfill site	Waste landfilling	20km
Cantley Landfill	Inert Landfill (L05)	40km
Rackheath Landfill	Household, Commercial and Industrial and waste Landfill. (A04)	43km
Burgh Castle	Landfill taking Non-Biodegradable Wastes (L05)	15km
Spixworth	Inert Landfill (L05)	45km

14.5 Predicted Impacts

- 14.5.1 Potentially significant effects associated with materials are expected to arise from the excavation of site won materials and imported materials.

Excavation and Site Won Materials

- 14.5.2 The exact quantity of material to be excavated during site preparation and construction as part of the proposed works is unknown at the time of preparing this materials assessment that accompanies the PEIR although Kier Infrastructure (see Section 6.6) has identified that

approximately 25,000m³ of material is likely to be excavated from within the proposed scheme.

14.5.3 On completion of the ground investigation in autumn 2017, the ES will include an indication of the need for remediation of contamination and the suitability for re-use of soils that could be excavated during the construction. The assessment can then be further refined once detailed design is complete and excavation depths and dimensions of above ground structures requiring soils are known. Please see Chapter 12 for greater detail on the approach to the ground investigation.

14.5.4 At this stage, it is likely that surplus material will comprise; contaminated soils (made ground or natural soils) that require landfill disposal or are unsuitable for re-use without treatment, made ground that requires no treatment but could be re-used on other sites and natural soils (clay, sand and gravel) that could be re-used on other sites with no treatment.

14.5.5 Without the findings of the ground investigation it is not possible to identify the nature of any environmental impact and hence this will be addressed within the ES.

Imported Materials

14.5.6 Using information provided by Kier Infrastructure (see 6.6), Table 14-2 below provides an overview of the imported materials that are likely to be necessary to construct the proposed scheme.

Table 14-2 Imported Materials

Site Remediation	Possible Material Use
Site preparation	Compound materials (aggregates)
Site construction	Piers (concrete and steel) Vertical walls Lighting and traffic lights (steel) Bascule bridge (steel and concrete) Carriageway material (aggregates) Control tower (concrete, steel) Embankments (aggregates)

14.5.7 Material resources required for the proposed scheme will largely consist of concrete, reinforcing steel, formwork, structural steelwork, kerbs and aggregates. Aggregates will be required for earthworks, structures, drainage and road pavement construction. These can be either primary, secondary or recycled aggregates. The choice of which aggregate to use is likely to be shaped by a consideration of various factors including the source for the material, specification, production and transport. Although recycled aggregates and soils will be used where possible, there will still be a requirement to import raw aggregates although all are believed to be plentiful and available. Kier Infrastructure (see Section 6.6) has identified a need to import approximately 40,000m³ of fill material and an additional 22,000m³ of concrete to build the proposed scheme.

Mitigation

- 14.5.8 The Government removed the statutory requirement of implementing Site Waste Management Plans (SWMP) in October 2013. However, the use of a Code of Construction Practice (CoCP) is still considered good practice to ensure that demolition and construction wastes are dealt with in an appropriate manner and in accordance with the 'waste hierarchy'.
- 14.5.9 The contractor will be required to dispose of waste in accordance with the waste hierarchy which is to consider waste management in the following order:
- prevention;
 - preparing for reuse;
 - recycling;
 - other recovery, including energy recovery; and
 - disposal.
- 14.5.10 The following objectives will be included in the interim CoCP for the contractor to consider how it can deliver the scheme through:
- reduced raw materials costs;
 - reduced waste destined for landfill;
 - reduced waste disposal costs; and
 - meeting legislative requirements.
- 14.5.11 Material supply will be met from the following in order of priority:
- on site reuse / recycled;
 - off-site reuse / recycled; and
 - new materials.

14.6 Conclusions and Effects

- 14.6.1 It has not been possible to quantify the amount of materials needed for the proposed scheme as further design and ground investigation is not yet complete. Disposal options and raw materials are considered to be available in plentiful supply with ready availability.
- 14.6.2 Material resources will largely consist of imported fill, aggregates, planings, bitumen, reinforced concrete and steel. As such, there will be opportunities to specify materials from a recycled source. Therefore, it has been concluded that a negligible to slight adverse environmental effect will arise due to the need to use a proportion of raw materials for construction of the proposed scheme. This does not constitute a significant effect.
- 14.6.3 Volumes of waste arising from the scheme are considered to be small with the majority of waste likely to be reused and recycled in line with Suffolk and Norfolk Waste Strategies, with Contractors encouraged to maximise diversions to landfill by re-using, recycling and recovering waste as well as to record and monitor their performance and compliance with regulatory controls. Therefore the impact of waste is considered to be negligible to slight adverse which does not constitute a significant effect.

14.7 Assessments still to be undertaken

- 14.7.1 The results of the ground investigation will be used to inform the nature of the existing ground conditions within the proposed scheme and will quantify the potential volume of inert, non-hazardous and hazardous waste that would be present during the construction phase.
- 14.7.2 An interim CoCP will be prepared that will identify suitable mitigation measures that the contractor will be required to follow in light of the nature of the material that is present.

15 Private Assets

15.1 Scope of the Assessments

Introduction

- 15.1.1 This chapter describes the assessment of the likely significant effects of the proposed scheme on private assets during the construction and operational phases of the scheme. It is supported by Figure 6.1, Figure 15.1 and Appendix 15A.
- 15.1.2 The assessment of this topic area considers potential impacts relating to the following aspects:
- Demolition of buildings and land-take for the construction and operation of the scheme;
 - Disruption of business operations;
 - Effects on development land;
 - Effects on agricultural land; and
 - Effects on statutory undertakers' assets and operations.

Study Area

- 15.1.3 The study area for the purposes of assessment on communities and private assets is defined as the scheme's red line boundary (see Figure 6.1), hereafter referred to as the proposed scheme extent.
- 15.1.4 Traffic related effects, such as the potential disruption to businesses, are further discussed in the Traffic and Transport section (Chapter 19).

Limitations

- 15.1.5 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 15.1.6 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).
- 15.1.7 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

15.2 Directives, Regulations and Relevant Policy

- 15.2.1 Table 15-1 provides an outline of statutes, guidance, policies and plans considered relevant to the proposed scheme with respect to its impact on the local private assets.

Table 15-1: Private Assets Regulatory and Policy Framework

Policy Summary	Scheme Summary
National Networks: National Policy Statement (NN NPS) (December 2014)	The Government's vision and strategic objectives for national networks includes 'supporting a prosperous and competitive economy and improving overall quality of life' It also states that "An applicant should identify existing and proposed land uses near the project, any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing. Applicants should also assess any effects of precluding a new development or use proposed in the development plan".
National Planning Policy Framework (NPPF)	The NPPF was published in March 2012 by the Government. The document streamlines national planning policy into a consolidated set of priorities, replacing most Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) notes. The NPPF sets out 13 core planning principles that should underpin decision taking including: Promoting healthy communities. Decisions should "ensure an integrated approach to considering the location of housing, economic uses and community facilities and services."
Planning Practice Guidance (2014)	The Planning Practice Guidance provides practical guidance to support the NPPF. The policy document provides guidance on consideration of rural housing, existing open spaces, when considering development proposals.

- 15.2.2 To deliver the proposed scheme SCC will seek authorisation through the DCO for the compulsory acquisition of interests in and rights over land, the temporary use of land and the overriding of easements and other rights in connection with land. However, SCC will continue to engage with those parties affected by the proposed scheme and will seek to agree the acquisition of land (or rights in land) and will only use compulsory acquisition powers, if granted, as a last resort.
- 15.2.3 As discussed earlier in the PEIR (see 1.2.3) the proposed scheme is seeking consent through a DCO under the powers of the Planning Act 2008. A DCO is the means of obtaining multiple consents required for NSIPs including compulsory acquisition powers. Therefore, to deliver the proposed scheme SCC will seek authorisation from the SoS through the DCO for the compulsory acquisition powers of interests in and rights over land, the temporary use of land and the overriding of easements and other rights in connection with land.
- 15.2.4 However in line with the relevant guidance³⁴, SCC will continue to engage with those parties affected by the proposed scheme and will seek to agree the acquisition of land (or rights in land) and will only use compulsory acquisition powers, if granted, as a last resort. SCC recognises that where compulsory purchase powers are being sought, this can lead to a period of uncertainty for those potentially affected. However, the DCO process provides greater certainty over timescales than other consenting regimes, due to the statutory timescales that govern the application, once submitted.

³⁴ <https://www.gov.uk/government/publications/planning-act-2008-procedures-for-the-compulsory-acquisition-of-land>

- 15.2.5 During this preparatory stage, SCC will support affected parties by:
- providing full information about what the compulsory purchase process involves;
 - confirm the rights and duties of those affected and an indicative timetable of events, all in a format accessible to those affected; and
 - appoint a specified case manager to whom those with concerns about the proposed acquisition can have easy and direct access.

15.3 Methods of Assessment

- 15.3.1 This assessment adopts relevant aspects of the DMRB Volume 11, Section 3, Parts 6 and 8 which provide guidance on assessing the potential impact of a scheme in relation to land use and community effects. A detailed assessment of community effects is located in the People and Communities Chapter (Chapter 16).
- 15.3.2 The assessment of the effects on private assets takes into account demolition and/or land-take from private properties and effects on development land. This involves detailed consideration of the number of residential, commercial (including agricultural) and industrial buildings at risk of demolition or land-take and the probable effect of such loss of land (including gardens, car parking spaces or garages) from private dwellings. Continued discussion with the landowners of all areas of the proposed scheme extent will detail how the land is used and how the proposed scheme could impact upon their future use of the land, and how mitigation might be achievable through scheme design or adopting particular construction methodologies.
- 15.3.3 In relation to businesses and commercial operations which may be impacted by the proposed scheme, the assessment within the ES will consider the number of people employed at the affected sites and the potential operational impacts on the businesses given the loss of land and any constraints during both the operational and the construction phases.
- 15.3.4 The WDC local plan and planning register will also be reviewed to identify areas of land allocated for local planning authority development within the study area and assess any potential impact on the development lands will be included in the ES. In Chapter 10 of the ES an assessment of the 'adjusted baseline' will be included that identifies how the townscape character will evolve with planned developments.

Significance Criteria

- 15.3.5 The significance criteria that have been used in this assessment are shown in Table 15-2. For clarity, a moderate adverse impact is considered to be a significant effect.

Table 15-2 – Significance Criteria

Impact Rating	Criteria
Negligible	<ul style="list-style-type: none"> • A barely discernible impact on use of amenity value
Slight Adverse	<ul style="list-style-type: none"> • Landtake peripheral to existing or intended use; • Activity that temporarily compromises or precludes use; and • Loss of amenity that does not compromise use.
Moderate Adverse	<ul style="list-style-type: none"> • Landtake that compromises but does not preclude existing or intended use; • Activity that compromises or precludes use for a protracted period; and • Loss of amenity that compromises but does not preclude use.

Impact Rating	Criteria
Substantial Adverse	<ul style="list-style-type: none"> • Landtake that precludes existing or intended use; • Activity that permanently compromises or precludes use; and • Loss of amenity that precludes use.

Desk Study

15.3.6 Data and evidence base for this chapter has been collated from a number of sources to inform the private assets baseline. The desk-based sources used include:

- Ordnance Survey (OS) open data;
- DEFRA's online GIS portal - <http://www.magic.defra.gov.uk/>;
- Information from Local Planning Authority website;
- National and Regional Policies;
- Local development plan documents; and
- Preliminary consultation with local authorities and relevant stakeholders.

15.4 Baseline Environment

15.4.1 Land-use within the proposed scheme extent is predominantly industrial and commercial with some residential land use. The larger land interests within the proposed scheme's red line boundary (Figure 6.1) are:

- Highway land, as well as land owned by SCC at Denmark Road and at Riverside Road/Canning Road;
- Land owned by WDC at Riverside Road/Canning Road;
- Port of Lowestoft, owned and operated by ABP;
- Network Rail estate;
- Wickes DIY store;
- Nexen Trucks;
- NWES Riverside Business Centre;
- Essex and Suffolk Water;
- Motorlings car showroom (including Enterprise);
- Former Jeld Wen site at Waveney Drive;
- Residential properties on Waveney Drive; and
- Bella Blue Beauty Clinic on Waveney Drive.

15.4.2 The above list is not exhaustive and at this stage the design is subject to further assessments and consultation feedback. Therefore at this PEIR stage it is not possible to determine the precise land requirement for the operational phase, the construction phase or the extent of rights that will need to be acquired, for example in association with maintenance of the proposed scheme. SCC will continue to engage with all affected parties as the design evolves.

15.4.3 Highway land and that which is owned by SCC and WDC is not considered to be a constraint that requires further assessment as it does not come within the definition of a private asset that is required for the construction of the proposed scheme.

15.4.4 Further information is provided on the use of private land in Table 15-3;

Table 15-3 – Land uses within the proposed scheme extent

Land interest	Description of land use and proposed scheme requirements
ABP	<p>Quay and associated port land owned and operated by ABP is included within the proposed scheme. The proposed scheme extent also includes a section of navigation channel used for the port and for leisure vessels. The channel is maintained by ABP.</p> <p>ABP's operational Port area is shown in Figure 15.1. Land will be required for construction, including within Lake Lothing. A pier will be located with ABP land and the crossing will oversail the quay and adjacent land. Access for maintenance will be required.</p>
Network Rail	<p>Land over the East Suffolk railway line, including associated storage and yard areas will be required for the construction phase. During the operational phase, the bridge will oversail the rail line with one pier and part of one abutment located in Network Rail land. Maintenance access will be required.</p>
Wickes Store	<p>A small area of non-operational land will be required for both the construction and operation phases.</p>
Nexen Trucks	<p>Hardstanding to the west of Nexen's building including its entrance is included within the proposed scheme extent. The majority of this land is only likely required for the construction phase. Land to the south of Nexen, proposed for development by Nexen (but currently vacant), is also included in the scheme boundary. A strip abutting the proposed alignment will be required for construction, and access for maintenance will also be required.</p>
NWES Riverside Business Centre	<p>A strip of land along the eastern and southern boundary of the site will be required for construction, operation and access for maintenance will also be required. The land is currently used for parking and landscaping.</p>
Essex and Suffolk Water	<p>A strip of land along the eastern boundary of the site abutting the crossing alignment will be required for construction and access for maintenance will also be required. The land is presently an area of rough grassland created to mitigate the impacts of past development on the five-banded weevil wasp <i>Cerceris quinquefasciata</i>.</p>
Motorlings (including Enterprise)	<p>Part of the forecourt area for this car showroom is included within the proposed scheme extent, in particular to accommodate the southern roundabout of the proposed scheme. Additionally, land adjacent to the proposed alignment would be required for the construction phase and access for maintenance will be required. The relocation of the prefabricated building on the western edge of the site is likely to be required, and a new access will need to be formed. An Enterprise car and can rental business also operates from this site. Car transporters associated with site currently unload from Riverside Road, which would no longer be permitted.</p>
Former Jeld Wen site at Waveney Drive	<p>Land currently occupied by a number of large, open sided sheds. The site is generally vacant, but sub-letting has occurred and is expected to continue to occur in the short-term.</p>
Residential dwellings	<p>Currently, the proposed scheme requires the likely demolition of one residential dwelling with two other dwellings expected to experience land take from part of their gardens and interference with existing accesses that will require re-provision.</p>
Bella Blue Beauty Clinic	<p>A private business providing beauty treatments. Land is required permanently.</p>

- 15.4.5 Beyond the proposed scheme and within the Study Area there are depots, business parks, retail parks, industrial estates, factories, a water treatment facility, port, quays, marinas, offices and car parks located along the northern and southern stretches of the Lake Lothing, running from east to west.
- 15.4.6 Beyond the immediate stretch of the commercial and industrial units, there are residential properties, recreational/playgrounds, a care home (to the northeast) leisure/entertainment centres, restaurants, churches, a cemetery, hotels, social clubs, post offices and educational facilities.
- 15.4.7 Agricultural Land Classification information obtained shows that there are no Best and Most Versatile (BMV) land located within the study area.

15.5 Predicted Impacts and mitigation

- 15.5.1 Predicted impacts upon private land users and any mitigation that is embedded within the proposed scheme are described in Table 15-4 below. The impacts upon ABP, are discussed in greater detail in section 15.5.2 to 15.5.23 below.

Table 15-4 – Predicted Impacts

Land interest	Description of impact	Significance of effect
Network Rail	A clearance of 4.98m over the operational railway line has been agreed with Network Rail (as shown in Figure 6.4). As discussed in Chapter 6 it is proposed that the bridge over network rail land will be constructed perpendicular to the railway and swung into place. Discussions with Network Rail are ongoing and any possession and closure of the railway would be with their full consent. For the purposes of this PEIR assessment, a temporary possession is assumed to be required and therefore there may be some disruption for a limited period during construction to rail operations into Lowestoft. No significant operational impacts are expected	Slight Adverse (construction) Negligible (operation)
Wickes	The loss of land is limited to a narrow slither of verge that is not presently used in connection with the operation of the store.	Slight Adverse (construction) Negligible (operation)
Nexen Trucks	The proposed scheme will provide a new permanent access to Nexen and the height of the underpass has been designed to allow HGVs to continue to access the site. The temporary loss of some land has the potential to affect operations although close liaison with the operator will reduce this as much as is possible. It is likely a narrow strip of land would be permanently required from the currently vacant land to the south of the Nexen building, but this should not prejudice future potential for expansion, subject to planning.	Slight Adverse (construction) Negligible (operation)
NWES Riverside Business Centre	The proposed scheme could result in the loss of 8 parking spaces on the eastern boundary of the site, along with some landscaping. It may be possible to re-provide those spaces elsewhere	Slight Adverse (construction) Negligible (operation)

Land interest	Description of impact	Significance of effect
	on the site in association with a reconfigured hard and soft landscaping scheme.	
Essex and Suffolk Water	The proposed scheme could result in the loss of a strip of rough grassland. Chapter 11 will address the impacts of this from an ecological perspective. Given the scale of the land take this is unlikely to prejudice the any future expansion aspirations for the site.	Slight Adverse (construction) Negligible (operation)
Motorlings (including Enterprise)	The site currently comprises a 3,700m ² showroom on a 1.6 hectare site, 150 display spaces, workshops, customer and staff parking. A new access will be formed from Waveney Drive. To mitigate the loss of parking for a car transporter on Riverside Road, one option is to locate transporter parking to the south of Kirkley Ham (but in the Motorlings site), with egress through the private road serving Asda, which has access on to the Tom Crisp Way roundabout. If the pre-fabricated building on the western side of the site needs to be moved, the aim would be to relocate it elsewhere within the site. There would be a permanent loss of forecourt space and options to mitigate for this will be explored further. However the site will also benefit from an increase in passing traffic along its Waveney Drive and Riverside road frontages	TBC
Former Jeld Wen site at Waveney Drive	The proposed scheme would require the removal of one row of the sheds, which are understood to be unoccupied currently, to enable construction. A permanent land-take would result from the new footprint of the highway. Overall the site is likely to benefit from improved access, enhancing its prospects for future development.	Slight Adverse (construction) Negligible (operation)
Residential properties	The footprint of one house is required, so there would be the permanent loss of one dwelling. Of the two further dwellings to likely be affected, one currently does not have a vehicular access, but land-take from some of its garden is likely. Vehicular access to the third property would be affected, and land would be required from the garden with the adjacent garage likely to need demolishing. Two garages, which exist independent of dwellings on a standalone plot would also need to be demolished.	Substantial Adverse (overall)
Bella Blue Beauty Clinic	As the site would be required permanently, the business would need to be relocated to an alternative location.	TBC

Impacts upon Port Operations

15.5.2 Impacts upon ABP's operation in both the construction and operation phase are identified below.

Construction phase – Navigation Channel impacts

15.5.3 During the construction phase the construction of the piers and the placement of the bascule bridge have the potential to impact vessel transport and Port operations.

15.5.4 The contractor will be required to maintain the navigation channel at all times, except when a possession of the entire channel is required to facilitate construction. Such occasions will be agreed in advance with ABP and are likely to be limited in nature. Therefore the impact is likely to be Slight Adverse.

Construction phase – Quay and land impacts

15.5.5 Figure 6.6 shows the proposed contractor's compound on the north quay of Lake Lothing. This will be required to facilitate the construction of both the proposed bascule bridge and the bridge over the East Suffolk railway line.

15.5.6 The contractor will be required to maintain access for port operations at all times, except by agreement with ABP. This access will allow all likely plant and vehicle movements to take place.

15.5.7 Impacts upon quay and land based Port operations are therefore likely to be limited to loss of quay side storage and berth.

15.5.8 As shown in Figure 15.1, the Port of Lowestoft covers an area adjacent to Lake Lothing and as stated in Section 5.3.1 covers an area of approximately 40 hectares. The area of the proposed compound (Figure 6.6) is 1.3 hectares and the compound's frontage along the quay is approximately 160m.

15.5.9 Given the relatively small loss of land for the temporary construction period, relative to the scale of the Port in total, the impact upon the port is considered to be no greater than Slight Adverse, although discussions with the ABP to ascertain the use of the quay and the possibility of temporarily relocating any uses to elsewhere in the Port will continue.

Operational phase – Navigation Channel impacts

15.5.10 The proposed scheme will introduce a new structure within Lake Lothing. Plate 6-1 shows that the clear span of 32m between fenders, which is greater than the width of the existing A47 Bascule Bridge, will allow all existing vessels that enter Lake Lothing to navigate west of the proposed scheme. An infinite air draught will also not constrain a vessel of any height that wants to navigate west of the proposed scheme. As stated in Section 6.7.1, while the proposed bascule bridge's opening schedule is to be confirmed, it is likely to operate on similar arrangements to the existing A47 Bascule Bridge.

15.5.11 A vessel simulation model has been prepared with Lowestoft College. Their vessel simulator allows a virtual navigation of a vessel through Lake Lothing to test how the proposed scheme interacts with Port operations. The purpose of producing this model was to:

- Establish the navigability through and adjacent to the proposed bascule bridge;
- Establish the suitability of the proposed passage width beneath the proposed bascule bridge;

- To confirm the requirements for protection in the form of fenders;
- To determine any aids to navigation that the proposed bascule bridge may require; and
- To establish the opening timings and interaction between the proposed and existing bridges.

15.5.12 The vessel simulation model was built on a base model that was derived from mapping provided by ABP. The model included the navigation channel from the seaward approach of Lake Lothing to the bend travelling westwards towards Mutford Lock.

15.5.13 Similarly to the Interim Assessment of Flooding (Appendix 18A) the vessel simulation was built upon the proposed scheme as submitted and considered at the scoping stage. The model has not been updated for this PEIR, however an update will be provided in the ES.

15.5.14 A number of scenarios, including different vessel sizes, weather and tide conditions were tested by ABP's pilots in the model to verify its adequacy. Following feedback from ABP some refinements were made and a second stage of simulations was undertaken, again considering different sized vessels, weather conditions and tidal conditions.

15.5.15 The vessel simulator was used to navigate both through the proposed bascule bridge and to both adjacent berths on the north quay.

15.5.16 Appendix 15A provides a detailed review of the adequacy of the vessel simulation model, and following use of the model by an experienced pilot, proposed recommendations for increased safety of operations.

15.5.17 Assuming that these recommendations are implemented it is concluded in Appendix 15A that the risks to the bridge and from vessels navigating through and around it are As Low As Reasonably Practicable.

15.5.18 Discussions with ABP will continue and their feedback on the model simulation will be incorporated within a further additional model that will incorporate the design of the proposed scheme at the PEIR stage. However, at this PEIR stage, given that the proposed scheme will only impact upon land that is peripheral to its intended use i.e. out with of the navigation channel, it is accordingly concluded that the proposed scheme has a no greater than Slight Adverse impact upon vessel transport.

15.5.19 It is recognised that the introduction of a new structure and associated fenders in Lake Lothing may have an impact on dredging operations. SCC will continue to discuss this with ABP to understand the consequences and potential mitigation measures.

Operational phase –Quay and Land impacts

15.5.20 The loss of quay space on the north of Lake Lothing has the potential to permanently impact Port operations through the loss of operational port land and berthing space.

15.5.21 The clearance provided underneath the proposed scheme as it crosses ABP's operational Port is a minimum of 5.3m (see Figure 6.4) which will allow all likely vehicles to be able to travel unhindered underneath and without the need for diversion.

15.5.22 ABP have drawn attention in their response to the request for a scoping opinion, that they store hazardous substances as part of their operations. Any materials stored beneath the proposed scheme will need to be appropriate for such a location and discussions with ABP are required to identify if dangerous materials will need to be located elsewhere.

15.5.23 Approximately 2,100m of Quay length is available within the Entrance Channel and Inner Harbour³⁵. The loss of berthing space resulting from the proposed scheme is unlikely to be greater than 60m although the size/number of vessels that can berth east and west of the proposed scheme may be curtailed. Greater information on vessel sizes using the Port is required and this will be provided in the ES (a vessel survey is currently underway to capture vessel movements and parameters) and greater discussion with ABP will be undertaken to identify the degree to which this loss of berthing space will affect their operations.

Impacts upon land users in the Study Area

15.5.24 No impacts are predicted upon agricultural land as there are no BMV land identified within the immediate vicinity of the scheme and the study area.

15.5.25 Impacts upon statutory undertakers will be of negligible significance as diversions will be provided for within the proposed scheme construction proposals and no loss of service is presently envisaged.

15.6 Conclusions and Effects

15.6.1 Further detailed assessments and discussions with land owners are required for a conclusive assessment of the impacts on private assets and land-take. Through this process, refinement of the proposed scheme and associated construction methodologies will be refined to mitigate impacts where possible.

15.7 Assessments still to be undertaken

15.7.1 The following will be undertaken and provided within the ES;

- An assessment of land-take within the proposed scheme red line boundary and greater information from land owners on their intended use for the land;
- Details of diversions, protective provisions to be agreed with utilities, for example UK Power Networks in respect of its tunnel which runs parallel to, but offset from, the scheme alignment under the bed of lake Lothing.
- An updated assessment of impacts upon private assets based upon discussion and consultation with land owners;
- A Navigational Risk Assessment and vessel survey; and
- An updated vessel simulation model that incorporates recent changes to the design of the bascule bridge and an update to the assessment of impacts to the navigation channel.

³⁵ http://www.abports.co.uk/Our_Locations/Short_Sea_Ports/Lowestoft/ (accessed 15/08/17)

16 Socio-Economics including Recreation

16.1 Scope of the Assessments

Introduction

- 16.1.1 This chapter describes the assessment of the likely significant effects of the proposed scheme on socio-economic factors and recreation during the construction and operational phases of the scheme. The assessment of this topic area considers potential impacts relating to:
- The creation of jobs and training opportunities within the local economy during the anticipated two to three-year construction period for the proposed scheme;
 - Changes in accessibility for leisure-related vessels which gain access to the Broads or the North Sea via Lake Lothing and the consequent effect on tourism;
 - Changes in accessibility for users of the local and strategic road network visiting Lowestoft and the consequential effect on tourism; and
 - The demand for temporary accommodation during the anticipated two to three-year construction period and the likely effect on established business / tourism accommodation within the town.
- 16.1.2 The creation of jobs during the operation phase was scoped out by the Secretary of State (see Appendix 7B).
- 16.1.3 Chapter 15 considers the impacts on private assets, including commercial operations within the Port of Lowestoft. Chapter 19 considers the traffic effects of the proposed scheme, including in relation to severance from community facilities, which in turn addresses effects on social cohesion.

Study area

- 16.1.4 The study area for the proposed assessment encompasses the entire area administered by Waveney District Council (Waveney) and Great Yarmouth Borough Council (GYBC) collectively known as the Great Yarmouth and Waveney sub-region. These areas are shown in Figure 16.1.

Limitations

- 16.1.5 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 16.1.6 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).
- 16.1.7 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

16.2 Directives, Regulations and Relevant Policy

- 16.2.1 Table 16-1 provides an outline of statutes, guidance, policies and plans considered relevant to the proposed scheme with respect to its impact on socio-economic features.

Table 16-1 - Socio-Economic Regulatory and Policy Framework

Policy Summary	Scheme Summary
<p>National Networks: National Policy Statement (NN NPS) (December 2014)</p>	<p>The Government's vision and strategic objectives for national networks includes 'supporting a prosperous and competitive economy' and specifically:</p> <p>Networks with the capacity and connectivity to support national, regional and local economic activity and facilitate growth whilst creating jobs; and</p> <p>Networks which sustain cohesion and decreases severance of communities and effectively providing linkages to each other.</p> <p>Paragraph 2.27 states that 'in some cases...it will not be sufficient to simply expand capacity on the existing network. In those circumstances new road alignments and corresponding links, including alignments which cross a river or estuary, may be needed to support increased capacity and connectivity.'</p> <p>Paragraph 3.3 requires that in delivering new schemes, 'reasonable opportunities to deliver environmental and social benefits as part of the schemes' should be considered and that environmental and social impacts should be mitigated in line with the principles set out in the National Planning Policy Framework (NPPF) and the Government's planning guidance.</p>
<p>National Planning Policy Framework (NPPF)</p>	<p>The NPPF was published in March 2012 by the Government. The document streamlines national planning policy into a consolidated set of priorities, replacing most Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) notes. The NPPF sets out 13 core planning principles that should underpin decision taking including:</p> <p>Supporting a prosperous rural economy through policies that encourage economic growth in rural areas by creating jobs, prosperity and taking a positive approach to sustainable new development; and</p> <p>Supporting sustainable rural tourism and developments that provide positive benefits to local businesses, communities and visitors.</p> <p>NPPF Paragraph 7:</p> <p>This policy framework provides a three dimensional guideline for achieving sustainable development, two of which are economy and socially driven. From an economic point of view, the document highlights the importance of '<i>ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure.</i>'</p> <p>From a social point of view, the policy document also states the importance of 'supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being'.</p>
<p>Planning Practice Guidance (2014)</p>	<p>The Planning Practice Guidance provides practical guidance to support the NPPF. The policy document provides guidance to local authorities on consideration of rural housing, existing open spaces, when considering development proposals.</p>

16.3 Methods of Assessment

16.3.1 This assessment adopts relevant aspects of the DMRB Volume 11, Section 3, Parts 3, 6, 8 and 12 which provides guidance on assessing the potential impact of a scheme in relation to disruption due to construction, land use, community effects and policies and plans.

- 16.3.2 The proposed assessment will be of a combined qualitative and quantitative nature, involving the analysis of numeric data and descriptive criteria to enable substantiated conclusions to be drawn as to the nature and magnitude of change that is likely to occur and the potential of such changes to be significant in the context of the 2009 Regulations.
- 16.3.3 The evaluation of impacts associated with jobs created during the anticipated two to three-year construction period will be based on consideration of the total number of jobs created for the two to three year period as a proportion of current jobs and job opportunities within the town relative to all employment sectors and the construction sector as a specific sector.
- 16.3.4 As stated in 6.6.5 Kier Infrastructure has specifically advised that the proposed scheme will employ just over 100 people at the peak of construction. As shown in Plate 6-4, employment on site will rise to this peak and taper off as construction progresses.
- 16.3.5 In the EA the evaluation of changes in accessibility for leisure-related vessels which gain access to the Broads via Mutford Lock and vice versa will be based on an analysis of the findings of the assessment of impacts on maritime operations. A survey of the number and sizes of vessels using Lake Lothing is presently being undertaken. This will be used to inform a qualitative assessment of the activity as an important contributor to tourism within the local and wider area (see Chapter 15).

Desk Study

- 16.3.6 Data and evidence base for this chapter has been collated from a number of sources to inform the socio-economic and recreation baseline. The desk-based sources used include:
- Population and labour market statistics provided by the Office for National Statistics (ONS) and Nomis including;
 - Key demographics;
 - Economic activity;
 - Unemployment; and
 - Workforce qualifications.
 - The DEFRA's online GIS portal - <http://www.magic.defra.gov.uk/>;
 - National and Regional Policies;
 - Local development plan documents;
 - Definitive PRoW mapping including information on recreational and tourist resources; and
 - Preliminary consultation with local authorities and relevant stakeholders.

Significance of effect

- 16.3.7 The importance of receptors is defined by how sensitive they are to changes in the socio-economic environment. Table 16-2 below identifies how receptors will be categorised.

Table 16-2 – Socio-economic sensitivity

Sensitivity	Criteria
High	A vulnerable receptor with little capacity to absorb change
Medium	A non-vulnerable receptor with limited capacity to absorb change
Low	A non-vulnerable receptor with capacity to absorb change

16.3.8 The magnitude of an effect is measured by a change in the baseline conditions that result from the proposed scheme. The following magnitude of effect parameters will be adopted.

Table 16-3 – Socio-economic magnitude of effect

Impact	Criteria
Major	A long term and permanent effect that extends beyond the boundaries of the study area that affects the well-being of many socio-economic receptors and/or a high value resource.
Moderate	A medium term effect that lasts for longer than a year within the study area that affects the well-being of socio-economic resources and/or of medium value.
Minor	A short term effect that lasts for less than a year within the area of Lowestoft that affects the well-being of a few socio-economic receptors and/or a low value resource.
Negligible	A short term effect that does not extend beyond the extent of the proposed scheme that affects the well-being of a few socio-economic receptors and/or a low value resource.

16.3.9 Significance will be appointed to each type of effect as shown in Table 16-4.

Table 16-4 – Socio-economics significance of effect

	Negligible	Minor	Moderate	Major
Low	Not significant	Not significant	Not significant	Significant
Moderate	Not significant	Not significant	Significant	Significant
High	Not significant	Significant	Significant	Significant

16.4 Baseline Environment

16.4.1 The existing environment in relation to socio-economic and recreational features has been based on current available data and strategies and plans currently in place within the defined study area.

16.4.2 Lowestoft is Waveney's largest town and the second largest in Suffolk. It is the most easterly town in the country and is situated between the eastern edge of The Broads National Park and the North Sea. Great Yarmouth lies approximately 15km to the north of Lowestoft.

16.4.3 Lake Lothing creates a significant barrier to movement within and across Lowestoft and the wider area. Lake Lothing splits Lowestoft in two, with the main employment area located to the northern side and a sizeable residential population to the south. The two existing lifting bridges are located at the eastern and western ends of the town, this creates significant bottlenecks at the points where several roads merge into one.

Population and Labour Market

16.4.4 The 2016 figures³⁶ show the total resident population in Waveney as 116,500 and the total population of Great Yarmouth as 99,200 making a total of 215,700 within the study area.

16.4.5 The estimated working age population in the study area between the ages of 16 and 64 years is 65,600 in Waveney and 58,200 in Great Yarmouth making a total of 123,800 which is 57.4% of the total resident population. This is lower than that for the East of England (regional) and Great Britain (national) at 61.8% and 63.3% respectively.

³⁶ <https://www.nomisweb.co.uk/reports/Imp/la/1946157245/report.aspx> (accessed 10th August 2017)

- 16.4.6 The sub-national population projections³⁷ of the ONS estimates that the total resident population in Great Yarmouth is projected to keep increasing to 101,300 by 2022 and the population of Waveney to 118,500.
- 16.4.7 The estimated increases in population numbers is significantly influenced by the ageing population across the local authority areas, regionally and nationally. Between 2014 and 2022 the population of working age (20-64) is due to stay reasonably static falling from 114,300 to 113,900. However, the retired population (65+) is due to increase from 36,700 to 43,100.
- 16.4.8 Lake Lothing divides Lowestoft into two halves, similar in size but different in character. Data obtained from the ONS Census 2011, shows that the area to the north of the lake has a population of approximately about 36,180 people, and includes the main shopping centre and marina. The area to the south is home to about 26,041 people and includes the main seafront, pier and beach.

Economic Activity

- 16.4.9 Economic activity in Waveney is 78.7% and 79.6% in Great Yarmouth which are comparable with those for the East of England at approximately 80% but higher than that of Great Britain at 77.8%. This indicates that employment opportunities are favourable.
- 16.4.10 The employment rates are however closer to the national average where the Waveney rate is at 72.6% and Great Yarmouth at 73.3% compared to the Great Britain rate at 73.9%.
- 16.4.11 Rates of self-employment are 11.8% in Waveney but are unavailable for Great Yarmouth. This is higher than the East of England and Great Britain average of 11.2% and 10.4% respectively.
- 16.4.12 Similarly, unemployment is 5.8% in Waveney and 6.9% in Great Yarmouth which is higher than 3.8% and 4.9% in the East of England and Great Britain respectively.

Employment by Occupation

- 16.4.13 A review of the ONS annual population data between October 2015 and September 2016 shows that the Waveney and GYBC sub-region has a significantly lower proportion of Standard Occupational Classification (SOC) 2010 Major Groups 1-3 and a significantly higher SOC 2010 Major Groups 8-9 than the regional and national figures respectively. A breakdown of this categorisation is presented in Table 16-2.
- 16.4.14 This occupational profile indicates that overall, there are less workers in the highly skilled categorisation and more in the elementary categorisation in the study area in comparison to the East of England and national figures.

Table 16-2: Employment by occupation category

SOC 2010 Major Group	Waveney (%)	Great Yarmouth (%)	East of England (%)	Great Britain (%)
Groups 1-3: (Managers, Directors, Senior Officials / Professional Occupations / Associate Professional & Technical)	32.0	33.2	45.2	45.1
Groups 4-5: (Administrative & Secretarial / Skilled Trades)	22.5	15.9	22.1	20.9

³⁷

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/localauthoritiesnenglandtable2> [Accessed 10/04/2017]

SOC 2010 Major Group	Waveney (%)	Great Yarmouth (%)	East of England (%)	Great Britain (%)
Groups 6-7: (Caring, Leisure and other service Occupations / Sales and Customer Services Occupation)	23.7	32.5	16.0	16.8
Groups 8-9: (Process Plant & Machine Operatives / Elementary Occupations)	21.8	18.4	16.6	17.2

- 16.4.15 In Lowestoft, the decline in employment in the key industries has been a major change in the past two decades. Employment in the manufacturing sector has continued to fall and employment has increasingly depended upon a small number of larger employers, particularly in engineering and food processing.
- 16.4.16 However, compensatory growth employment is also occurring in retail, tourism, service, construction and public service sectors. The proportion claiming Job Seeker's Allowance is 4.6%, compared to 2.3% in Suffolk and 3.1% in England. The Waveney Core Strategy highlights the problem of long-term unemployment and the proportion of low skilled jobs.
- 16.4.17 According to the Index of Multiple Deprivation (IMD) ranking³⁸ Waveney has an IMD ranking of 95 and GYBC has a rank of 29. Waveney remains the most deprived local authority in Suffolk and has become relatively more deprived between 2010 and 2015, dropping 32 places on the national rankings. GYBC is one of the most deprived areas in the country.
- 16.4.18 According to the IMD (2015) composite index, the level of deprivation in Lowestoft is relatively high. Parts of the Kirkley, Harbour and Normanston, St Margaret's and Whitton wards are among the 10% most deprived areas in England. All parts of these wards are amongst the 20% most deprived areas in England.

Qualifications

- 16.4.19 The analysis of data for workplace qualifications within the study area in comparison to the East of England and Great Britain national figures.

Table 16-3: Qualification Levels

Qualification Levels	Waveney (%)	Great Yarmouth (%)	East of England (%)	Great Britain (%)
NVQ 4 and above	20.6	23.0	33.6	37.1
NVQ 3	36.7	34.6	52.0	55.8
NVQ 2	56.3	52.8	71.5	73.6
NVQ 1	81.5	77.9	84.9	84.9
Other Qualifications	8.3	8.3	7.1	6.5
No Qualifications	10.2	13.8	8.0	8.6

Employment Infrastructure

- 16.4.20 Lowestoft has a traditional economic structure characterised by a large manufacturing sector, a smaller services sector and a noticeable dependence on larger employees within key sectors such as food and drink. The manufacturing sector has continued to decline and growth in employment has occurred in retail, tourism, service, construction and public service sectors.

³⁸ <http://www.healthysuffolk.org.uk/assets/JSNA/PH-reports/SCC-Index-of-Multiple-Deprivation-2010-2015-FINAL.pdf>

[Accessed 02/05/2017]

16.4.21 The decline in the oil and gas and fishing industries in the UK has impacted on economic and employment levels in Lowestoft. However, the UK's need for alternative energy sources places the area in a position to encourage investment, most notably the establishment of Orbis Energy to support the operations and maintenance of offshore windfarms. The locations of offshore wind farms around the UK sees Lowestoft in a prime position to reap the benefits from the £15bn windfarm development entitled the 'East Anglian Array' which is to be built off the Suffolk and Norfolk coast, and forms part of the Round Three phase of developments. 'East Anglian Array' windfarm will be one of the largest in the world with at least 1,000 turbines located about 15 miles offshore between Lowestoft and Great Yarmouth.

16.4.22 The Port of Lowestoft is a significant employer in Lowestoft supporting around 1,200 jobs and contributing around £80 million to the economy per annum. The Port serves as a major centre for servicing the North Sea offshore oil and gas Industry and has been actively involved in development, construction and operations and maintenance of the offshore wind farms. The Operations and Management for Greater Gabbard (offshore windfarm) is based at the Port. The successful Round Three developers for the East Anglia Array, ScottishPower Renewables, have agreed a 30 year deal with the Port of Lowestoft to act as a construction & operations hub for the East Anglia ONE. Lowestoft is also home to other leading companies in the energy sector, including Airtricity (a subsidiary of Scottish and Southern Energy) SLP (a division of Sembmarine of Singapore), RWE Innogy, James Fisher Marine Services and Babcock Helicopters.

Recreation and Tourism

16.4.23 Lowestoft port generates significant interest from the culture and tourism sectors in respect of the town's fishing heritage. There is a modern fish market with fish auction and processing facilities. Fifteen inshore fishing vessels are based at the Hamilton dock in the outer harbour. Traditional boat building/repairs also operate in the port. There are significant developments in the marine leisure industry in the outer and inner harbours. The Royal Norfolk and Suffolk yacht club is located on the south side of the outer harbour and the Lowestoft Haven Marina is located at the west of Lake Lothing.

16.4.24 A boat survey is presently ongoing to identify the type and size vessels that pass through Lake Lothing in the area of the proposed scheme. The results of this survey will identify the frequency with which recreational vessels make use of the Lake.

16.4.25 Other tourism facilities and assets in the study area within Waveney include the North and South Beaches of Lowestoft as well as access points to the Broads National Park.

16.5 Predicted Impacts

16.5.1 The following impacts are identified as having a potential to impact on the receiving environment:

- The creation of jobs and training opportunities within the local economy during the anticipated two to three-year construction period for the proposed scheme;
- Changes in accessibility for leisure-related vessels which gain access to the Broads or the North Sea via Lake Lothing and the consequent effect on tourism;
- Changes in accessibility for users of the local and strategic road network visiting Lowestoft and the consequential effect on tourism; and
- The demand for accommodation during the anticipated two to three year construction period and the likely effect on established business / tourism accommodation.

16.5.2 These have been described in turn in Table 16-5.

Table 16-5 – Assessment of effects

Environmental aspect	Sensitivity	Type of impact	Nature of impact	Magnitude of impact (Adverse and Beneficial)	Significance of effect
The creation of jobs and training opportunities within the local economy during the anticipated two to three-year construction period for the proposed scheme.	Low	Construction	The proposed scheme will employ approximately 100 FTE at the peak of construction. The study area is known to have a high percentage of people employed in the construction sector than the national and regional average and therefore it is likely that some construction workers can be sourced from within the study area. SCC's policy on procurement (see Section 16.5.3) will provide enhancement for job opportunities through ensuring that contractors who will tender to construct the proposed scheme are assessed against matters relating to using local suppliers and employing apprentices.	Negligible	Not significant
Changes in accessibility for leisure-related vessels which gain access to the Broads via Lake Lothing and the consequent effect on tourism.	Medium	Construction	A vessel survey is currently ongoing to identify the use of Lake Lothing as both a commercial and recreational resource. The degree to which the Lake is used will inform this assessment that will be presented in the ES. However, at this PEIR stage it is noteworthy that the bridge has been identified as unlikely to be a navigational constraint to commercial vessels (see Chapter 15 and Appendix 15A) and is proposed to operate on a similar regime to the existing A47 Bascule Bridge.	TBC	TBC
	Medium	Operation		TBC	TBC
Changes in accessibility for users of the local and strategic road network who gain access to the Broads and the consequent effect on tourism.	Low	Construction	During the construction stage there is unlikely to be a significant change to the traffic flow on the SRN (see Chapter 6 and Chapter 19).	Negligible	Not significant
	Low	Operation	Upon opening of the proposed scheme the flow upon the local and strategic road network is likely to fall and therefore access to tourism and leisure assets will be improved due to decreased delay. Notwithstanding the assessment in Chapter 19 the	Minor beneficial	Not significant

Environmental aspect	Sensitivity	Type of impact	Nature of impact	Magnitude of impact (Adverse and Beneficial)	Significance of effect
			assessment in this chapter relates only to access for tourism rather than for all travelling purposes as presented in Chapter 19 and therefore the impact is of a lesser degree as it affects a smaller number of travellers.		
The demand for temporary accommodation during the anticipated two to three year construction period and the likely effect on established business / tourism accommodation within the town.	TBC	Construction	<p>As stated above, there is likely to be approximately 100 FTE employed at the peak of construction although it is likely that a number of these employees will be sourced from the local labour market. However, some degree of labour that will require accommodation is likely to be required and an assessment of the availability of this accommodation will be undertaken for the ES.</p> <p>At this PEIR stage it is noteworthy that peak employment is due to take place in the second quarter of 2020 (see Plate 6-4). Whilst this doesn't correspond with the likely peak holiday season of the summer months, it does include holiday periods such as Easter and the May Bank Holidays.</p>	TBC	TBC

Mitigation and enhancement

- 16.5.3 The proposed scheme, due to the value of the contract, will be required to address SCC's Social Value and Sustainable Procurement Policy³⁹. The contractor will be required to adhere to these requirements. Similarly the contract will be assessed in accordance with Procurement Policy Note (PPN) 09/16⁴⁰ which is a government policy for the procurement of public works such as the proposed scheme.
- 16.5.4 PPN 09/16 requires the following to be material considerations in the decision making of the appointment of contractors:
- Solution Quality;
 - Supply Chain;
 - Cost;
 - Employment/Skills;
 - Sustainability;
 - Health & Safety; and
 - Outcome Benefits.
- 16.5.5 Those that are pertinent to the assessment of socio-economics are identified in greater detail below in section 16.5.6 to 16.5.8, although at this PEIR stage, a contractor is yet to be appointed and hence detail on what these will entail is not available. Further information will be provided in the ES should further information be available.

Supply Chain

- 16.5.6 SCC will require contractors bidding to construct the proposed scheme to detail how they will engage local suppliers and labour. This will include the requirement for a supplier event where local suppliers will be able to meet the contractor to discuss its sub-contracting requirements.

Employment and Skills

- 16.5.7 SCC will require bidders to detail what their commitment to skills/training will be and how it will be continued down the supply chain. This will follow government guidance within PPN 14/15⁴¹. Typically this requirement can include information on the number of apprenticeships the contractor will create and community initiatives they will implement.

Outcome benefits

- 16.5.8 Outcome benefits are additional community benefits that will be provided by the contractor as part of the delivery of the proposed scheme.

³⁹ <https://www.suffolk.gov.uk/assets/Jobs-careers-and-business/tenders-and-supplying-us/2017-07-13-Social-Value-and-Sustainable-Procurement-PolicyV1.0-Final.pdf>

⁴⁰ <https://www.gov.uk/government/publications/procurement-policy-note-0916-procuring-for-growth-balanced-scorecard>

⁴¹ <https://www.gov.uk/government/publications/procurement-policy-note-1415-supporting-apprenticeships-and-skills-through-public-procurement>

16.6 Conclusions and effects

- 16.6.1 Interim conclusions drawn from the preliminary assessments carried out to date are that:
- The creation of jobs within the construction phase of the proposed scheme will have a negligible impact given the skills that are likely to be available in the construction sector within the study area;
 - The change in accessibility for users of the road network will have a minor beneficial impact to those accessing the Broads and other leisure resources;
 - At this PEIR stage, insufficient information is available to conclude on the demand for temporary accommodation during the construction phase and the impact upon recreational users of Lake Lothing.

16.7 Assessments still to be undertaken

- 16.7.1 The following assessments will be included within the ES:
- An assessment of the availability of temporary accommodation within the study area during the construction period;
 - Information on the amount of tourists to Lowestoft and where they visit will be sought to further inform the accessibility assessment; and
 - An assessment of the impact upon the use of Lake Lothing as a recreational resource based upon the findings of the vessel survey.

17 Road Drainage and the Water Environment

17.1 Scope of the Assessments

Introduction

17.1.1 This chapter describes the assessment of the likely significant effects of the proposed scheme on the water environment (surface water and groundwater) during construction and operation. The assessment of this topic area considers potential impacts relating to the following aspects as proposed and identified in the Scoping Opinion (Appendix 7B):

- Construction pollution;
- Pollution from routine runoff;
- Pollution from accidental spillage;
- Changes to the hydromorphological regime; and
- Alteration of groundwater flows.

17.1.2 Indirect impacts on the aquatic ecology of the affected waterbodies are reported in Chapter 11 including the proposed benthic and fish trawl surveys.

17.1.3 Chapter 12 identifies the assessment and surveys that are pending with regard to soils and contamination.

17.1.4 The findings of the Interim Assessment on Flooding are reported in Chapter 18 and are not considered further within this chapter.

Study area

17.1.5 The study area for the proposed assessment encompasses the area illustrated in Figure 17.1 and is described in Section 17.4.

Limitations

17.1.6 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.

17.1.7 A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).

17.1.8 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

17.2 Directives, Statutes and Relevant Policy

17.2.1 A summary of the current legislation, policy and guidance documents relevant to the assessment of impacts of the proposed scheme on road drainage and the water environment is presented below.

The Water Framework Directive – Directive 2000/60/EC

- 17.2.2 The Water Framework Directive (WFD) makes provision for the maintenance and improvement of the 'ecological and chemical status' of the water environment, which includes rivers, lakes, wetlands, groundwater, estuaries and coastal waters. Chemical status is determined from compliance with environmental standards for chemicals that are classed as 'priority hazardous substances'. The ecological status of a surface waterbody is measured through a range of biological quality elements, supported by measurements of physicochemistry, hydromorphology and compliance with environmental standards for chemicals that are classed as 'specific pollutants'. For groundwater the overall status has a quantitative and a chemical component. The aim is for designated waterbodies to achieve 'good overall status' and prevent deterioration of status of surface waters and groundwater. Certain surface waterbodies may be designated as artificial/heavily modified and will have less stringent targets to meet, however these will still need to demonstrate 'good overall potential'.
- 17.2.3 Guidance published by the Environment Agency (EA) provides further information on assessing the risk of activities in relation to the River Basin Management Plan (RBMP) objectives.

Groundwater Directives

- 17.2.4 The WFD and the Groundwater Daughter Directive (GDD) (2006/118/EC), which were enacted in 2003 and 2009 respectively, replace the original Groundwater Directive (80/68/EEC) which was repealed in 2013. The GDD introduces procedures for assessing the 'Chemical Status' of groundwater as per the WFD, and protects groundwater by preventing direct discharge of 'hazardous pollutants' and limiting the direct discharge of non-hazardous pollutants.

National Legislation

- 17.2.5 The objectives of the Directives discussed above that are relevant to this assessment are met through the following UK legislation:
- The Water Resources Act 1991;
 - The Water Act 2003;
 - The Flood and Water Management Act 2010;
 - The Salmon and Freshwater Fisheries Act 1975;
 - The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003;
 - The Groundwater (England and Wales) Regulations 2009;
 - The Environmental Permitting (England and Wales) regulations 2010;
 - The Surface Waters (Fishlife) (Classification) Regulations 1997;
 - The Surface Waters (Fishlife) Direction 2007;
 - The Control of Pollution (Oil Storage) (England) Regulations 2001; and
 - The Environmental Damage (Prevention and Remediation) Regulations 2009.

17.2.6 Under the Acts and Regulations listed above, consents will be required from the EA for temporary construction and permanent operational discharges as well as any temporary abstractions, impoundments and in-channel works related to construction activities.

National Planning Policy Framework

17.2.7 The NPPF for England was published in March 2012 and replaces the majority of the previous Planning Policy Statements. A number of areas of the NPPF are relevant to the assessment of impacts on the water environment from the proposed scheme.

17.2.8 Additionally, it is stated that the planning system should contribute to and enhance the natural environment by preventing both new and existing development from contributing to, being put at unacceptable risk from or being adversely affected by, unacceptable levels of soil, air, water, or noise pollution or land instability.

National Policy Statement for National Networks

17.2.9 Specific policies for NSIPs for which particular considerations apply are set out in national policy statements. The key document for this scheme is the National Policy Statement for National Networks. It sets out detailed policy on environmental mitigations for development including pollution control, and assessment and management of water quality and resources.

17.3 Methods of Assessment

17.3.1 The road drainage and the water environment assessment has and will continue to include the following key tasks:

- Consultation with the relevant statutory and non-statutory bodies to establish the principal water environment issues;
- Detailed desk studies and field surveys to ascertain the current baseline conditions;
- Assessment of the potential impacts related to the construction and operation of the proposed scheme; and
- Identification of measures to avoid, minimise or mitigate predicted impacts.

17.3.2 The assessment for the ES will focus upon defining the characteristics and subsequent potential impacts of the proposed scheme upon the surface water and groundwater receptors, including the wider hydrological catchments as categorised by the EA under the WFD. This hydrological catchment-based approach enables due consideration to be given to both individual locations where interactions occur and any cumulative impacts within larger water body areas.

Scoped Out Impacts

17.3.3 The specific characteristics of the proposed scheme enable particular impacts to be considered as highly unlikely to occur. Based on professional judgement and taking account of water environment characteristics and proposed scheme design, the following aspects are not intended to be considered further, thus enabling focus upon the more likely impacts on the water environment (as discussed in the following subheadings):

- Loss of standing water - scoped out due to the scale of the proposed scheme, the urban setting of the study area;

- Loss or change to Groundwater Dependent Terrestrial Ecosystems - scoped out due to the urban setting of the study area and the lack of such ecosystems below or adjacent to the proposed scheme as confirmed in Chapter 11: Nature Conservation; and
- Changes to groundwater level or flow impact due to cuttings and related dewatering - scoped out as no cuttings are anticipated for the proposed scheme, due to local topography, urban setting and flood risk characteristics.

Construction Pollution

17.3.4 Evaluation of the potential for pollution of surface waters as a result of spillage and of the release of sediments into watercourses or water bodies will involve a review of areas where construction would be required within or in close proximity (i.e. within 50m) to surface watercourses and water bodies.

17.3.5 Sediment sampling at Lake Lothing will be undertaken to gain a better understanding of the type and level of contamination currently present in the sediments of this waterbody, which could be mobilised.

17.3.6 The potential for pollution of groundwaters/aquifers will be determined by looking at the groundwater vulnerability to pollution and the potential for contaminants to infiltrate to groundwater. In addition there is the potential for contamination of the groundwater aquifer from piling activities creating a pathways for contaminated sediments. A Piling Risk Assessment will be undertaken and presented in Chapter 12: Geology, Soils and Contamination of the ES. This will inform an assessment of the potential for contamination of groundwater from piling.

Pollution from Routine Runoff

17.3.7 DMRB HD 45/09 (Highways Agency, 2009) specifies procedures for the assessment of pollution impacts from routine runoff on surface waters, known as 'Method A'.

17.3.8 The Method A assessment comprises two separate elements:

- HAWRAT Assessment: the Highways Agency Water Risk Assessment Tool (HAWRAT) is a Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road runoff. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment bound pollutants, respectively; and
- EQS Assessment: Environmental Quality Standards (EQS) are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the WFD. The long-term risks over the period of one year are assessed through comparison of the annual average concentration of pollutants discharged with the published EQS for those pollutants.

17.3.9 To carry out these assessments baseline and drainage design information is required, including; traffic volumes, areas of impermeable and permeable road surfaces to be drained, proposed treatment train, receiving watercourse dimensions and flow data, water hardness, presence of sensitive sites (considered as international / national designated conservation sites) and in-stream structures or features which may influence the flow.

17.3.10 Method A was developed for assessment of discharges into freshwater bodies rather than transitional water such as Lake Lothing, with such water bodies having different

characteristics, receptors and baseline conditions due to tidal influence and dilution factors. Further to consultation with the EA the HAWRAT assessment methodology will be used as a means to determine the impacts from routine runoff for the ES. Inputs will be derived using available data and professional judgement to enable a worst case scenario to be assessed for this transitional waterbody.

17.3.11 The assessment method for groundwater, known as 'Method C', is applied to drainage design features designed to discharge to groundwater specifically. The Method C assessment comprises a risk assessment procedure based on the source-pathway-receptor model and is designed to assess the potential overall risk to groundwater and to highlight any sites at high risk, where additional measures may be required. No soakaways to groundwater are currently proposed as part of the drainage design and therefore at this point a Method C assessment is not required.

Pollution from Accidental Spillage

17.3.12 The DMRB document HD 45/09 (Highways Agency, 2009) specifies procedures for the assessment of pollution impacts from accidental spillage, known as 'Method D'. A summary of the methodology is provided below, with full details provided in HD 45/09.

17.3.13 The assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:

- The probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway; and
- The probability that, if such a spillage did occur, the polluting substance would reach the receiving water body and cause a serious pollution incident.

17.3.14 The probability of a serious spillage occurring is dependent on a variety of factors:

- Traffic volumes;
- Percentage of heavy goods vehicles in the traffic volumes;
- Whether the road is motorway, rural or urban trunk road;
- The road type categories within the road drainage catchment under assessment (i.e. 'no junction', 'slip road', 'cross road' or 'roundabout'); and
- The length of each road type within the catchment.

17.3.15 The probability of a serious spillage subsequently causing a serious pollution incident is dependent on the receiving surface water body and the response time of the emergency services; i.e., less than 20 minutes, less than one hour, or greater than one hour.

Impacts on Groundwater Flows and supported water supplies

17.3.16 Groundwater aquifers shall be identified and their sensitivity evaluated through review of British Geological Survey (BGS) aquifer productivity and groundwater vulnerability mapping, and review of the WFD groundwater body status.

17.3.17 Groundwater abstraction data will be identified and receptors noted, with potable water supplies of particular concern. Other potential groundwater receptors such as base flow to surface waterbodies will be noted.

17.3.18 There is the potential for impacts on the groundwater flows should the piles be deep enough to penetrate the aquifer. A Piling Risk Assessment will be undertaken and presented in Chapter 12 of the ES. This will inform an assessment of the potential effects on groundwater flows.

Changes to Hydromorphological Regime

17.3.19 Sediment Transport Modelling will be undertaken for the ES to understand sediment transportation processes in Lake Lothing before, during and after construction of the proposed scheme, and the implications this may have on mobilisation of contaminated material.

17.3.20 A hydraulic model extending from Mutford Lock to the bascule bridge at the eastern extreme of Lowestoft inner harbour will be constructed using TUFLOW FV 3D for the ES. Bathymetric survey data collected as part of this project will be used to define the model grid. The model boundary conditions will be defined based on hydrological analysis and will include the tidal inflow and outflows of Lake Lothing as well as the water flows across Mutford Lock.

17.3.21 The hydraulic model will be verified using recorded tidal data and a suite of sensitivity tests will be undertaken to determine the impact of a variety of parameters on the model results. The model will be used to investigate three scenarios:

- Baseline: the existing regime within Lake Lothing;
- Construction Phase: the predicted regime during construction of the new bridge; and
- Post-development: the predicted regime following construction of the new bridge.

17.3.22 For each scenario modelled, the distribution of currents over time within Lake Lothing will be determined at various locations for different tidal conditions. Bed particle size and density as identified in a shallow Ground Investigation (GI) survey undertaken as part of this project will be used to calculate the fall velocity of any disturbed sediment. Given the water depths and currents calculated by the model and fall velocities calculated based on the GI data, the distances travelled by disturbed and suspended material before it resettles on the bed will be determined. The passage and dispersion of any sediment plume can therefore be estimated and areas prone to siltation and scour will be identified.

17.3.23 A hydraulic modelling report detailing the development of the sediment transport model and the findings will be presented in the ES and used to inform the assessment of potential impacts on the hydrogeomorphology of Lake Lothing. It will also be used to inform the ecological impact assessment in Chapter 11 of the ES as well as Port operations as discussed in Chapter 15.

Indirect loss or change to surface water receptors

17.3.24 Surface water bodies such as streams, lakes and wetlands can receive or recharge groundwater, with movement likely between the two receptors. Any changes to groundwater as a result of dewatering may indirectly impact surface water bodies and result in changes to surface water flow.

17.3.25 The impact on surface water receptors from the proposed scheme shall be assessed qualitatively.

Impact Assessment Criteria

17.3.26 The predicted significance of impacts on surface waters and groundwater for the ES will be based on the importance or sensitivity of the relevant waterbody and the magnitude of the

impact from the proposed scheme, as recommended in DMRB document HD 45/09 (Highways Agency, 2009).

- 17.3.27 The importance or sensitivity of the waterbodies has been evaluated taking into account their quality, rarity, scale and substitutability. The criteria used will be based on the guidance and examples given in HD 45/09, Table A4.3.
- 17.3.28 The magnitude of the various impacts is evaluated taking into account the extent of loss and effects on integrity of the relevant waterbody attributes. The criteria used will be based on the guidance and examples given in HD 45/09, Table A4.4.
- 17.3.29 The estimation of the impact significance will be derived by combining the estimated importance of the affected waterbodies and the magnitude of the impacts, taking into account mitigation. Table A4.5 in HD 45/09 provides a significance matrix which will be used to determine significance for this assessment.

Water Framework Directive Assessment

- 17.3.30 A WFD Assessment will be undertaken to assess the scheme against the key objectives of the water framework directive. The scope of this assessment has been discussed with the EA and will be provided in full in the ES. A preliminary assessment has been included in this PEIR in Appendix 17A.

17.4 Baseline Environment

- 17.4.1 A desk study has been undertaken for this PEIR. It comprises a review of various sources in order to obtain information relating to the water environment assembled from other studies and designated and non-designated sites. Information sources which have informed the desk study review are:
- Environment Agency 'What's in My Backyard' (WIMBY) Online Mapper;
 - Environment Agency 'Catchment Data Explorer' Online Mapper
 - British Geological Survey's Onshore GeoIndex Online Mapper;
 - Ordnance Survey Opendata;
 - Defra's online GIS portal - <http://www.magic.defra.gov.uk/>;
 - Envirocheck; and
 - Lake Lothing Third Crossing Geotechnical Feasibility Report, February 2016, SCC.
- 17.4.2 The study area is illustrated in Figure 17.1 Water Environment Study Area and Baseline Features. The study area is described as:
- the physical area of the proposed scheme under consideration;
 - a buffer of 2 km with respect to Water Framework Directive (WFD) protected areas (as defined under WFD);
 - a buffer of 1 km with respect to other sensitive receptors such as groundwater sensitive receptors/abstraction in line with WFD scoping criteria; and

- the upstream extent to Mutford Lock where the tidal regime ceases (approximately 2 km); and downstream extent as far as the coastal boundary of Lake Lothing (approximately 1 km).

17.4.3 Site visits have been undertaken to verify the desk study information and further site visits will be undertaken for water quality and sediment sampling. Methodologies for the sampling activities will be provided in the ES.

Designations

17.4.4 There are no water related designations within the study area, however the Outer Thames Estuary SPA (qualifying feature non-breeding red-throated divers) and candidate Southern North Sea cSAC (qualifying feature harbour porpoise) are located approximately 1.3km downstream, within the 2 km protected areas buffer.

Rainfall

17.4.5 East Anglia is one of the driest regions in the United Kingdom. The annual average rainfall from 1981 to 2010 from the Met Office weather station at Lowestoft is 619.9mm⁴².

Surface Water

17.4.6 Lake Lothing is a saltwater lake, connected to the North Sea, allowing marine access to the upstream Oulton Broad, via Mutford Lock, and the wider Broads National Park area to the west of Lowestoft.

17.4.7 Historically Lake Lothing was an enclosed inland lake, although in more recent times it has been physically adapted to create a link between the North Sea and the harbour of Lowestoft. Where the proposed scheme crosses Lake Lothing, it spans approximately 100m between the artificial banks existing on either side.

17.4.8 A watercourse known locally as the Kirkley Stream flows north to converge with Lake Lothing at approximately TM 5398 9269, downstream of the proposed scheme. This watercourse drains the south of Lowestoft and has an approximate catchment size of 11km². Between Kirkley Fen Park (TM 5373 9207) and the confluence with Lake Lothing, the lower course of this channel is culverted representing approximately 500m of channel length. It is likely that there are also a number of smaller watercourses also culverted and flowing directly into Lake Lothing.

17.4.9 Approximately 500m to the west of the proposed scheme is Leathes Ham which is a small freshwater lake adjacent to Lake Lothing to the north and is part of a Local Nature Reserve. The water bodies do not appear to be hydraulically connected. This lake is up-gradient of the scheme and therefore will not be considered further in this assessment.

17.4.10 Whereas Lake Lothing is a heavily modified lake with a tidal regime, Oulton Broad is distinctly different in its composition due to the artificial barrier at Mutford Lock. Oulton Dyke links Oulton Broad to the River Waveney located to the west, with a number of smaller channels directly draining the local urban area into Oulton Broad. There is also an extensive network of artificial channels located west of Oulton Broad, draining the areas of White Cast Marshes, Share Marsh and Oulton Marsh.

17.4.11 Under the Water Framework Directive (WFD), the EA has determined that Lake Lothing lies within the 'Bure & Waveney & Yare & Lothing' surface water body (GB510503410700),

⁴² Met Office UK Climate. Available from: <http://www.metoffice.gov.uk/public/weather/climate>.

classified as a heavily modified, transitional water body. This estuarine water body is evaluated as having a current overall status of 'Poor' (Environment Agency, 2016), based on the 2015 dataset, with this status due to biological and ecological results; and a status of 'Good' for chemical results. Kirkley Stream is unclassified.

Groundwater

- 17.4.12 Groundwater flow within the study area occurs in the superficial deposits and bedrock.
- 17.4.13 Lake Lothing's floodplain is largely underlain with superficial alluvium deposits, although smaller areas of Happisburgh Glacigenic Formation sands are found locally, set further back from the banks of Lake Lothing. These superficial deposits are cited as Secondary A aquifers; permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
- 17.4.14 The bedrock geology is Crag Group, a suite of sands, gravels, silts and clays. The bedrock aquifers are classed as Principal aquifers; having layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. BGS Hydrogeological mapping (1:650k) records the rock as being Neogene to Quaternary rocks (undifferentiated), and the aquifer as being moderately productive with yields of up to 40 l/s. Greater information is available in Chapter 12.
- 17.4.15 Under the WFD, the EA has determined the study area lies within the 'Broadland Rivers Chalk & Crag' groundwater body (GB40501G400300), classified as holding a 'Poor' status for both quantitative and chemical classifications based on the 2015 dataset. The main pressures were either from agricultural and rural land management or 'no sector responsible'. Saline intrusion is recorded as 'Good'. This waterbody is linked to protected areas under the Drinking Water Directive and Nitrates Directive.

Groundwater Vulnerability

- 17.4.16 The aquifer underlying the site is designated as a principal bedrock aquifer with a high vulnerability ('Major Aquifer High' as defined by the EA).

Groundwater Flow

- 17.4.17 The source of local groundwater recharge is from rainfall. Due to the high permeability of the ground, groundwater recharge in the study area is considered to be relatively high although somewhat reduced by the run-off and evaporation from the urban environment.
- 17.4.18 Locally, shallow groundwater flows towards ditches and surface water courses in particular, acting as groundwater discharge locations. Regional groundwater flow is likely to occur in the deeper bedrock aquifers.

Groundwater Levels

- 17.4.19 Groundwater levels are generally very close to ground surface over much of the proposed scheme study area.
- 17.4.20 Groundwater levels from historic boreholes were recorded within the vicinity of the scheme. Groundwater strikes were measured in 23 boreholes from one geotechnical investigation. The Strikes occurred between 1.6m below ground level (bgl) and 10.2m bgl (1.8m ordinance datum (OD) and -7.2m above ordinance datum (AOD)). Groundwater rises were generally limited to within 0.5m above the strike depth with a maximum rise of 0.75m. The recording of the groundwater strike at -7.2m AOD is lower in elevation than the adjacent river level by

approximately 7m. This is considered anomalous and not representative of the groundwater profile at the proposed crossing location.

Abstractions, Private Water Supplies and Discharges

17.4.21 A Source Protection Zone (SPZ) is centred on a large groundwater abstraction located at NGR 652350 294230, 1km north of Lake Lothing (Environment Agency, 2016). The SP2 does not extend as far as the proposed works. This is an active groundwater abstraction used as a source of process water. Within 500m of the scheme 22 sewage, surface water or trade discharges have been recorded at Lake Lothing and one on Kirkley Stream. These are all shown on Figure 17.0.

17.4.22 No potable water supplies or surface water abstractions have been identified in the study area.

Water Quality

17.4.23 No water quality monitoring stations are located within 2 km of the proposed scheme. The WFD classification has a chemical status of 'Good' for Lake Lothing, and all the recorded substances independently also have a status of 'Good' for 2015 data.

17.4.24 The importance of Lake Lothing in relation to water quality is therefore considered to be high.

Summary of Features and Importance

17.4.25 Table 17-1 summarises the importance of water features identified within the proposed scheme study area.

Table 17-1: Importance of water features within the proposed scheme corridor

Feature	Attribute	Comment	Importance
Lake Lothing	Water Quality	'Good' WFD chemical status	High
	Dilution and Removal of waste products	Presence of surface water discharges and effluent discharges. Heavily modified channel with potential foul water and sewage discharges. Waterbody has a very large volume and therefore significant capacity for dilution of waste products.	Low
	Biodiversity	'Poor' WFD biological status due to angiosperm data. Otherwise statuses are either 'Good' or 'High' except for dissolved inorganic nitrogen which has a 'Moderate' status. Heavily modified port with maritime traffic.	Medium
	Recreation	Used as a marina.	High
Kirkley Stream	Water Quality	Unknown, assume the same as Lake Lothing 'Good' WFD chemical status.	High

Feature	Attribute	Comment	Importance
	Dilution and Removal of waste products	Presence of surface water discharges and effluent discharges. Smaller watercourse with limited capacity for dilution.	Medium
	Biodiversity	Culverted section in the vicinity of the scheme and downstream section directly influenced by Lake Lothing which has 'Poor' biodiversity status. Potential for higher biodiversity is upstream of the site although there is minimal potential for impacts upstream.	Low
Groundwater	Water Supply / quality	'Poor' WFD overall status. Not within source protection zone and no other abstractions for potable use identified.	Low
	Vulnerability	Major Aquifer.	High
	Conveyance of flow	Groundwater not anticipated to be providing base flow in the vicinity of the works.	Low
	Biodiversity	No groundwater dependent habitats due to urban environment.	Low

17.5 Predicted Impacts

Construction Related Pollution

- 17.5.1 Silt and sediment laden site runoff generated during construction activities, such as soil stripping and earthworks, can have a detrimental impact if allowed to enter watercourses untreated. Fine sediments can increase water turbidity and smother stream beds, affecting water quality and causing harm to fish, aquatic invertebrates and plants by interfering with feeding, respiration and spawning. The effects of sediment release can extend considerable distances downstream.
- 17.5.2 In addition, accidental spillages of potential pollutants such as oils, fuels, concrete, cement and sewage from staff welfare facilities can impact both groundwater and surface waters. Oils form a film on the water surface and can coat organisms, blocking respiration, photosynthesis and feeding. Biodegradation of oils in aquatic systems can lead to oxygen depletion; and many hydrocarbons are toxic, persistent and bio-accumulate in the environment i.e. they build-up in the body tissue both directly and from feeding on other contaminated organisms. Cement in concrete is highly alkaline and can harm aquatic organisms if the pH of the receiving waters is affected.
- 17.5.3 For construction adjacent to Lake Lothing and Kirkley Stream and where surface water drains are located, mitigation to prevent the migration of soils/sediment into the drains / water bodies and control measures for accidental spillage associated with construction are required. In all instances mitigation measures including restrictions on working distances and the provision of temporary barriers (for example a straw bale wall lined with silt fencing; protected surface water drains) to prevent migration of sediments, would result in any pollution being minor such

that impacts on water quality and biodiversity would be short-term, of minor magnitude and slight significance based on preliminary information.

- 17.5.4 Groundwater vulnerability at the site is high and therefore the potential for pollutants to infiltrate to groundwater reserves in the event of an accidental spillage is increased; however the sensitivity of the groundwater reserves is low. The magnitude of the effect is limited to the size of container storage at the site and good practice mitigation measures will be employed during refuelling etc. which further limits the potential effect. The magnitude is therefore considered to be minor, resulting in an effect of slight significance based on preliminary information.
- 17.5.5 The risk of construction pollution is highest where the construction activities are taking place within Lake Lothing, adjacent to Lake Lothing and Kirkley Stream or in the vicinity of existing surface water drains. These water bodies are of high importance for water quality.
- 17.5.6 As discussed in Chapter 6 the construction of temporary jetty and the bridge piers within Lake Lothing (and to a lesser extent the 'dolphins') has the potential to mobilise sediment and historic contaminants if present. A coffer dam will be used to isolate the pier construction area from the water environment. Excavated sediments will be transported off-site and will not be disposed of within the estuary or at sea. The installation of the coffer dam will mobilise sediments to a limited extent, appropriate mitigation measures will be proposed in the ES to manage the mobilisation of sediments and potential contamination including materials pumped out of the dam; and use of measures to prevent fish entrapment. Considering the extent of the surface waterbody at this location, and with the inclusion of appropriate mitigation measures the effects are anticipated to be of minor temporary magnitude and of slight significance based on preliminary information.
- 17.5.7 Piling activities associated with the construction of the bridge piers and temporary jetty may intrude into groundwater reserves depending on the depth of the piles. This has the potential to create a preferential pathway for contamination if contamination is shown to be present in soils and sediments at the piling locations. Mitigation measures to manage this event are discussed in Section 17.6. Taking these into account the effects would be of minor temporary magnitude of slight significance based on preliminary information.

Surface Water Pollution Related to Routine Runoff

- 17.5.8 A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road during rainfall events, polluting the receiving waterbodies. Routine runoff from road drainage networks can result in both acute and chronic impacts on water quality and subsequently on the biodiversity of the receiving watercourses, due to both soluble and sediment bound pollutants.
- 17.5.9 At the current stage of design, all the drainage is being directed to the surface waters of Lake Lothing via the existing road drainage / sewer network or directly from the moving bridge deck. Chapter 6 describes the current drainage design features which are also illustrated in Figure 6.5. Key indicative features include the following:
- Two detention ponds will be constructed either side of the roundabout to the north of the crossing. They will outfall via flow control devices into the existing drainage or sewer network; and

- All other road drainage is proposed to discharge into the existing road drainage or sewer system either directly, or via storage within oversized pipes or storage tank and with flow control devices.

17.5.10 The results of the HAWRAT assessment of surface water pollution from routine run-off will be presented in the ES and additional protection measures will be considered where necessary.

17.5.11 Direct impacts on water quality have the potential to have indirect effects on human health where the water is consumed or used for primary recreational purposes. No surface or ground water abstractions for potable use have been identified within the study area. Although Lake Lothing is used for secondary (non-contact) recreational purposes, the potential for detrimental impacts on water quality from routine run-off is limited. The findings of the routine run-off assessment will inform this assessment.

Groundwater Pollution related to Routine Runoff

17.5.12 Based on the current drainage design, all drainage is being directed to surface waters. Should this remain the case, a DMRB assessment on groundwater would not be required.

Pollution Related to Accidental Spillages

17.5.13 On all roads there is a risk that road traffic accidents or vehicle fires may result in accidental spillage of potential pollutants on the road surface. These may then enter the road drainage network and subsequently be discharged to the water environment, causing an acute pollution event.

17.5.14 An assessment of accidental spillage will be undertaken and reported in the ES.

Hydromorphological and Hydrogeomorphological Changes

17.5.15 Channel modifications such as the construction of in-channel structures can result in changes to the geomorphological regime, such as erosion, deposition, channel migration and mobilisation of contaminants. A reduction in morphological diversity can subsequently impact on water quality and biodiversity.

17.5.16 The presence of two new piers in the estuary (and to a lesser extent the 'dolphins') will locally impact currents however it is not anticipated that the dominant currents would be significantly affected. The seabed will have two constructions within it which will have a local impact on sediment transport however the impact is not anticipated to be significant considering that the harbour is heavily modified and is subject to a regular dredging regime; approximately twice a year. The sediment transport modelling taking place for this project will further inform the assessment to be presented in the ES.

17.5.17 One new outfall from the new drainage systems associated with the scheme will discharge directly into Lake Lothing. This proposed road drainage outfall will be constructed to current good practice standards (as stated in Chapter 6) to reduce the impact on the geomorphology of the water body. This will include construction of the outfall structures flush to the watercourse bank, with discharge in the direction of watercourse flow. Outfall structure headwalls, wingwalls and erosion protection aprons, if required, will be designed to prevent erosion of the bed and banks of the watercourse.

17.5.18 With the above proposed measures in place the magnitude of the impact on the geomorphology of Lake Lothing would be minor. As the water body is heavily modified it has a low sensitivity resulting in a potential significance of Slight Adverse. The impact on the geomorphology of Kirkley Stream is Neutral based on preliminary information.

17.5.19 The SoS in their Scoping Opinion (Appendix 7B) has identified that alterations to the hydromorphological regime should be included within the scope of the ES. The EA has also since requested hydromorphological assessment within the scope of the WFD assessment. This assessment will be reported in the ES.

Subsurface flows

17.5.20 There is the potential for piles associated with the bridge piers and temporary jetty to extend within the groundwater body depending on the length of the piles and the depth of the groundwater. This may locally affect flows within the aquifer but the magnitude of effect is anticipated to be minor, resulting in an impact of slight significance based on preliminary information.

WFD Assessment

17.5.21 In relation to assessing waterbodies under the WFD, a preliminary assessment is provided in Appendix 17A which comprises WFD Assessment data sheets for surface and groundwater bodies and a WFD Scoping sheet for activities in estuarine and coastal waters. The EA has commented on the WFD scoping and its comments have been incorporated into the current WFD Scoping sheet.

17.5.22 With the application of standard good practice and appropriate mitigation measures, the preliminary assessment of the proposed scheme indicates that the following four key objectives of the WFD are anticipated to be met:

1. To prevent deterioration in the ecological status of the water body;
2. To prevent the introduction of impediments to the attainment of Good WFD status for the water body;
3. To ensure that the attainment of the WFD objectives for the water body are not compromised; and
4. To ensure the achievement of the WFD objectives in other water bodies within the same catchment are not permanently excluded or compromised.

17.5.23 The assessment will be further expanded within the ES.

17.6 Proposed Mitigation

Embedded Mitigation

17.6.1 At this stage of the development of the design some embedded mitigation is already available for assessment. This includes the provision of SUDS features such as ponds which remove hydrocarbons, soluble metals, sediment and sediment bound pollutants from road drainage discharges, and other flow attenuation systems. Full details will be provided in the ES once the design has been progressed and assessment has been completed. Mitigation will be incorporated to reduce pollution from routine run-off to acceptable levels as defined within DMRB.

Construction Mitigation

17.6.2 Mitigation beyond the design commitments described above will be incorporated into the full Code of Construction Practice (CoCP); more detail will be provided in the ES which will be accompanied by an interim CoCP. Examples of appropriate measures are as follows:

- Oil absorbent booms will be installed, as appropriate, on the surface watercourses immediately downstream of the works area, and will be regularly inspected and maintained;
- Temporary cut-off drains will be used uphill and downhill of the working areas to prevent clean runoff entering and dirty water leaving the working area without appropriate treatment;
- Vegetated buffer strips will be maintained adjacent to all watercourses where possible;
- Sediment laden water generated on site will be appropriately treated before discharge. This may be through the use of silt fences, silt traps, filter bunds, settlement ponds and/or proprietary units such as a 'siltbuster';
- Control and treatment measures will be regularly inspected to ensure they are working effectively;
- Local weather forecasts will be monitored and works scheduled accordingly. In particular earthworks and in-stream works will be stopped during storm events;
- Emergency response plans will be developed and spill kits made available on site;
- Stockpiling areas will be located at least 50m from sensitive watercourses;
- Fuels and potentially hazardous construction materials will be stored in bunds that have areas with external cut-off drainage; fuel will be stored in double skinned tanks with 110% capacity;
- Fuelling and lubrication of construction vehicles and plant will generally be on hardstandings, where reasonably practical, with appropriate cut-off drainage and located away from watercourses. In the event of plant breakdown drip trays will be used during any emergency maintenance and spill kits will be available on site;
- Construction plant will be checked regularly for oil and fuel leaks, particularly when construction works are undertaken in or near the existing site waterbodies;
- Waste fuels and other fluid contaminants will be collected in leak-proof containers prior to removal from site to an approved recycling processing facility;
- Sewage generated from site welfare facilities will be disposed of appropriately. This may be by discharge to the foul sewer or by collection in septic tank for disposal off site.

17.6.3 The above list is illustrative. The interim CoCP will incorporate guidance from all relevant pollution prevention guidance.

17.6.4 Specific Construction Method Statements (CMS) will be developed and implemented for construction works in or near the watercourses, including the construction of the bridges and outfalls. These will include details of methods proposed to ensure dry working conditions and minimisation of sediment pollution of the watercourses. These will include isolation of the working area using cofferdams and additional specific measures to manage the mobilisation of potentially contaminated sediments if required.

17.6.5 If work is carried out during warmer weather, monitoring of Dissolved Oxygen levels will be considered, particularly if sediment is being disturbed.

17.6.6 In relation to potential effects from piling activities, ground investigation and a Piling Risk Assessment will be undertaken as detailed in Chapter 12: Geology, Soils and Contamination. It is anticipated that a piling method which does not allow the “dragging down” of contaminants and does not create pathways from the near-surface soils to the aquifers shall be adopted where required depending on site conditions. The precise solution will be discussed in the ES once the piling risk assessment has been completed.

17.6.7 A programme of water quality monitoring on the relevant watercourses, upstream and downstream of the working corridor will be implemented throughout the construction phase period. The monitoring parameters and frequency will be agreed with the EA and ABP prior to construction works commencing.

Operational Management and Monitoring

17.6.8 Ongoing monitoring requirements to ensure that any mitigation measures are effective once the proposed scheme is operational will be agreed with EA and ABP.

17.6.9 Other permits will be sought under other regimes notably the Environmental Permitting Regulations for the ongoing operation and maintenance of the drainage systems and protection measures therein.

17.7 Conclusions and Effects

17.7.1 Table 17.2 summarises the findings of the preliminary assessment of potential impacts and resulting significance of effects from the construction and operation of the proposed scheme where possible. The estimation of the impact significance has been derived by combining the estimated importance of the affected waterbodies and the magnitude of the impacts, taking into account mitigation in line with the guidance provided in HD 45/09 Table A4.5. Where the preliminary assessment has derived a level of significance, none of the impacts at this PEIR stage are considered to be significant in terms of the Regulations.

Table 17-2 Summary of Potential Effects - Preliminary

Potential Impact	Feature	Attribute	Importance	Magnitude	Significance
Construction Related Pollution – i.e. increased sedimentation and increased risk of accidental spillage of pollutants such as oil, fuel and concrete during construction	Lake Lothing and Kirkley Stream	Water quality / Biodiversity	High / Medium	Minor	Slight
	Groundwater water body	Water quality / water supply	Low	Minor	Slight
Surface water pollution related to operational routine runoff	Lake Lothing and Kirkley Stream	Water quality / Biodiversity	High / Medium	TBC	TBC
Cumulative surface water pollution related to operational routine runoff	Lake Lothing and Kirkley Stream	Water quality / Biodiversity	High / Medium	TBC	TBC
Groundwater Pollution related to Routine Runoff	Groundwater water body	Water quality / water supply	Low	Negligible	Neutral
Pollution Related to Accidental Spillages	Lake Lothing and Kirkley Stream	Water quality / Biodiversity	High / Medium	TBC	TBC

Potential Impact	Feature	Attribute	Importance	Magnitude	Significance
	Groundwater water body	Water quality / water supply	Low	TBC	TBC
Changes in geomorphological regime such as erosion, deposition and channel migration due to proposed in-channel constructions	Lake Lothing and Kirkley Stream	Water Quality / Biodiversity	High / Medium	TBC	TBC
Changes in groundwater flows due to the presence of piles for the bridge piers and temporary jetty	Groundwater water body	Water supply	Low	Minor	Slight

17.7.2 Considering the nature of the receiving water body and the scale of the proposed scheme, it is not anticipated that the assessment would conclude a significant residual effect. Further studies are required to confirm this preliminary assessment which will be reported in the ES

17.8 Assessments still to be completed

17.8.1 The following will be undertaken and presented in the ES:

- Detailed assessment on the water environment once the design has been further progressed.
- Sediment transport modelling and assessment of impacts on hydromorphological and hydrogeomorphological regime.
- Sediment and water quality sampling and identification of mitigation measures as necessary to manage potential mobilisation of contaminated sediments during construction.
- DMRB HAWRAT calculations for routine run-off pollution impacts to surface waters (Methods A and B) and accidental spillages (Method D).
- Detailed assessment of potential impacts on groundwater aquifers from piling operations and the presence of piles, once the design has been further progressed and the piling risk assessment has been completed.
- Water Framework Directive Assessment against the Anglian River Basin Management Plan.

18 Flood Risk

18.1 Scope of the Assessments

Introduction

- 18.1.1 This chapter addresses the likely effects of the proposed scheme on flooding and is supported by an Interim Assessment of Flooding (Appendix 18A), and Figure 18.1 and 18.2.
- 18.1.2 A full Flood Risk Assessment (FRA) will be carried out upon confirmation of the design of the proposed scheme that will be presented at the application for the DCO. The FRA will include an assessment of flood risk to the proposed scheme from all sources as well as an assessment of the impact of the proposed scheme on flood risk elsewhere for both the construction and post-construction phases.
- 18.1.3 A number of comments were made at scoping stage by Suffolk County Council (SCC) and the Environment Agency (EA), these are discussed in this chapter and have either been addressed at this stage or will be in the FRA and Environmental Statement that will support the DCO.

Study area

- 18.1.4 The study area for the proposed assessment encompasses a large part of Lowestoft and is centred on Lake Lothing. Oulton Broad is at the western extent of the study area, the eastern extent is the North Sea immediately outside of the outer harbour at Lowestoft. The study area extends as far as Corton in the north and Kirkley in the south.

Limitations

- 18.1.5 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 18.1.6 To date, the impact of the proposed scheme on fluvial and tidal flood risk post-construction has been considered. The risk of flooding to the proposed scheme from all sources has not yet been assessed and will be in the full FRA submitted with the DCO application and appended to the ES. Similarly, the impact of the proposed scheme on surface water runoff will be assessed as part of the full FRA. The FRA will also consider the risk of flooding to the proposed scheme and impacts on flooding elsewhere during the construction phase.
- 18.1.7 The information contained herein is intended to inform consultation responses at this stage.
- 18.1.8 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessment for the production of the ES.

18.2 Directives, Regulations and Relevant Policy

- 18.2.1 The proposed scheme has been defined as a Nationally Significant Infrastructure Project (NSIP) and it has been agreed with the Environment Agency (EA) that it is “safety critical infrastructure” for the purposes of paragraph 4.4.1 of the National Networks National Policy Statement (NPS).
- 18.2.2 The NPS recognises that as a result of climate change, the risk of flooding will increase within the lifetime of NSIPs. The NPS states that the FRA should be carried out with reference to the

guidance from the National Planning Policy Framework (NPPF) and accompanying National Planning Practice Guidance (NPPG) document.

- 18.2.3 The NPPF is a material consideration in determining planning applications in England. Paragraphs 99 to 108 of the NPPF outline the development requirements in terms of flood risk and the impact of climate change. The UK Government's Department for Communities and Local Government PPG ID7 (March 2014) for Flood Risk and Coastal Change provides additional guidance in the implementation of the NPPF in relation to development and flood risk.
- 18.2.4 NPPF requires developments to be 'safe, without increasing flood risk elsewhere' and, where possible to 'reduce flood risk overall'. Priority is given to the use of Sustainable Drainage Systems (SuDS) within the NPPF.

18.3 Methods of Assessment

- 18.3.1 The objectives of the FRA that will be presented in the ES will be to:
- Assess the risk to the development from all potential sources of flooding (both during construction and operation);
 - Establish the existing and future flood risk to the development;
 - Assess the potential impacts of the proposed development on flood risk elsewhere (both during construction and operation); and
 - Determine appropriate mitigation measures to manage flooding issues during operation in a sustainable way; and
 - Link to the drainage strategy for the proposed scheme that will address how any additional surface water runoff generated by the proposed scheme will be managed.
- 18.3.2 The key objective of the Interim Assessment of Flooding (Appendix 18A) that is the subject of this PEIR chapter was to assess the potential impacts of the proposed development on flood risk elsewhere and to ascertain the likely requirement for mitigation.
- 18.3.3 The following data have been used to undertake the interim assessment of flooding:
- OS Mastermap covering Lowestoft;
 - Bathymetric survey of Lake Lothing and the outer harbour;
 - 0.5m resolution LiDAR flown in 2015;
 - Environment Agency Extreme Sea Levels;
 - Daily average level data recorded in Lake Lothing and Oulton Broad;
 - Topographic data on the north and south quay of Lake Lothing;
 - C13A design for Lake Lothing Third Crossing;
 - As built construction drawings for existing bridges across Lake Lothing;
 - Lowestoft tidal barrier - outer harbour water level modelling investigation – CH2M Hill 2016;
 - Lowestoft Tidal Defences Additional Modelling Studies – CH2M Hill 2014; and

- Lowestoft Flood Risk Management Strategy – CH2M Hill 2016

18.3.4 The interim assessment of flooding has involved the following:

- Consultation with the EA and SCC to establish key issues within the study area and confirm aspects of the methodology used in the assessment of flooding;
- Detailed hydraulic modelling of Lake Lothing and the outer harbour to establish the baseline hydrological conditions and existing levels of tidal and fluvial flood risk within Lowestoft (surface water flood risk will be assessed within the FRA); and
- Establishing any potential impacts on tidal and fluvial flood risk to the surrounding area associated with the proposed scheme using the hydraulic model (impacts on surface water runoff will be considered within the FRA).

18.3.5 The main source of flooding to the proposed scheme is tidal. An existing 1D-2D hydraulic model of Lake Lothing and the outer harbour plus part of Oulton Broad (developed by CH2M Hill as part of the Lowestoft Tidal Barrier project in 2014) was obtained for use in this assessment. The existing model was reviewed and it was deemed appropriate to develop a new 2D only model of Lake Lothing and the outer harbour for the purposes of this assessment.

18.3.6 The focus of this assessment is the local hydraulic effects of the proposed scheme, therefore there is a need to use the most recent and accurate data, particularly close to the proposed scheme site. The CH2M Hill model was developed for a different purpose and is still valid but it is necessary to refine and incorporate more detail into the model developed for this assessment to determine the impacts of the proposed scheme on the hydraulics within Lake Lothing.

18.3.7 A suite of sensitivity tests has been undertaken to determine the impact of a variety of parameters on the model results, including the roughness values representing land use within the model, fluvial inflows and tidal levels.

18.3.8 The model has been used to investigate two scenarios in the interim assessment of flooding:

- Baseline – to establish the existing flood risk to the existing area of the proposed scheme and Lowestoft as a whole; and
- Post-development – to establish the impact of the proposed scheme on flooding elsewhere.

18.3.9 The water levels predicted by the model for the post-development scenario have been compared to the predicted water levels for the baseline scenario, to determine the impact of the proposed scheme (design C13A) on flood levels in Lowestoft.

18.3.10 Design C13A is an earlier design iteration than the current proposals that are presented in Chapter 6 of this PEIR. This is because the preparation of the model and the assessment of the proposed scheme has taken approximately four months and hence an earlier design had to be used in order to have a suitable proposal to assess at this stage. The modelling undertaken for the interim assessment of flooding using design C13A considers the worst case scenario for flood risk as two bridge piers are represented each with a footprint of over 426m² which is greater than that proposed at this PEIR stage.

18.3.11 Three flood return periods have been investigated using the flood model developed for this project; these are:

- the 5% Annual Exceedance Probability (AEP) event;

- the 0.5% AEP event (tidal Flood Zone 3); and
- the 0.1% AEP event (tidal Flood Zone 2).

18.3.12 Model runs have been undertaken for each return period with and without climate change allowances applied to determine the present day (2017) flood risk in Lowestoft and predicted future flood risk. As the development is a NSIP (see Chapter 1), the impact of, and resilience to, future flooding will be considered and mitigation against future flood risk elsewhere will be recommended as necessary. Climate change allowances have been applied based on the National Policy Statement for National Networks. As the development is safety-critical, the UK Climate Projections (UKCP09) high emissions scenario for the 2080s at the 50% probability level will be used to inform the design and mitigation of the development as agreed with the EA (Appendix 18A).

18.3.13 The C13A design has been assessed against the H++ estimates (high risk, low probability) for sea level rise to assess a credible maximum scenario. The EA have agreed that they do not expect the design or mitigation to be provided to this level but the development should be assessed against this scenario to understand the full picture of risk.

The need for flood mitigation is dependent on the magnitude of impact and the vulnerability of the receptor(s) that are affected by any increase in flood depth.

Table 18-1 shows how a given increase in flood depth from the baseline scenario to the post-development scenario will be classified in terms of impact. It is noteworthy that the information presented in

18.3.14 Table 18-1 provides a correction to that which was submitted within the Scoping Report (Appendix 7A) and identified by the EA in their response (Appendix 7B).

18.3.15 The EA commented at scoping that wave overtopping should also be considered within the model developed to assess flood risk as part of the FRA. Wave overtopping from the open coast has been considered but it was judged not to be critical in this assessment as the main flood risk to Lowestoft is tidal inundation.

18.3.16 The proposed scheme is approximately 1km from the coastal boundary, therefore wave overtopping will not have an impact on the development because at water levels below the coastal defences, the arrangement of the harbour entrance prevents significant transmission of waves into Lake Lothing. Should the defences be overtopped, wave action would have less of an impact and wave overtopping has been judged as a small residual uncertainty and sensitivity testing of the tidal boundary has shown that the peak tidal level has the greatest impact on the maximum flood levels predicted for each return period event. Following further liaison on this point the EA have accepted that wave overtopping does not need to be included in the FRA.

18.3.17 Table 18-2 compares the magnitude of impact with the flood risk vulnerability of receptors (taken from Table 2 within the NPPF PPG for flood risk and coastal change) to demonstrate when mitigation is required.

Table 18-1 – Classification of magnitude of Flooding Impact

Magnitude of Impact	Change in depth (m)
No change	0
Negligible	>0.0 – <=0.02
Moderate	>0.02 – <=0.3
Major	0.3+ OR Flooding in areas that were previously not flooding.

Table 18-2 – Significance of flood impact

Magnitude of Impact	Receptor Sensitivity				
	Water Compatible	Less Vulnerable	More Vulnerable	Highly Vulnerable	Essential infrastructure
No change	No Mitigation required	No Mitigation required	No Mitigation required	No Mitigation required	No Mitigation required
Negligible	No Mitigation required	No Mitigation required	No Mitigation required	Mitigation	Mitigation
Moderate	No Mitigation required	Mitigation	Mitigation	Mitigation	Mitigation
Major	No Mitigation required	Mitigation	Mitigation	Mitigation	Mitigation

18.4 Baseline Environment

- 18.4.1 The proposed scheme lies predominantly within floodplain cited as Flood Zone 3 (defined as land having a 1 in 100 or greater annual probability of river flooding (1%) or land having a 1 in 200 or greater annual probability of sea flooding (0.5%)), with this typically adjacent and relatively close to the banks of Lake Lothing and Oulton Broad, plus the area where Kirkley Stream is culverted. Flood Zone 3 is the highest risk zone defined by the EA.
- 18.4.2 Additional areas of land classified as being within Flood Zone 2 are also within the study area (defined as land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%)), primarily for the proposed option at Riverside Road, where the route connects into the existing road network.
- 18.4.3 Figure 18.1 shows the areas of Flood Zone 3 and 2 relative to the proposed scheme location.

18.4.4 The EA Flood Map for planning does not show any defences in Lowestoft. The Lake Lothing quay walls are classified as informal defences and are generally at the same level as the ground behind them. The Lowestoft Flood Risk Management Strategy is ongoing, the aim of which is to reduce flood risk within Lowestoft by providing additional defences. The strategy may involve the construction of a tidal barrier across Lake Lothing. As the flood risk management strategy has not been implemented yet, potential future defences in Lowestoft have not been included in this assessment in order to represent the existing situation within Lowestoft. It may be that in future, the overall flood risk to Lowestoft is reduced based on the works undertaken as part of the Lowestoft Flood Risk Management Strategy.

18.5 Predicted Impacts

18.5.1 The Interim Assessment of Flooding (Appendix 18A) predicts the impacts on flooding of an early design for the proposed scheme, and will be used to inform the proposed scheme that is submitted for the DCO. Figure 2 and 3 that accompanied the Scoping Report (Appendix 7A) shows the scheme design (C13A) represented in the interim post-development model. Tables 18.3, 18.4 and 18.5 show the model results for the present day (2017), climate change (2117) and H++ scenarios respectively at a number of locations within Lake Lothing as shown in Figure 18.2. The highlighted results are at the location of the proposed scheme.

Table 18-3 – Model results for the present day (2017) scenario

Point	Baseline Peak Water Levels (mAOD)			Post-development Peak Water Levels (mAOD)			Change from Baseline (m)		
	5%	0.5%	0.1%	5%	0.5%	0.1%	5%	0.5%	0.1%
P1	2.65	3.25	3.77	2.65	3.26	3.77	0.00	0.00	0.00
P2	2.65	3.25	3.77	2.65	3.25	3.77	0.00	0.00	0.00
P3	2.65	3.26	3.77	2.65	3.26	3.77	0.00	0.00	0.00
P4	2.65	3.26	3.77	2.65	3.26	3.77	0.00	0.00	0.00
P5	2.65	3.20	3.67	2.65	3.20	3.68	0.00	0.00	0.01
P6	2.64	3.19	3.62	2.64	3.19	3.63	0.00	0.00	0.01
P7	2.65	3.20	3.59	2.65	3.20	3.61	0.00	0.00	0.01
P8	2.65	3.20	3.60	2.65	3.20	3.61	0.00	0.00	0.02
P9	2.65	3.20	3.60	2.65	3.20	3.61	0.00	0.00	0.01
P10	2.65	3.20	3.60	2.65	3.20	3.61	0.00	0.00	0.02
P11	2.65	3.20	3.60	2.65	3.18	3.56	0.00	-0.03	-0.03
P12	2.65	3.20	3.60	2.65	3.18	3.56	0.00	-0.03	-0.04
P13	2.65	3.20	3.60	2.64	3.18	3.56	0.00	-0.03	-0.04
P14	2.65	3.20	3.59	2.65	3.18	3.56	-0.01	-0.03	-0.04
P15	2.65	3.19	3.57	2.64	3.17	3.53	-0.01	-0.03	-0.04
P16	2.64	3.16	3.50	2.64	3.14	3.47	0.00	-0.02	-0.03

The results have shown that the proposed scheme has a minimal impact on peak water levels for the present day (2017) design event scenarios. During the 0.1% AEP event, there is a slight increase (up to 0.02m) in water levels within Lake Lothing on the eastern side of the proposed scheme. The increase in water levels here is considered negligible based upon the criteria within

18.5.2 Table 18-1.

18.5.3 For each of the present day design events considered, the model predicts a slight decrease in water levels in Lake Lothing to the west of the proposed scheme compared to the baseline scenario. An investigation of the 2D floodplain has shown that for the present day design events, the impact is classed as negligible.

Table 18-4 – Model results for the climate change (2117) scenario

Point	Baseline Peak Water Levels (mAOD)			Post-development Peak Water Levels (mAOD)			Change from Baseline (m)		
	5%	0.5%	0.1%	5%	0.5%	0.1%	5%	0.5%	0.1%
P1	3.50	4.12	4.63	3.50	4.12	4.63	0.00	0.00	0.00
P2	3.50	4.12	4.63	3.50	4.12	4.63	0.00	0.00	0.00
P3	3.50	4.12	4.63	3.50	4.12	4.63	0.00	0.00	0.00
P4	3.50	4.12	4.63	3.50	4.12	4.63	0.00	0.00	0.00
P5	3.43	4.02	4.48	3.44	4.02	4.49	0.01	0.01	0.01
P6	3.39	3.90	4.35	3.40	3.92	4.37	0.00	0.02	0.02
P7	3.38	3.85	4.26	3.38	3.87	4.29	0.00	0.02	0.03
P8	3.38	3.85	4.27	3.38	3.88	4.30	0.00	0.03	0.04
P9	3.38	3.85	4.27	3.38	3.87	4.29	0.00	0.02	0.02
P10	3.38	3.85	4.26	3.38	3.88	4.30	0.00	0.03	0.04
P11	3.38	3.85	4.26	3.35	3.81	4.20	-0.03	-0.04	-0.06
P12	3.38	3.85	4.27	3.35	3.81	4.20	-0.03	-0.04	-0.07
P13	3.38	3.85	4.26	3.34	3.80	4.20	-0.03	-0.04	-0.06
P14	3.37	3.84	4.26	3.34	3.80	4.18	-0.03	-0.05	-0.07
P15	3.35	3.80	4.20	3.32	3.76	4.14	-0.03	-0.04	-0.07
P16	3.30	3.69	4.01	3.28	3.66	3.96	-0.03	-0.03	-0.05

The climate change events (2117) show a maximum increase of 0.04m in the 0.1% AEP climate change event on the eastern side of the proposed scheme (Table 18-4). This falls within the moderate category based upon the criteria in

18.5.4 Table 18-1 and mitigation may be required (Table 18-2). The climate change events show a slight reduction in peak water levels (up to 0.07m) to the west of the proposed third crossing. Across the majority of the floodplain, flood depths are increased by up to 0.1m in the climate change events compared to the baseline, this is within the moderate category. There is a small area where flood depths increase by more than 0.1m during the 0.1% AEP climate change event, following analysis of the floodplain elevations it was shown that this area is a low point where water pools during the 0.1% AEP climate change event.

Table 18-5 – Model results for the H++ scenario

Point	Pre-Development Simulation (mAOD)			Post-development Simulation (mAOD)			Difference (Post- Pre)		
	5%	0.5%	0.1%	5%	0.5%	0.1%	5%	0.5%	0.1%
P1	5.74	6.36	6.87	5.74	6.36	6.87	0.00	0.00	0.00
P2	5.74	6.36	6.87	5.74	6.36	6.87	0.00	0.00	0.00
P3	5.75	6.37	6.88	5.75	6.37	6.88	0.00	0.00	0.00

P4	5.75	6.37	6.88	5.75	6.37	6.88	0.00	0.00	0.00
P5	5.57	6.20	6.70	5.58	6.21	6.72	0.02	0.02	0.02
P6	5.44	6.08	6.57	5.47	6.11	6.61	0.03	0.03	0.04
P7	5.23	5.79	6.20	5.28	5.85	6.29	0.05	0.07	0.09
P8	5.23	5.78	6.19	5.31	5.88	6.34	0.08	0.11	0.15
P9	5.23	5.78	6.20	5.28	5.85	6.29	0.05	0.07	0.10
P10	5.22	5.76	6.17	5.30	5.88	6.34	0.09	0.12	0.17
P11	5.22	5.77	6.18	5.13	5.66	6.06	-0.10	-0.11	-0.12
P12	5.23	5.77	6.18	5.12	5.66	6.06	-0.10	-0.11	-0.12
P13	5.21	5.75	6.16	5.12	5.65	6.06	-0.09	-0.10	-0.10
P14	5.21	5.75	6.15	5.08	5.60	5.98	-0.13	-0.15	-0.17
P15	5.13	5.65	6.02	5.00	5.50	5.86	-0.12	-0.14	-0.16
P16	4.69	5.03	5.32	4.60	4.95	5.20	-0.09	-0.09	-0.12

18.5.5 As requested by the EA, the impact of the proposed scheme has been assessed against the H++ extreme climate change scenario as well. The EA do not expect the proposed scheme to be designed for this event or for mitigation to be provided and the results are included to show the credible maximum worst case scenario.

The H++ event results for each return period show an increase in water levels to the east of the proposed crossing (up to 0.17m in the 0.1% AEP event) and a decrease to the west (maximum reduction of 0.17m in the 0.1% AEP event) as shown in Table 18-5. The maximum impacts for the H++ events are classified as moderate impacts based on the criteria in

18.5.6 Table 18-1.

18.6 Conclusions and Effects

18.6.1 Based on the C13A design, the interim assessment of flooding has found that some mitigation could be required as part of the proposed scheme to prevent an increase in flood levels within Lowestoft. New areas are not predicted to flood with the proposed scheme in place compared to the baseline scenario, the model predicts small increases in depth in areas that are already predicted to flood in the baseline scenario.

18.6.2 As the design of the proposed scheme has not been progressed to the degree required for the DCO submission, it is hoped that the need for flood mitigation can be 'designed out' of the final design. If mitigation is required as part of the proposed scheme, any mitigation measures will be discussed and agreed with the EA.

18.7 Assessments still to be undertaken

18.7.1 The EA reviewed the interim assessment of flooding and the model developed and have requested that the following are addressed in the FRA and the ES:

- Additional climate change events are to be modelled as agreed with the EA;
- The latest Extreme Sea Level values are to be used;
- Both the operational and during construction phases are to be considered;
- Flood risk posed to the proposed scheme itself is to be considered; and

- The reduction in floodplain storage due to raised roads on land is to be modelled, this was modelled as part of the interim assessment of flooding but may change as the design changes and the model will be updated to reflect this;

18.7.2 Further discussions with EA will determine whether any increase in flood depth and extent is acceptable as part of the proposed scheme. The EA discussions will inform any mitigation for increased flood risk that is required.

18.7.3 When the design of the proposed scheme has been finalised sufficient for the purposes of the DCO submission, a full FRA will be carried out with reference to the NPPF and NPPG to not only assess the impact of the proposed scheme elsewhere but to assess flood risk to the proposed scheme itself. All sources of flooding will be considered as part of the FRA and the surface water drainage required on the site will be determined.

18.7.4 Work is ongoing to define the proposed scheme that is to be put forward in the ES and currently the latest design (Chapter 6) includes piers within Lake Lothing that are smaller in volume than those assessed in design C13A. The scheme that is submitted with the DCO is therefore likely to include piers of smaller volume and would therefore be likely to contribute to a reduction in the impact of flooding compared to the findings presented within this PEIR. Preliminary flood modelling of smaller piers, similar to those presented in Figure 6.2, has identified that this is likely to be the case and that a measurable decrease in flood impacts will result from a marked reduction in pier volume.

18.7.5 The findings of the FRA will be presented within a Chapter of the ES.

19 Traffic and Transport

19.1 Scope of the Assessments

Introduction

- 19.1.1 This chapter of the PEIR assesses the likely significant effects of the proposed scheme with respect to traffic and transport in both the 'opening year' (2021) and in the 'future year' (2036). Potentially significant impacts that are considered include:
- A quantitative assessment of junction traffic capacity both with and without the proposed scheme;
 - A qualitative assessment of the effect of the proposed scheme upon pedestrian and cyclists; and
 - A qualitative assessment of the effect of the proposed scheme upon highway safety.
- 19.1.2 This chapter of the PEIR considers the effect of the re-distributed traffic associated with the proposed scheme, identifying areas where there are expected increases in traffic on the existing highway network during the weekday AM and PM peak hours.
- 19.1.3 This chapter also describes the methods used to assess the effects; the baseline conditions currently existing in the study area; the mitigation measures required to prevent, reduce or offset any significant negative effects; and the likely residual effects after these measures have been adopted. It also identifies the studies and assessments that are yet to be undertaken which will be presented in the ES.
- 19.1.4 This chapter is supported by the Preliminary Transport Assessment (PTA) which is included in Appendix 19A and Appendix 19B; Junction Capacity Analysis. This chapter incorporates to the extent it can at this PEIR stage an assessment of the Effects on All Travellers, as set out in Chapter 11 of DMRB. It is also accompanied by Figure 19.1 to 19.3.
- 19.1.5 This chapter also considers the impacts of the proposed scheme against the following, in accordance with IEMA and DMRB Guidance:
- Severance (including new pedestrian severance from community facilities and relief from severance for pedestrians);
 - Driver stress and delay;
 - Pedestrian and cyclist amenity, journey times and delay;
 - Collisions and safety;
 - Fear and intimidation; and
 - Views from the road

Study area

- 19.1.6 The study area has been informed by those junctions where traffic is expected to change significantly. This could be by way of an increase in traffic flow, a decrease in traffic flow, or changes to the direction of flow of traffic.

Limitations

- 19.1.7 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 19.1.8 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the ES.
- 19.1.9 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.
- 19.1.10 It should be noted that the actual proposed scheme ‘opening year’ is 2022 and ‘future year’ 2037, however the PTA (Appendix 19A) supporting this Chapter is 2021 / 2036 in accordance with the SATURN model used to support the OBC.
- 19.1.11 Whilst a new SATURN model has recently been developed, it has not been used to rerun an assessment of all the junctions in the study area at this time; however, detailed junction modelling has been undertaken for the new north and south junctions to test they can accommodate the new traffic flows. The results of this exercise have dictated that an increased land take is necessary for the southern junction, along with the closure of Durban Road at its junction with Waveney Drive.
- 19.1.12 Based on an early comparison of the new and old SATURN model, the main differences that are observed relate to the flows on the new crossing and its approach roads, hence why a preliminary analysis for the northern and southern junctions has been prioritised for this consultation.
- 19.1.13 A review of the effect of the revised SATURN model on the remainder of the junctions within the study area will be covered within the final TA and summarised in the ES.

19.2 Directives, Statutes and Relevant Policy

Legislation

Countryside and Rights of Way Act (2000)

- 19.2.1 The CRoW Act (2000) amongst other ecological matters provides for public access on foot to certain types of land and amends the law relating to public rights of way (PRoW).

The Wildlife and Countryside Act (1980)

- 19.2.2 Part III of the Wildlife and Countryside Act 1980 requires Local Authorities to produce a Definitive Map showing all PRoW within their jurisdiction. The map has been used to identify PRoW within the study area to be considered within the assessment.

The Highways Act (1980)

- 19.2.3 The Highways Act 1980 gives Local Authorities the necessary powers to apply to the Secretary of State (SoS) to divert or stop up public footpaths or bridleways as necessary. This may be due to the PRoW not being used or because it is expedient to divert the path. This may be the case for new highways that cross a PRoW and diversion is required.

Public Rights of Way (Combined Orders) (England) Regulations (2008) / Public Rights of Way (Combined Orders) (England) Amendment

- 19.2.4 The above legislation has been updated by the Public Rights of Way (Combined Orders) (England) Regulations 2008 and Public Rights of Way (Combined Orders) (England)

(Amendment) Regulations 2010. This Act provides access to all public rights of way, where some public rights of way are also open to horse riders, cyclists and motorists.

National Planning Policy Framework

19.2.5 The National Planning Policy Framework (NPPF) states that encouragement should be given to solutions that support reductions in greenhouse gas emissions and reduce congestion. The proposed new crossing has the primary aim of reducing congestion, and will thereby support reduced greenhouse gases and pollutants.

19.2.6 With particular reference to transport, paragraph 32 of the NPPF advises that:

“All developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether:

- The opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;*
- Safe and suitable access to the site can be achieved for all people; and*
- Improvements can be undertaken within the transport network that cost effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe.”*

19.2.7 Whilst the proposed scheme is not ‘development’ which itself generates trips, it will cause traffic reassignment around the town which requires assessment.

National Policy Statement for National Networks

19.2.8 The National Policy Statement for National Network (NPS), January 2015, sets out the need for, and Government’s policies to deliver, development of nationally significant infrastructure projects (NSIPs) on the national road networks in England. The NPS works to complement the overall strategic aims of the NPPF.

19.2.9 The Government, therefore, sets out its vision and strategic objectives for the national road network in the NPS, which are as follows:

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

- Networks with the capacity and connectivity and resilience to support national and local economic activity and facilitate growth and create jobs;*
- Networks which support and improve journey quality, reliability and safety;*
- Networks which support the delivery of environmental goals and the move to a low carbon economy; and*
- Networks which join up our communities and link effectively to each other”.*

19.2.10 The NPS highlights the need for development of the national road network and delivers the above aims in the context of Government policy for economic performance, environment, safety, technology, sustainable transport, accessibility and journey reliability. The national road network connects towns, cities and regions and there is a critical need to address

congestion issues to provide safe and resilient networks. The pressure on this network is predicted to increase as the long term drivers for demand to travel, GDP and population, are also forecast to increase.

The National Infrastructure Plan

- 19.2.11 The National Infrastructure Plan was published in 2014 and is based on the principle that high quality infrastructure boosts productivity and competitiveness, allowing businesses to grow and enabling them to reach suppliers, deepen labour and product markets, collaborate and innovate, and attract inward investment.
- 19.2.12 Hence, the Plan recognises the role of Government in funding improvements to the Strategic Road Network (SRN) and aims to transform the nation's road network over the next 25 years. Furthermore, local roads which are not a component of the SRN, are also crucial to the successful operation of the transport system. Local authorities are responsible for managing, maintaining and improving the overall local road network. The Government provides financial support for road maintenance and renewal schemes, and supports investment in new local transport schemes through Growth Deals, allocating Local Growth Fund through Local Enterprise Partnerships.
- 19.2.13 This support was fulfilled in spring 2016, when the then Prime Minister, David Cameron, pledged £73.39m of funding towards the construction of the proposed crossing.

19.3 Methods of Assessment

Technical Guidance Documents

- 19.3.1 The following guidance documents have been considered in this assessment:
- Department for Communities and Local Government (DCLG)/Department for Transport (DfT) Guidance on Transport Assessment (2007);
 - DCLG National Planning Policy Framework (2012);
 - DCLG National Planning Practice Guidance (2014);
 - Environmental Management (IEMA) has prepared Guidelines for the Environmental Assessment of Road Traffic (Guidance Note. 1); and
 - DMRB Volume 11, Environmental Assessment.
- 19.3.2 A Preliminary Transport Assessment (PTA) (included in Appendix 19A), which assesses the impact of the proposed scheme on the capacity of highway infrastructure, has been scoped with SCC and key stakeholders. A TA will be completed and appended to the ES.
- 19.3.3 This PEIR will consider all information available at the time of writing, with further assessments to be provided within the ES.
- 19.3.4 Desk studies and site visits have been undertaken to identify key features of the existing road and pedestrian/cycle networks in the vicinity of the proposed scheme and to obtain data on existing collision rates and identify existing public transport services.
- 19.3.5 The reassignment of traffic onto the proposed scheme will be taken from the strategic model, which is a dynamic assignment model utilising data on route choice and driver behaviour built in SATURN.

- 19.3.6 The SATURN model used to forecast future travel demand and traffic flows and has been constructed and validated in line with WebTAG criteria. WebTAG is national guidance for undertaking transport studies and required for all projects that require government approval. Use of the model within this PTA is therefore considered valid and appropriate means to assess the impact on traffic.
- 19.3.7 The majority of data will be available from the strategic model for the area with traffic surveys completed at key junctions and links surrounding the proposed scheme to supplement the model data available. The strategic model was used to support the OBC, which was scrutinised by the Department for Transport (DfT) prior to funding approval and Programme Entry status of the scheme being confirmed. The forecast years of assessment were agreed with the Department for Transport and the Suffolk County Council Development Manager.
- 19.3.8 An initial assessment of the impact of the redistribution of traffic on local junctions has been completed using appropriate software (JUNCTIONS8 and LINSIG) at the individual junctions, to determine where any additional mitigation is required based on Ratio of Flow to Capacity (RFC) results, delays and expected queue lengths.
- 19.3.9 The assessments include scenarios which take into account traffic growth associated with planned and committed development with the vicinity of the scheme and across Lowestoft. Future traffic flows are forecast using appropriate DfT-approved software, and junction performance has been assessed using appropriate software.
- 19.3.10 In the design of the capacity of junctions, designers seek to achieve a ratio of flow to capacity (RFC) below 0.85 (for non-signalised junctions) and 0.9 (for signalised junctions), the theoretical capacity of traffic passing through a junction being 1.0. This is reflected in Table 19-6 which assigns a 'large' magnitude of change for any junction with a RFC above 0.9. Table 19.4 also provides a summary of the significance of effects that are proposed for each aspect of the assessment, based upon the relationship of the magnitude of impact of each assessment criteria to the assessed sensitivity of each receptor.
- 19.3.11 This chapter also considers the impact of the proposed scheme against the following, in accordance with IEMA and DMRB Guidance:
- Severance (including new pedestrian severance from community facilities and relief from severance for pedestrians);
 - Driver stress and delay;
 - Pedestrian and cyclist amenity, journey times and delay;
 - Collisions and safety;
 - Fear and intimidation; and
 - Views from the road.
- 19.3.12 It should be noted that the construction traffic associated with the development will also be subject to an interim Code of Construction Practice (CoCP) which will be submitted with the ES.
- Severance (including new pedestrian severance from community facilities and relief from severance for pedestrians)*
- 19.3.13 Severance is the perceived division that can occur within a community (See Figure 19.3) when it becomes separated by a major traffic route. The assessment of severance pays full regards to specific local conditions, in particular the location of pedestrian routes to key local facilities

and whether crossing facilities are provided or not. Several factors are considered in determining the existing level of severance. These include: road width, traffic flow and composition, vehicle speed and the availability of pedestrian crossing facilities.

19.3.14 The IEMA guidelines suggest that a 30%, 60% and 90% increase in traffic flows have a slight, moderate and substantial change in severance respectively. Severance can be associated with residents, local employees, motorists, cyclists or pedestrians.

New Severance

19.3.15 Pedestrian and cycle connectivity is an important to enable journeys to be made on foot or by bicycle. Using DMRB criteria (DMRB Volume 11, Section 3, Part 8, Chapters 5, 6 and 8) new severance is described using a three point scale: slight, moderate or severe, as shown below in Table 19.1.

Table 19.1 – DMRB Magnitude Criteria, New Severance

Magnitude of Impact	Criteria
Slight	<ul style="list-style-type: none"> • Pedestrian at-grade crossing (located at carriageway level) of a new road carrying below 8,000 vehicles per day (Average Annual Daily Traffic (AADT)); or • A new bridge will need to be climbed or a subway transverse; or • Pedestrian journeys increased by 250-500m
Moderate	<ul style="list-style-type: none"> • Two or more of the hindrances set out under 'slight' applying to single trips; or • Pedestrian at-grade crossing of a new road carrying between 8,000-16,000 vehicles per day (AADT) in the opening year; or • Journeys will be increased by 250-500m
Severe	<ul style="list-style-type: none"> • Pedestrian at-grade crossing of a new road carrying 16,000 vehicles per day (AADT) in the opening year; or • An increase in length of journeys of over 500m; or • Three or more of the hindrances set out under 'slight' or two or more set out under moderate

Relief from Existing Severance

19.3.16 The assessment will consider the extent of relief that can be gained from a reduction in traffic on the existing road network on the opening year of the proposed scheme (2022). Reductions in traffic flows as a result of the proposed scheme should be considered across the wider network as the implementation of a new crossing intends to take traffic away from the two other existing crossings. Relief from severance is not considered significant where traffic flows are relatively low and DMRB guidelines do not apply when the Annual Average Daily Traffic (AADT) is less than 8,000 vehicles. Where traffic flows are greater than 8,000 AADT the approach provided by IEMA has been used in this Assessment.

Driver Stress and Delay

19.3.17 Using criteria in DMRB Volume 11, Section 3, Part 9, Chapters 3 and 4, driver stress has three main components:

- frustration;
- fear of potential accidents; and
- uncertainty relating to the route being followed.

- 19.3.18 The assessment of driver stress has been based on the traffic and road conditions likely to be encountered and the certainty of the route for travellers.
- 19.3.19 Frustration can be caused by a driver's inability to drive at speed consistent with his or her wishes. Frustration increases as speed falls in relation to expectation and may be due to high flow levels, intersections, roadworks, or difficulties in overtaking.
- 19.3.20 The main factors leading to fear are the presence of other vehicles, inadequate sight distances, and the likelihood of pedestrians stepping into the road. Fear is highest when speeds, flows and the proportion of heavy vehicles are all high.
- 19.3.21 Evidence suggests that drivers make a compensatory reduction in their speed where conditions increase the risk of an accident.
- 19.3.22 Overall driver stress will be assessed according to a three point descriptive scale: low, moderate or high.
- 19.3.23 Traffic delays to non-development traffic can occur:
- At the proposed scheme entry points where there will be additional turning movements;
 - On the highways passing the site where there may be additional flow; and
 - At key junctions on the local highway network.
- 19.3.24 The proposed scheme is not a 'development' that will generate trips, but will instead create a reassignment of trips throughout the town. The impact of those reassigned trips will be considered to determine whether there is a detrimental impact on driver stress and delay.
- 19.3.25 Values for delay are based upon computer junction assessment programs: LinSig for signalised junctions; JUNCTIONS8 for roundabouts and for priority junctions. JUNCTIONS8 has been utilised within the PTA (Appendix 19A).
- Pedestrian and Cyclist Amenity, Journey Times and Delay*
- 19.3.26 The importance of walking and cycling in contributing towards sustainable travel patterns is outlined in the NPPF, which places focus on the roles that walking and cycling can play as both the main modes of transport or as part of a longer journey by public transport. The IEMA guidance broadly defines amenity as "*the relative pleasantness of a journey, and is considered to be affected by traffic flows, traffic composition and pavement width/separation from traffic*".
- 19.3.27 An indicative threshold for changes in pedestrian amenity are where traffic flows are halved or doubled. The traffic flow reductions predicted by the SATURN model will be reviewed in the final TA and ES to assess the changes in pedestrian amenity across all bridges following the construction of the proposed scheme.
- 19.3.28 The IEMA guidelines recommend that rather than to rely on thresholds for pedestrian and cycle delay the assessor should use judgement to determine whether there will be a significant impact.
- 19.3.29 Increases in traffic levels as a consequence of a development are likely to lead to increased delay to pedestrians and cyclists wishing to cross roads. The degree of pedestrian and cycle delay therefore corresponds to the level of severance.
- 19.3.30 The assessment has involved identification of the existing network of public rights of way (PRoW), other NMU routes and the road network likely to be affected by the proposed scheme.

- 19.3.31 NMU routes which have been included in the assessment were identified from OS mapping. PRow routes which have been included in the assessment were identified from the SCC PRow definitive map (see Figure 19.2)
- 19.3.32 Diversion lengths have not been assessed at this PEIR stage although a full assessment will be provided within the ES.
- 19.3.33 Using guidance from DMRB Section 3, Part 8, Chapters 2 and 3 and professional judgement, changes to journey lengths will be calculated for road links where traffic flows on an existing road increase or decrease by 30% or more or where journeys are diverted. The effects of the following changes will be identified and a descriptive assessment on the effects to all users provided:
- journey routes;
 - journey lengths;
 - journey times; and
 - the potential number of people affected.
- 19.3.34 Impacts to amenity are assessed by qualitatively describing the perceived changes to the relative pleasantness of a journey. This is determined by the views afforded to travellers along an NMU route and any exposure to traffic which would potentially affect travellers in respect of fear / safety, noise pollution and air quality.
- 19.3.35 The number and type of paths impacted will be noted, with any changes to amenity value reported, i.e. where there would be an increase, decrease, or no change in amenity value. Where a decrease is reported this is considered an adverse impact on the amenity of the route.
- 19.3.36 In accordance with the DMRB guidance in Volume 11, Section 3, Part 8, Chapter 4, the assessment undertaken is subjective, qualitative and based on the likely perception of change to the individual experience.

Collisions and Safety

- 19.3.37 The IEMA Guidelines state that an assessment of road safety on the highway network should be undertaken based on recent collision records. Personal Injury Collision (PIC) data has been obtained for the study area from STATS19 Road Safety Data for a 5 year period to the end of December 2015 and is summarised later in the baseline conditions section of this PEIR chapter.

Fear and Intimidation

- 19.3.38 A further impact that traffic may have on pedestrians is fear and intimidation. This impact is dependent on the volume of traffic, its HGV composition and its proximity to people and/or lack of protection caused by factors such as narrow pavement widths.
- 19.3.39 The IEMA guidelines suggest thresholds based on 18-hour daily flow and vehicle speeds, as shown in Table 19.2.

Table 19.2 – Fear and Intimidation Thresholds

Degree of Hazard	Average traffic flow over 18-hour day (veh/hr)	Total 18-hour HGV flow	Average speed over 18-hour day (mph)
Extreme	1800+	3000+	20+
Great	1200-1800	2000-3000	15-20
Moderate	600-1200	1000-2000	10-15

Views from the Road

19.3.40 The assessment of views from the road has involved understanding how the extent to which travellers would be able to perceive the landscape would vary with the relative level of the road, surrounding topography and vegetation. ‘Travellers’ in this section can be defined as pedestrians, cyclists and vehicle drivers. The categories used in assessing this have been derived from DMRB guidance and are as follows:

- minimum change to view as the road is slightly widened;
- no view - road in very deep cutting or contained by earth bunds, environmental barriers or adjacent structures;
- restricted view - road in frequent cuttings, or with deep cuttings across slopes, with frequent environmental barriers or adjacent structures blocking the view;
- intermittent view - road generally at grade but with shallow cuttings, environmental barriers or structures at intervals; and
- open view - road generally at grade or on embankment with views extending over the wider landscape or only restricted by existing landscape features.

19.3.41 In addition to the ability of the traveller to see the view, the assessment must take into consideration the route type, landscape character and the quality of the view experienced. Table 19.3 provides definition of the category of the view from the road for vehicle travellers.

Table 19.3 – DMRB Magnitude Criteria, Views from the Road

Magnitude of Impact	Criteria
High	Travellers are exposed to views of high quality landscape/ townscape or an area of unique landscape/townscape character. Views may have features of particular interest or quality, or distinctive attractive landscape features.
Medium	Travellers are exposed to views of moderate quality landscape / townscape, which may include views of some features of moderate interest
Low	Travellers are exposed to views of low quality landscape/townscape and/or unremarkable landscape character/ townscape. Views may include detractors or features which are inconsistent with an area of higher quality or character.

Affected Parties

19.3.42 The groups or locations which may be sensitive to change in traffic conditions are identified below:

- Local residents and employees;
- Sensitive groups including children, elderly and disabled;
- Sensitive locations e.g. hospitals, churches, schools, historical buildings;
- Pedestrians and cyclists;
- Open spaces, recreational sites, shopping areas;
- Sites of ecological/nature conservation value; and
- Sites of tourist/visitor attraction.

19.3.43 The above list will be considered in relation each of the assessment criteria within the ES.

Significance of Effects

19.3.44 The IEMA Guidelines states: “detailed environmental impact studies will normally only be triggered where road links experience change in traffic level greater than 30% or 10% where links contain sensitive interest”.

19.3.45 The former is considered relevant to the proposed scheme.

19.3.46 Table 19.4 identifies the magnitude of change (in percentage terms) in traffic flows and its effect (negligible, small, medium and large).

Table 19.4 – Magnitude of Change of Traffic and Effects

Magnitude of Change	Impact
Exceeding the road’s traffic capacity or a junction with a predicted flow ratio greater than 0.9	Substantial
Change in total traffic, HGV or hazardous load flows more than 90%	Substantial
Change in total traffic, HGV or hazardous loads flows of 60% to 90%	Moderate
Change in total traffic, HGV or hazardous load flows of 30% to 60%	Slight
Change in total traffic, HGV or hazardous load flows of less than 30%	Negligible

19.3.47 Table 19.5 provides a summary of the significance of effects that are proposed for each aspect of the assessment. This is based on the relationship of the magnitude of impact of each assessment criteria to the assessed sensitivity of each receptor. A major and moderate effect is seen as significant in EIA terms. A minor or negligible effect is seen as not significant.

Table 19.5 – DMRB Magnitude Criteria (incorporating IEMA impact ratings), Significance

Importance / sensitivity of resource of receptor	Magnitude of Impact (Adverse / Beneficial +/-)			
	Substantial	Moderate	Slight	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

19.4 Baseline Environment

19.4.1 This section examines the existing transport conditions within the vicinity of the proposed scheme. The study area is shown in Figure 19.1.

Strategic Road Network

19.4.2 The SRN in England is managed by Highways England and within the study area includes the existing A47 Bascule Bridge, and the A47 to Great Yarmouth to the north of the Bascule Bridge.

19.4.3 Between the A47 Bascule Bridge and Ipswich to the south, the A12 is managed by Suffolk County Council. Access to the A12 from the proposed scheme is approximately 0.25km to the south-east, via the A12 Tom Crisp Way / Horn Hill Roundabout.

Local Highway Network

- 19.4.4 To the south of the proposed scheme is the B1531 Waveney Drive/ Victoria Road, which forms the main east-west route on the south side of Lake Lothing. It is a wide single carriageway road, with good forward visibility, with a 30mph speed limit.
- 19.4.5 The C909 Denmark Road runs along the northern boundary of the proposed scheme and forms the east-west route on the north side of Lake Lothing. It feeds into the C971 Peto Way at the North Quay Retail Park to the west, and the A47 to the east, adjacent to Lowestoft railway station. The carriageway is narrow where residential parking exists between Hervey Street and Trafalgar Street.
- 19.4.6 The A146 is a main distributor road in Oulton Broad which connects with numerous other ‘A’ and ‘B’ roads to provide access across Suffolk and Norfolk. From the location of the proposed scheme, A146 is accessible via B1531 Waveney Drive / Victoria Road and is subject to a 30mph speed limit within the boundaries of the town.
- 19.4.7 The A1117 is a main distributor road that provides a direct connection between the A12 and A47. From the location of the proposed scheme, A1117 is accessible via B1531 Waveney Drive / Victoria Road. It is subject to a 30mph speed limit from Mutford Lock through to Peto Way, and thereafter 40mph until A47 Yarmouth Road.

Baseline Traffic Data

- 19.4.8 A summary of the existing, and historic, two-way traffic flows from DfT data sources in the study area is shown in Table 19.6.

Table 19.6 – Existing and Historic Two-way Traffic Flows in the Study Area

DfT Traffic Count Site	Average Annual Daily Traffic Flow				
	2011	2012	2013	2014	2015
A1117 Bridge Road (S)	20,501	20,251	20,177	20,031	19,853
A1117 Bridge Road (N)	26,146	25,844	25,734	25,912	25,645
A1117 Normanston Drive	7,892	7,807	7,804	8,035	8,214
A1144 St Peter's Street	14,421	14,267	14,269	14,709	15,044
A12 Katwijk Way	6,757	6,673	-	-	-
A12 Pier Terrace (Bascule Bridge)	15,794	15,609	16,728	17,228	17,613

Public Transport Network

- 19.4.9 Buses in Lowestoft are mainly operated by First Norfolk & Suffolk and Anglian Bus providing public transport in and around the town. The bus services cover the main corridors through the town, with all routes serving the town centre from outer lying areas. There is a good quality bus interchange located approximately 1km east of the proposed scheme, at Lowestoft railway station. Lowestoft Bus Station is located on Gordon Road, approximately 1.5km from the proposed scheme.
- 19.4.10 The nearest bus stops to the proposed scheme are located on Denmark Road to the north, the B1531 Waveney Drive to the south and the A12 Horn Hill to the east. Bus Route 101 is the most frequent service along these roads, stopping at the B1531 Waveney Drive bus stop approximately every 20 minutes, Monday to Friday.
- 19.4.11 Lowestoft railway station is a terminus on the Wherry Line from Norwich and the East Suffolk Line from Ipswich, located approximately 850m from the proposed scheme.

19.4.12 During the extended AM peak period (0700-1000), there are four services that depart from Lowestoft to Norwich, and two services departing for Ipswich. In the extended PM peak period (1600-1900), there are three services that depart to Norwich, and three departing for Ipswich. The approximate journey time on the stopping service between Lowestoft and Norwich is 45 minutes and 1 hour and 30 minutes between Lowestoft and Ipswich.

Pedestrian Network

19.4.13 There is a good provision of existing pedestrian routes in the proximity of the proposed scheme with continuous footways or wide shared use facilities on either side of the highways to the north (Denmark Road) and south of Lake Lothing (Riverside Road and B1531 Waveney Drive).

19.4.14 On the two existing crossing points over Lake Lothing, the A47 Bascule Bridge to the east and Mutford Lock to the west, there are continuous footways on either side of the carriageway, with a shared cycle / footway on the eastern side of the A47 Bascule Bridge. The footways are relatively narrow and, particularly at the A47 Bascule Bridge, the provision is inadequate to cater for the high number of pedestrians in the summer months. In addition to this, there is a separate pedestrian and cycle bridge directly to the west of Mutford Lock.

19.4.15 However, the Lake itself creates a severance issue for pedestrians with only the two crossing points at either end of the town.

19.4.16 No PRow is directly intersected or impacted by the proposed scheme although two PRow are located within the 500m of the scheme (see Figure 19.2).

Footpath 021

19.4.17 This footpath runs in an east-west direction north of Peto Way and provides access around Leathes Ham. A controlled signal allows for users to cross Peto Way and access Leathes Ham and a footbridge provides a crossing point over the railway line near the northern most point of Lake Lothing.

Footpaths 028 and 044

19.4.18 These two footpaths are located to the south east of the proposed scheme boundary beyond the A12 Tom Crisp Way roundabout. They are considered together due to how they connect together and due to their short length.

19.4.19 Footpath 028, approximately 150m long, runs south from the A12 Tom Crisp Way roundabout that connects Horn Hill and Belvedere Road before it connects into Footpath 044. Footpath 044 runs between Mill Road and Salisbury Road for approximately 340m.

Other pedestrian routes

19.4.20 The area surrounding the proposed scheme, both north and south of the lake, are provided with a network of pedestrian footpaths alongside the highway. Pedestrian footpaths are located on Denmark Road, Peto Way, Riverside Road and Waveney Drive as well as along other roads leading into Lowestoft town centre and through the surrounding residential areas.

Cycle Network

19.4.21 Lowestoft's wider cycle network comprises sections of National Cycle Network Route 517 and the Regional Cycle Network, as well as other signposted on-road cycle routes, advisory cycling routes and some traffic free cycle routes. Similarly to pedestrians, Lake Lothing provides limited opportunities for cyclists to make north-south connections within the town. There is

adequate provision for cyclists to the west of the town centre in the form of a shared use pedestrian / cycle bridge to the west of Mutford Lock, and a shared use footway / cycleway on the eastern footway on Mutford Lock itself. The A47 Bascule Bridge to the east of the town has no specific provision for cyclists and the three-lane tidal flow system means that the road lane widths are narrow and create a poor environment for cyclists.

Community facilities

- 19.4.22 The movement of vehicles and NMUs to community facilities is presently severed by Lake Lothing and Figure 19.3 shows those community facilities surrounding Lake Lothing. These include religious buildings, medical and educational facilities.

Personal Injury Collisions

- 19.4.23 Personal injury collisions (PIC) data for the Lowestoft area was obtained from STATS19 Road Safety Data from the five year period between January 2011 and December 2015. In total, there were 115 injury collisions across the junctions assessed within the PTA in Appendix 19A, There were no fatal collisions, 20 severe PICs and 95 slight PICs during the five year period. More detailed accident analysis can be found within Section 3 of the PTA.

19.5 Predicted Impacts

Construction Phase

- 19.5.1 Kier Infrastructure have advised, at this preliminary PEIR stage, that there could be a peak of approximately 220 two-way traffic movements per day during the construction phase split between the northern compounds and a southern compound. This preliminary construction traffic volume would include staff travel, cars, LGVs and HGVs (see section 6.6).
- 19.5.2 Assuming 220 vehicles are split with 50% north and south of the Lake (accessing each compound in Figure 6.6), there could be 110 construction vehicles movements on the local highway network on either side of Lake Lothing per day.
- 19.5.3 A level of construction traffic movements of circa 220 per day on the local highway network will not require a detailed assessment as it will not constitute a change in traffic of greater than 30%.
- 19.5.4 Due to the current level of predicted construction traffic movements, an assessment against the categories set out in 19.1.5 is not currently proposed, but will be reviewed in the production of the ES.

Operational Phase

- 19.5.5 This section considers the impact of the proposed scheme upon the baseline conditions during the operational phase. The results presented in this PEIR are preliminary, and are subject to change due to refinement through detailed assessments for submission in the ES and TA. The change in traffic flows as a result of the introduction of the new crossing, and the associated reassignment of traffic are shown by comparing the Do Minimum (without scheme) traffic flows with the Do Something (with scheme traffic flows) in Table 19.7 and Table 19.8⁴³.

⁴³ Subject to change in final TA and ES

Table 19.7 – Do Minimum vs Do Something Peak Hours Traffic Flows (AM and PM)

Road	AM Peak (08:00-0900)		PM Peak (17:00-18:00)	
	Do Minimum (without scheme)	Do Something (with scheme)	Do Minimum (without scheme)	Do Something (with scheme)
A12 Pier Terrace (Bascule Bridge)	2197	1244	2579	1506
A1117 Bridge Road (Mutford Lock)	2026	1195	2262	1507
New Bridge	N/A	1934	N/A	1945
Waveney Drive (Between Waveney Crescent)	614	664	649	669
A12 Tom Crisp Way	1307	1764	1394	1913
Kirkley Run	247	230	574	535
Normanston Drive (Between Peto Way and Gorelston Road)	1343	808	1422	1075
Peto Way (Between New bridge and Normanston Drive)	699	1040	985	1336
Rotterdam Road (Between Denmark Road and Normanston Drive)	329	901	416	898
Battery Green Road	1097	873	1486	1249
A47 Jubilee Way	1035	834	1414	1184
A1144 St. Peter's Street	667	781	628	720
A47 Foxburrow Hill	1535	1488	1797	1810
Peto Way (Between Park Meadows and Somerleyton Road)	953	1079	946	1038
Denmark Road (Between Katwijk Way and Trafalgar Street)	471	99	616	190
A12 Katwijk Way	729	358	572	410

Table 19.8 – Percentage Change in Traffic Flow

Road	AM Peak (08:00-0900)	PM Peak (17:00-18:00)
A12 Pier Terrace (Bascule Bridge)	-43%	-42%
A1117 Bridge Road (Mutford Lock)	-41%	-33%
New Bridge	N/A	N/A
Waveney Drive (Between Waveney Crescent)	8%	3%
A12 Tom Crisp Way	35%	37%
Kirkley Run	-7%	-7%
Normanston Drive (Between Peto Way and Gorelston Road)	-40%	-24%
Peto Way (Between New bridge and Normanston Drive)	49%	36%
Rotterdam Road (Between Denmark Road and Normanston Drive)	174%	116%
Battery Green Road	-20%	-16%
A47 Jubilee Way	-19%	-16%
A1144 St. Peter's Street	17%	15%
A47 Foxburrow Hill	-3%	1%
Peto Way (Between Park Meadows and Somerleyton Road)	13%	10%

Road	AM Peak (08:00-0900)	PM Peak (17:00-18:00)
Denmark Road (Between Katwijk Way and Trafalgar Street)	-79%	-69%
A12 Katwijk Way	-51%	-28%

19.5.6 An initial assessment of junction capacities for this PEIR has been undertaken for junctions identified during the scoping process and this is presented within the Preliminary TA (Appendix 19A). The results comparing the Do Minimum (without scheme) and Do Something (with scheme) model scenario are summarised in Appendix 19B.

Junction capacity analysis

19.5.7 The junction capacity analysis for the indicative scheme opening year (Appendix 19B) indicates that whilst a small number of junction arms operate above the 90% flow to capacity ratio⁴⁴ in the Do Minimum (without scheme) scenario, such as at Junction 5: Belvedere Road / Kirkley Rise, Junction 10: A1117 Bridge Road / Victoria Road roundabout and Junction 11: A1117 Normanston Drive / Gorleston Road roundabout, the introduction of the scheme in the Do Something scenario, sees junction operational efficiency at these junctions improve, and all then fall below the 0.9 flow to capacity ratio, which is the threshold for a 'large effect' in Table 19.4

19.5.8 The only junction which experiences a reduction in capacity, above the 0.9 RFC threshold, as a result of the scheme being in place, is Junction 8, with Tom Crisp Way Southbound and Blackheath Way Westbound arms approximating a 0.93 flow to capacity ratio. Mitigation of these effects will be considered further in the TA.

19.5.9 An update to the SATURN model has been recently completed, which will supersede the modelling that supports the assessment in this PEIR. Based upon a preliminary review of the updated model a greater volume of traffic is reassigning to the new bridge from the existing bridges compared to the previous model which supported the OBC. Consequently it has been necessary to increase highway capacity at both the northern and southern roundabouts and this has been achieved through increasing the roundabout sizes to a greater area of land than was noted at the Scoping stage (Appendix 7A). This preliminary analysis based on the new SATURN model has not been included in the Preliminary Traffic Assessment in Appendix 19A which as noted earlier is based on the SATURN model that supported the OBC but traffic flow data is shown in Plate 19-1.

19.5.10 To provide sufficient capacity, the design of the southern roundabout requires the closure of Durban Road at the junction with Waveney Road. Initial capacity analysis suggests that this junction will operate satisfactorily although further assessments will be provided in the full TA and ES. The TA will assess the implications of closing Durban Road at its intersection with Waveney Drive, although given the relatively low level of flows associated with this road, the reassignment of traffic is unlikely to have a significant impact on the affected junctions.

⁴⁴ presented as Ratio of Flow to Capacity (RFC) or Degree of Saturation (DoS) depending upon software used

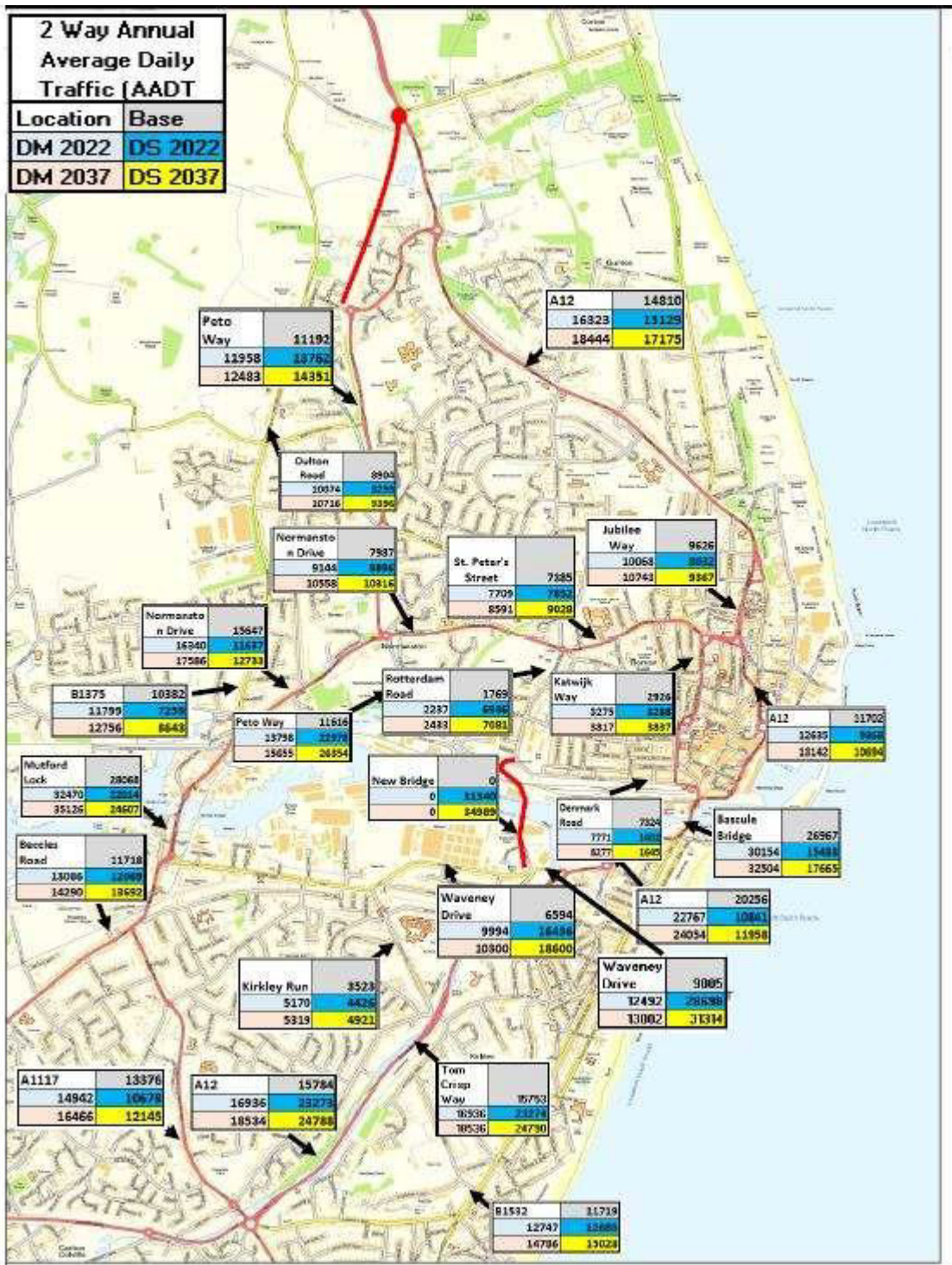


Plate 19-1 – AADT flows from the update to the SATURN model

Severance (including new pedestrian severance from community facilities and relief from severance for pedestrians)

19.5.11 The IEMA guidelines suggest that only increases in traffic flow as a result of a development or scheme in excess of 30% or more are likely to result in increased severance. The increase in traffic on Rotterdam Road falls into the large effect category, with all other increases in the small or negligible category. The majority of roads see a decrease in traffic flow which generates positive benefits for severance. These changes and any potential mitigation will be considered in the TA and presented in the ES.

- 19.5.12 The junction modelling shows that overall the local highway network will operate with less congestion, and therefore less delay during the AM and PM peak hours. The implementation of the scheme has a beneficial impact on the local highway network.
- 19.5.13 A microsimulation model will be produced to assess the consequences of the opening of the proposed scheme on queuing and delay in close proximity to the proposed bascule bridge. The results of the microsimulation modelling will be provided in the TA and ES.
- 19.5.14 It is predicted that severance will be greatly reduced as a result of the implementation of the proposed scheme. An increase in vehicle movements will occur on a few of the roads closest to the new bridge, but it is not considered that communities will be severed by this increase.

New Severance

- 19.5.15 New severance, as assessed against DMRB criteria (see 19.3.15), is unlikely for the town of Lowestoft as a result of the proposed scheme. As discussed in Chapter 6 the proposed scheme incorporates measures to support pedestrians and cyclists to use the new crossing. The inclusion of segregation will likely encourage pedestrians to use this route and therefore not act as a hindrance or deterrent to journeys north and south of the lake
- 19.5.16 Benefits are likely to be experienced by pedestrians and cyclists as a result of the proposed scheme as the new crossing will provide improved access to the north and south of Lake Lothing. This includes accessing community facilities, shops and schools. Additional crossings points have been proposed for locations on both the north and south of the lake which intend to further support access to facilities and amenities, as shown in Figure 6.4. Crossings points have been proposed for Rotterdam Road to the north and three to the south of Lake Lothing.
- 19.5.17 Further assessment will be undertaken and published in the ES to further assess the effect, although at this stage the effect upon new severance is likely to be positive.

Relief from Existing Severance

- 19.5.18 A reduction in traffic congestion is likely to occur as a result of the installation of the proposed scheme in the opening year. It is likely people will be encouraged to make journeys to the north and south of Lake Lothing as the proposed scheme will alleviate traffic congestion and additional journey time associated with the current highway network in Lowestoft. Once in operation, the proposed scheme will act to reduce congestion on the local network including the other bridges currently in operation, namely Mutford Lock and A47 Bascule Bridge.
- 19.5.19 Traffic data simulating AADT flows in a 'Do Minimum' and a 'Do Something approach', thus providing evidence to support an assessment of whether the new scheme is providing relief from severance and the magnitude of such changes, is shown in Table 19.9. Table 19.9 shows the result of the AADT flows and presents them as a percentage change in one column whilst assigning a magnitude of change in another in accordance with IEMA guidelines. In accordance with the guidance, roads with an existing AADT of fewer than 8,000 vehicles are excluded from the assessment.
- 19.5.20 The anticipated relief from existing severance is demonstrated in Table 19.9

Table 19.9 – Relief from Existing Severance

Road	DM 2021	DS 2021	% Change	Magnitude Change
Peto Way	11,907	13,588	-12.37%	Negligible
Oulton	10,040	8,017	25.23%	Negligible

Road	DM 2021	DS 2021	% Change	Magnitude Change
A12	16,214	15,084	7.49%	Negligible
Normanston Drive	9,222	8,626	6.91%	Negligible
Jubilee Way	10,004	10,675	-6.29%	Negligible
Normanston Drive (S)	16,579	11,326	46.38%	Slight Beneficial
B 1375	11,859	6,945	70.76%	Moderate Beneficial
Peto Way (S)	13,855	22,276	-37.80%	Slight Adverse
A12	12,553	9,184	36.68%	Slight Beneficial
A47 Bascule Bridge	30,394	14,661	107.31%	Substantial Beneficial
A12 (SE)	22,937	10,382	120.93%	Substantial Beneficial
Waveney Drive	9,912	15,249	-35.00%	Slight Adverse
A12 (S)	17,071	22,925	-25.54%	Negligible
A1117	14,990	10,452	43.42%	Slight Beneficial
Beccles Road	13,127	11,792	11.32%	Negligible
Mutford Lock	32,874	21,257	54.65%	Slight Beneficial
B1532	12,693	12,441	2.03%	Negligible

Driver Stress and Delay

- 19.5.21 During operation of the proposed scheme it is likely that levels of driver frustration will be reduced as it will provide an alternative route to cross Lake Lothing.
- 19.5.22 It is likely that there will be a beneficial impact upon driver stress as a consequence of the proposed scheme although the degree of benefit will be presented in the ES.

Pedestrian and Cyclist Amenity, Journey Length and Delay

- 19.5.23 It is anticipated that the number of pedestrian and cycle journeys on the network in the vicinity of the new bridge will increase, however taking into account the new connections between the north and south of the town, the overall impact for pedestrians and cyclists is expected to be beneficial. There will be a benefit to the pedestrian and cycle environment around the A47 Bascule Bridge (where there is already a significant pedestrian presence) created by the reduction in vehicles as a result of the redistribution of traffic to the proposed scheme. An analysis will be carried out in the TA and presented in the ES.
- 19.5.24 It is considered that the proposed scheme will positively impact the pleasantness of journeys on foot or by bicycle, by introducing an alternative crossing route over Lake Lothing, which will reduce journey times for many users through more direct routings, and will encourage pedestrian and cycling trips where previously distances were too long. Furthermore, expected reduction in vehicle traffic along existing crossing routes over Lake Lothing will be beneficial for pedestrians and cyclists using these routes.
- 19.5.25 The impacts of the proposed scheme on the PRow network will be reviewed within the ES.

Changes in Amenity

- 19.5.26 Amenity change relating to the proposed scheme will vary dependent on the road utilised by travellers. Peto Way will see an increase in traffic as vehicles divert to the new crossing which will increase travellers' awareness of traffic.
- 19.5.27 Other roads that will see an increase in traffic flows as a result of the proposed scheme include Rotterdam Road, Waveney Drive, St. Peter's Street, and the A12. Other major roads have been estimated to have reductions in traffic flows and are therefore likely to experience an increase in amenity.

Journey Length

- 19.5.28 During the operational stage the proposed scheme is likely to benefit travellers as the new crossing provides an additional crossing point over Lake Lothing, reducing travelling time and reducing the length of journeys.
- 19.5.29 Users are likely to benefit from better access to community facilities as a result of the proposed scheme (Figure 19.3). Access to Lowestoft hospital, retirement homes and religious facilities will be improved as the new crossing offers an alternative and in some cases more direct route. The overall impact of the proposed scheme is therefore likely to be positive, although the degree of improvement has not been assessed at this present time.
- 19.5.30 Using DMRB guidance and professional judgement, changes to journey lengths will be provided in the ES that will accompany the DCO application. These journey lengths will be assessed for road links where traffic flows on an existing road increase or decrease by 30% or more or where journeys are diverted. The effects of the following changes will be identified for these roads and a descriptive assessment on the effects to all users provided:
- journey routes;
 - journey lengths;
 - journey times; and
 - the potential number of people affected

Collisions and Safety

- 19.5.31 The PTA (Appendix 19A) assesses the latest five year collision record and concludes that the increased level of traffic is unlikely to give rise to an increase in collisions on the local highway network. It is likely that there will be beneficial effects from the proposed scheme in relation to reduced collisions/enhanced safety. A full analysis will be completed within the TA and presented in the ES.

Fear and Intimidation

- 19.5.32 The increase in traffic associated with the operational phase of the proposed scheme will be considered in greater detail in the TA and presented in the ES, however it is considered that any impacts are likely to be beneficial.

Views from the Road

- 19.5.33 The view from the road is likely to be limited to the Zone of Visual Influence as identified in Figure 10.2 which shows the view of HGVs upon the proposed bridge. It is noteworthy that this view will be an 'open view' as defined by the DMRB given that it will be a view restricted largely by existing landscape features rather than features of the proposed scheme.

- 19.5.34 Given the short time period that vehicles will be travelling on the proposed scheme it is unlikely that there will be opportunities for prolonged views, although cyclists and pedestrians will be able to appreciate the view of Lake Lothing for a greater duration. The proposed scheme will allow a view of Lake Lothing and its industrial surroundings from a new perspective and a view from the road assessment will be included in the ES.

19.6 Mitigation Measures

Mitigation Measures During Construction

- 19.6.1 Details of access to the site during construction will be provided within the ES, along with details of the traffic management required, the profile and quantum of expected construction traffic, and the duration of the construction period. The assessment of the impact of this traffic will be reviewed in conjunction with the noise assessment for the proposed scheme.
- 19.6.2 These details will also be included within an interim Code of Construction Practice (CoCP), and a Construction Traffic Management Plan (CTMP).
- 19.6.3 The interim CoCP will include details of the restrictions and controls (e.g. route and parking) of construction vehicles (including HGVs and contractors' vans / cars). These measures will form a key part of the full CoCP and will be agreed with the Highway Authority in advance of commencement of works. Further information regarding the mitigation required during construction will be provided in the TA and ES.

Mitigation Measures – Operational Phase

- 19.6.4 The impacts of the implementation of the proposed scheme on the local highway network in terms of junction capacity are considered in detail within the PTA (Appendix 19A) and in the junction capacity assessment tables (Appendix 19B). There should not normally be a requirement for the proposed scheme to mitigate the impacts of future development, for which separate, individual planning applications including mitigation of impacts would be required. Mitigation will be provided by the proposed scheme to ensure that junctions will operate within theoretical capacity in the future year with the scheme operational. Further information regarding the mitigation for the operational phase of the development will be provided in the ES.

Residual effects

- 19.6.5 The changes in daily traffic during the operational phase of the completed development is anticipated to be negligible where traffic increases on the highway network within the study area, and beneficial where traffic decreases, other than on the roads immediately surrounding the new crossing. After mitigation, including enhanced junction capacities and provision of additional footways/cycleways, the completed development is expected to have a permanent beneficial effect on: severance (including new pedestrian severance from community facilities and relief from severance for pedestrians); driver stress and delay; pedestrian and cyclist amenity, journey times and delay; collisions and safety; fear and intimidation; and views from the road.

19.7 Summary, Conclusions and Effects

- 19.7.1 Lake Lothing and the railway line sever the north and south communities of Lowestoft and severely restrict movement of traffic, buses, pedestrian and cyclists. This severance generates longer, less direct, less efficient journeys, and due to the restricted number of lake crossing points: at Mutford Lock to the west of the town; and the Bascule Bridge in the east around the town centre, traffic becomes congested and queuing forms emanating from these “pinch points”.
- 19.7.2 This traffic congestion and queueing is severely exacerbated by the opening of the bridges (the bridges open to allow both commercial port vessels and leisure craft to pass), particularly if this coincides with the morning and evening peak periods of travel demand.
- 19.7.3 Apart from the transport problems caused by the constraints of the lake and railway line, other baseline transport conditions are adequate, with a reasonable provision of public transport, walking and cycling infrastructure and services.
- 19.7.4 The proposed scheme mitigates the effects of these pinch points on the network and constraints to north/south movements of traffic and people, particularly at the A47 Bascule Bridge, to reduce traffic congestion and severance, and to improve travel journey times on the strategic highway and local roads.
- 19.7.5 The proposed scheme has therefore been tested, and the impacts of it assessed within a PTA (Appendix 19A). This assessment, which has included analysis of the capacity and operation of a range of junctions across the town, concluded that the proposed scheme has a positive effect on transport and the traffic operation of Lowestoft and the wider strategic highway network, improving operational performance (queuing, congestion, and journey times).
- 19.7.6 The capacity of existing junctions in the vicinity of the proposed scheme has been assessed to ensure they can accommodate the increase in traffic associated with traffic re-routing to the new bridge. Amendments to their layout will be proposed in the TA and included in the ES, if required, to mitigate the impact of the proposals. In addition, the northern and southern roundabouts connecting the new infrastructure have been designed to allow them to operate efficiently and within acceptable design standards, both at the time of scheme opening, and fifteen years after in the ‘design year’.
- 19.7.7 Following the assessments of the proposed scheme that will be submitted with the DCO, it is likely that the overall impact on: severance (including new pedestrian severance from community facilities and relief from severance for pedestrians); driver stress and delay; pedestrian and cyclist amenity; journey times and delay; collisions and safety; fear and intimidation; and views from the road will be beneficial and permanent. The proposed scheme is not anticipated to create any significant residual impacts that are severe in the context of paragraph 32 of the NPPF.

19.8 Assessments still to be undertaken

- 19.8.1 Chapter 19 of the ES will summarise the findings of the TA and will focus on likely significant environmental effects on users of the highway network including:
- Assessing the impact of, and need for mitigation for, construction traffic movements on all users;

- Assessing the impact of the proposed scheme once complete and operational on all users; and
- Provide information on transport conditions both before and after the proposed scheme is built, including changes in relative accessibility of the local area by foot, bicycle, and public transport.

19.8.2 These assessments, where applicable, will be based upon an update to the Strategic Traffic Model which is currently being finalised.

19.8.3 A microsimulation model will be produced to assess the consequences of the opening of the proposed scheme on queuing and delay in close proximity to the bridge. The results of the microsimulation modelling will be provided within the final TA appended to the ES

20 Cumulative Effects

20.1 Scope of the Assessments

Introduction

- 20.1.1 This chapter presents the findings of the Cumulative Effects Assessment (CEA) of the proposed scheme on the receiving environment during both the construction and operational phases. It is supported by Figure 20.1. It should be read in conjunction with Appendix 11C, the Habitats Regulation Screening Assessment, which considers the cumulative effects of the scheme upon internationally designated ecological sites and therefore cumulative effects upon these sites is not considered further in this chapter.
- 20.1.2 The focus of this CEA is to assess potential cumulative effects of the proposed scheme interacting with other developments as a result of multiple actions on receptors and resources over time which are generally additive or interactive. This assessment has been based upon: *Cumulative Effects Assessment Advice Note 17v4 (see 1.2.24)*.
- 20.1.3 Although the term cumulative is not defined in either the EIA Directive or the 2009 Regulations, the DMRB in Volume 11, Section 2, Part 5 identifies two types of cumulative impact:
- the combined action of different environmental topic-specific impacts upon a single resource/receptor, which are termed ‘in combination’ effects (synergistic); and
 - the combined action of a number of different projects, cumulatively with the project being assessed, on a single resource/receptor, which are termed ‘cumulative’ effects (additive). This can include multiple impacts of the same or similar type from a number of projects upon the same receptor/resource.
- 20.1.4 Cumulative impacts considered here can be defined as impacts resulting from incremental changes caused by other past, present or reasonably foreseeable developments together with the proposed scheme.
- 20.1.5 As requested by PINS, in Advice Note 17v4, assessments of interrelationships between topics (e.g. ecology and hydrology) will be assessed as part of specialist topic chapters and presented in the ES.

Study Area

- 20.1.6 The study area for the assessment has been determined following consideration of the likely significant effects that could reasonably arise from the projects that have been considered alongside the proposed scheme. The location of these projects is shown in Figure 20.1.

Limitations

- 20.1.7 This chapter of the PEIR provides preliminary information as it relates to the proposed scheme to date and to data currently available and gathered at this point of the assessment process.
- 20.1.8 The information contained herein is intended to inform consultation responses at this stage. A more detailed assessment of potential significant impacts as a result of the proposed scheme on identified sensitive receptors will be undertaken at subsequent stages to inform the Environmental Statement (ES).
- 20.1.9 Any gaps in information identified at this PEIR stage will be considered and addressed along with specific mitigation measures as part of the assessments for the production of the ES.

20.2 Directives, Regulations and Relevant Policy

EU EIA Directive

- 20.2.1 The EIA Regulations implement the EU Directive “*on the assessment of the effects of certain public and private projects on the environment*” (usually referred to as the EIA Directive) for the Planning Act (2008) regime.
- 20.2.2 Schedule 3 paragraph 14 of the EIA Regulations, which refers to the selection criteria for screening Schedule 2 development, states that ‘*the characteristics of the development must be considered having regard, in particular, to... (b) the cumulation with other development*’.

Infrastructure Planning (EIA) Regulations 2009

- 20.2.3 In relation to inclusion within an ES, Schedule 4, states that a description of likely significant effects ‘*should cover the direct effects and any...cumulative...positive and negative effects of the development*’.

NPS for National Networks

- 20.2.4 The NPS states that the SoS should take into account ‘*potential adverse impacts, including any longer term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts*’. The Examining Authority should consider how significant cumulative effects and the interrelationships between effects might as a whole affect the environment, even though they may be considered on an individual basis with mitigation measures in place.

Communities and Local Government; Pre-Application Guidance

- 20.2.5 This guidance identifies the nature of projects that should be within a CEA. They include a hierarchy of projects which are:
- In the process of being built;
 - Permitted applications, but not yet implemented;
 - Submitted applications, but not yet implemented;
 - Projects on the National Infrastructure’s programme of projects;
 - Identified in the relevant local plan (recognising that much information will be limited); and
 - Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is likely to come forward.
- 20.2.6 The guidance also identifies that impacts may not be fully assessed due to a lack of information and in such a situation a pragmatic approach to what is feasible and reasonable should be undertaken.

20.3 Methods of Assessment

- 20.3.1 At the scoping stage a list of ‘other developments’ was collated based upon information available from WDC, SCC, PINS and the MMO. This list of proposed developments to be considered in the assessment of cumulative effects was compiled through searches of local authority planning portals for planning applications; a review of allocated and proposed sites

in local plans; and direct consultation with local authorities whose areas are predicted to be affected by the proposed scheme.

20.3.2 The response by the SoS within the Scoping Opinion (Appendix 7B) noted the selection the six projects and no further projects were identified by the SoS, although the SoS recommended that the list is updated as appropriate during the preparation of the application.

20.3.3 It is noteworthy that, since the scoping stage, the Riverside Road Local Development Order (LDO) has expired and therefore is not considered further in this assessment. The remaining five projects outlined in the Baseline Environment (Section 20.4) therefore form the basis of the CEA.

The CEA Process

20.3.4 Advice Note 17v4 sets out a four stage approach to present the outcomes of the CEA, Table 20-1 below illustrates these four stages.

Table 20-1 – The CEA Stages

CEA Stage	Main Activities
Stage 1 – Establishing a Zone of Influence (Zoi) for the proposed scheme and identifying a long list of 'other development',	Identifying a long list of 'other development' that is proposed in the vicinity of the proposed scheme.
Stage 2 – Identify a shortlist of 'other development'.	Identifying the nature of the 'other development' and assessing whether there is the potential for significant cumulative effects.
Stage 3 – Information gathering	Collation of information on the 'other development' identified at Stage 2
Stage 4 - Assessment	Review each of the 'other developments' in turn to assess whether cumulative effects may arise. Mitigation measures should be identified in relation to adverse cumulative effects.

20.3.5 Rejected planning applications that are not subject to appeal were not considered as their implementation is not considered to be reasonably foreseeable.

20.3.6 The assessment will consider the capacity of environmental resource and receptors to accommodate changes that are likely to occur. This includes the duration, extent, type (additive or synergistic), frequency, value and resilience of the receptor and likely mitigation.

20.3.7 When considered in isolation environmental effects of a single resource or receptor may not be significant. However when individual effects are considered in combination the resulting cumulative effect may be significant.

Significance of Effects

20.3.8 The significance of the effect is formulated as a function of the receptors or a resources' environmental value (or sensitivity) and the magnitude of the project impact. Advice Note 17v4 states "*The significance criteria used to assess likely cumulative effects should consider the capacity of environmental resources and receptors to accommodate changes that are likely to occur. The terminology used to determine significance should be explicit and ensure a clear understanding of the outcome of the CEA.*"

20.3.9 The generic significance of effects matrix that is presented in Chapter 7 will be used for the CEA. Significance will then be identified using the criteria within Table 20-2 which is derived from the DMRB.

Table 20-2 Determining Significance of Cumulative Effects

Significance category	Typical descriptors of effect
Severe	Effects that the decision-maker must take into account as the receptor/resource is irretrievably compromised
Major	Effects that may become key decision making issue
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant
Not significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change

Study Area

- 20.3.10 Advice Note 17v4 states that the ‘*scale and nature of NSIPs will typically dictate a broad and temporal zone of influence (ZOI) for an NSIP*’. For individual environmental topics the ZOI is defined by relevant institutional guidelines which are discussed within each respective chapter. However, in determining a ZOI for ‘other developments’ that could give rise to cumulative effects when interacting with the proposed scheme it will be necessary to consider each development on a case-by case basis. A desk study was completed to examine and record permitted developments that as a result of *scale and nature* or *temporal scope* may cause a cumulative effect.
- 20.3.11 Considerations for temporal scope has included construction, operation and decommissioning programs to establish whether there is overlap and any potential for interaction. As project programmes continue to develop, this will be kept under review and presented in the ES.
- 20.3.12 The scale and nature of developments identified within the ZOI is included if it is considered that interactions between developments and the proposed scheme could result in a cumulative effect.

20.4 Baseline Environment

- 20.4.1 The five projects that form the basis of this cumulative assessment are shown in Figure 20.1 providing perspective on their geographical position in relation to one another and to the proposed scheme. These projects are as follows:
- East Anglia Array;
 - Sizewell C Nuclear Power Station;
 - Sanyo Development Site;
 - Brooke Peninsula and Jeld Wen Development; and
 - Lowestoft Tidal Barrier.
- 20.4.2 The East Anglia Array is a wind farm development that consists of four phases:
- East Anglia One was granted development consent in August 2017. Construction of this project is not expected to overlap with the proposed scheme;
 - East Anglia THREE was granted development consent in August 2017. The Environmental Statement submitted with the application states that “Construction of

the proposed East Anglia THREE project...would commence between 2020 and 2025⁴⁵; and

- East Anglia Two and East Anglia ONE North – applications for development consent are due in Q1 2019 and 2020 respectively, while EIA Scoping is planned for both projects in November 2017⁴⁶. Until that information is published, no details on the construction programme is available.

20.4.3 At this PEIR stage therefore, only a cumulative assessment with the East Anglia Three project is presented.

20.4.4 In November 2016, the Secretary of State issued a Scoping Opinion for the proposed Norfolk Vanguard Offshore Windfarm. That report notes that offshore construction is not proposed to commence until 2023, although landfall ducts could be installed from 2022, however this connection is to Necton, some 70km northwest of Lowestoft⁴⁷. In June 2017, the Secretary of State issued a Scoping Opinion for the proposed Norfolk Boreas Offshore Windfarm. That report notes that offshore and onshore construction is not proposed to commence until 2024, and therefore will not coincide with the proposed scheme⁴⁸.

20.4.5 The former, part of the Lowestoft Flood Risk Management Project aims for completion in 2020/21⁴⁹. While the programme for Sizewell C is to be confirmed, the Stage 2 consultation suggests a peak (or middle) construction year of 2024 for the 7-9 construction period⁵⁰.

20.4.6 Brooke Peninsula and Jen Weld and Sanyo Development Site both have planning permission.

20.4.7 The Lowestoft Tidal Barrier and Sizewell C Nuclear Power Station are both in pre-application stage at the time of this PEIR assessment.

20.4.8 For the avoidance of doubt, these five are presented in this CEA as proposed projects whereas any reference to the proposed scheme continues to refer to the Lake Lothing Third Crossing.

20.4.9 Table 20-3 below provides information that has been sourced to date on the five projects and identifies whether it is appropriate to progress the assessment to stages 3 and 4 (as outlined in Table 20-1). To inform the assessment the table includes information on the following, which is recommended in CEA Advise Note 17v4:

- Project type;
- Description of project;
- Distance from proposed scheme; and
- Likely cumulative impacts.

⁴⁵ Paragraph 17 - https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN_010056/EN010056-000432-6.1.5%20Volume%201%20Chapter%205%20Description%20of%20Development.pdf

⁴⁶ PINS website, accessed 9th August 2017

⁴⁷ Paragraph 2.27 <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-000018-Scoping%20Opinion.pdf>

⁴⁸ Paragraph 2.38- 2.39 <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010087/EN010087-000013-Scoping%20Opinion.pdf>

⁴⁹ http://www.lowestoffrmp.org.uk/media/1087/2017_01-lfrmp-newsletter-winter.p

⁵⁰ http://sizewell.edfenergyconsultation.info/wp-content/uploads/2016/11/EDF_SZC_Stage2_ConsultationDoc_sfw.pdf

- 20.4.10 Information collated in Table 20-3 below was extracted from a multitude of sources including, *inter alia*: Scoping Reports, Environmental Statements, Environmental Reports, Consultation Reports and Sustainability Appraisals.
- 20.4.11 The environmental aspects considered in Table 20-3 below have been limited to the potential cumulative impacts associated with employment, traffic and construction impacts upon air quality and noise. All other environmental aspects have been excluded from the assessment for the PEIR stage as the size and temporal scope of the proposed scheme was deemed to have limited or no interactions with environmental aspects of other developments, aside from those discussed in specific discipline sections. This will be revisited at the ES stage.
- 20.4.12 The assessment of operational traffic has been excluded from this CEA because operational traffic from the Tidal Barrier, the East Anglia THREE and Sizewell C projects is unlikely to adversely affect the highway network in the study area for the proposed scheme. The traffic model that the operational air quality, noise, traffic and water environment assessments will be based upon (and presented in the ES) includes the Sanyo and Brooke Yachts and Jeld Wen development and hence cumulative effects arising from these projects will be presented in their respective chapters in the ES.
- 20.4.13 Each of the five projects was taken forward into assessment Stage 3 and 4 as each is considered to be large enough or in close enough proximity to have the potential to cause cumulative impacts.

Table 20-3 – Information sourced to date on the projects

Application Reference	Applicant for 'other development' and brief description	Distance from Project	Status	Within ZOI?	Potential significant effect?	Progress to Stage 3/4?
East Anglia THREE	East Anglia THREE comprises up to 172 turbines generating up to 1200MW to be built in up to two phases.	70km east to offshore windfarm, 55km south to landfall at Bawdsey	Development Consent granted on 7 th August 2017	Yes	Employment, construction traffic (if Port of Lowestoft is used)	Yes
Sizewell C Nuclear Reactor	EDF Energy proposes to build, operate and decommission a new nuclear power station comprising two UK European Pressurised Reactors in Sizewell, Suffolk The proposed development is expected to have an electrical capacity of approximately 3,260 megawatts (MW) when operational	Approx. 30 km	Pre-application stage	Yes	Employment, construction traffic	Yes
Sanyo Site (DC/15/2004 /RG3)	Outline application for up to 252 residential units and associated infrastructure. The site is located adjacent to Brooke Peninsula and Jeld Weld site.	Less than 1km	Application granted 22 nd January 2017	Yes	Employment and construction effects on traffic, air quality and noise	Yes
Brooke Peninsula and Jen Weld Development (DC/13/3482 /OUT)	Planning application for the demolition of the existing industrial units and residential-led mixed use redevelopment for residential use (use class C3) of up to 850 dwellings or 950,000 sqft (whichever is the greater), up to 1774sqm commercial (use classes A1-A5), marina building (sui generis), 1.5 form entry primary school, together with associated infrastructure including a new spine road access and open space (as amended)	Less than 1km	Application granted 17 th August 2015	Yes	Employment and construction effects on traffic, air quality and noise	Yes

Application Reference	Applicant for 'other development' and brief description	Distance from Project	Status	Within ZOI?	Potential significant effect?	Progress to Stage 3/4?
Lowestoft Tidal Barrier	The development is currently at the funding stage with an application made to the Flood Defence Grant in Aid (FDGiA)	Less than 1km	Pre-application stage.	Yes	Construction traffic, ecology and private assets (Port of Lowestoft) and construction effects on air quality and noise.	Yes

20.5 Predicted Impacts

- 20.5.1 The assessment of cumulative impacts is reliant on the availability of information relating to the identified schemes and the assessment is therefore based upon the degree of information that is available at the time of the PEIR assessment.
- 20.5.2 Should any number of projects be constructed concurrently impacts of traffic and transport have the potential to create traffic and there could also be employment impacts. For example, during construction phases projects are likely to increase the amount of traffic on the local road network, something which may cause a significant environmental effect. In terms of employment, different projects being constructed simultaneously, or which have similar construction programs, may place strain on the availability of skilled workforce, especially if developments require a workforce with similar skill sets.
- 20.5.3 Included within Table 20-4 below is the assessment of cumulative effects based upon the information available to date.

Table 20-4 – Assessment of Cumulative Effects

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
East Anglia Three	Employment, construction traffic	East Anglia THREE Limited estimates 285 construction workers will be required to construct the onshore cable route, and that between 356 and 870 jobs associated with the offshore construction would be realised at the regional level. ⁵¹	The East Anglia ONE development required the production of a Skills Strategy ⁵² in association with the	Not significant. The nature of construction of both schemes are unlikely to require a similar skill set of a significant number of construction workers at the same time. The scale of employment generated by the proposed scheme is much less than that associated with the East Anglia THREE project.

⁵¹ <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-000413-6.1.28%20Volume%201%20Chapter%2028%20Socio%20Economics%20Tourism%20and%20Recreation.pdf>

⁵² <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001866-East%20Anglia%20Three%20Limited%2030.pdf>

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
			<p>local planning authorities, the objectives of which were to:</p> <ul style="list-style-type: none"> • To utilise existing parent company skills programmes where and when possible and appropriate • To make best use of existing local and national education and skills infrastructures and add value to these where appropriate • To promote employment and re-skilling opportunities in the communities most closely associated with the development of EA ONE • To ensure the necessary balance of demand and supply of skills to support the delivery of EA ONE and leave a legacy. <p>It was considered by the Secretary of State no additional mitigation beyond this was required to address the effects of the East Anglia THREE development.</p>	
	Traffic	Additional construction traffic within the proposed scheme's study area	<p>Traffic Management Plan – albeit construction traffic routes are focussed around the cable corridor, some 55km to the south.</p> <p>Travel Plan – Requirement 28 of the DCO provides for a Port Travel Plan to be agreed with the relevant planning authority after consultation with the relevant highway</p>	Not significant. The nature of construction related traffic movements associated with the proposed project are unlikely to result in significant movements through the study area for the proposed scheme and as identified in Chapter 19, the construction traffic

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
			authority once the main port for the construction and operation of the windfarm is confirmed	associated with the proposed scheme is not a significant effect. Traffic impacts associated with the project are adequately controlled by that DCO.
Sizewell C Nuclear Reactor	Employment	It is likely that approximately 5600 people will be required during the peak construction of the scheme, with the gravity model assuming a proportion of those would come from the socio-economic study area (Lowestoft & Great Yarmouth). ⁵³	EDF proposes to produce an Economic Strategy & Skills Education and Employment Strategy to mitigate the effects of and exploit the opportunities provided by the Sizewell C development.	Not significant as the nature of construction of both schemes are unlikely to require a similar skill set of a significant number of construction workers at the same time given the staggered programmes. The mitigation proposed by that project should address the effects associated with it. The total number of people estimated to be employed by the project at peak construction is also almost 50 times greater than the proposed scheme.

⁵³ http://sizewell.edfenergyconsultation.info/wp-content/uploads/2016/11/EDF_SZC_Stage2_ConsultationDoc_sfw.pdf

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
	Traffic - construction	Traffic information provided at EDF's Stage 2 consultation indicated an assumption that 15% of HGV traffic arriving at the Sizewell C construction site would arrive from the north (i.e. north of Yoxford). A Park and Ride site is proposed at Darsham with 1,000 spaces to provide capacity for construction workers arriving along the A12 corridor, north of Darsham	<p>No mitigation is proposed for the volume of HGV movements on the A12 north, consequently it is assumed that there are no impacts requiring mitigation on this route.</p> <p>A direct bus is proposed from Lowestoft to site to mitigate the traffic movements associated with construction worker traffic.</p> <p>It is anticipated that a Traffic Management Plan and Travel Plan would be produced as part of the application</p>	Not significant. Although the scale of the Sizewell C project is substantial, it is unlikely that construction traffic associated with the proposed scheme will interact significantly with construction traffic associated with Sizewell C, based on the current understanding of likely routeing. As discussed in Chapter 19, the construction traffic from the proposed scheme is not likely to result in a significant effect.

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
Sanyo Development Site DC/15/2004/R G3, Application permitted 22 January 2016	Employment	No information regarding construction dates or the number of construction workers is available. There is the potential to create a cumulative effect with regard to recruiting construction employees	A full assessment of the availability of skilled workforce to quantify if there is likely to be a shortfall of skilled workforce	Further assessment will be conducted for the ES once a construction program / information is made available.
	Traffic	Potential traffic issues during construction phases, more information will become available once optioneering phase has been completed and further reports are released	Develop a transport strategy to control movement of HGV's on the local network to avoid specific time periods and be of appropriate size and volume for the route A Traffic Assessment will establish a worst case traffic scenario and mitigate against potential impacts.	Further assessment will be required to assess potential construction traffic issues between the project and the proposed scheme as they are located within close proximity of one another. Through consultation and the introduction of suitable mitigation it is likely that project related traffic interactions will not be significant.
	Construction; Air quality and noise	Potential for construction dust from both the proposed scheme and the project to result in a cumulative effect upon properties to the south, particularly along Waveney Drive.	The project air quality assessment identifies that construction related air quality emissions are acceptable with best practice mitigation proposals. No assessment of construction noise has been undertaken by the applicant.	It is at this preliminary stage considered unlikely that the nature of both construction operations, even if run concurrently would cause a significant effect.

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
Brooke Peninsula and Jen Weld Development (DC/13/3482/OUT)	Employment	No information regarding construction dates or the number of construction workers is available. There is the potential to create a cumulative effect with regard to recruiting construction employees	A full assessment of the availability of skilled workforce to quantify if there is likely to be a shortfall of skilled workforce	Further assessment will be conducted for the ES once a construction program / information is made available.
	Traffic	Potential traffic issues during construction phases, more information will become available once optioneering phase has been completed and further reports are released	A Traffic Assessment will establish a worst case traffic scenario and mitigate against potential impacts.	Further assessment will be required to assess potential construction traffic issues between the project and the proposed scheme as they are located within close proximity of one another. Through consultation and the introduction of suitable mitigation it is likely that project related traffic interactions will not be significant.
	Construction; Air quality and noise	Potential for construction dust from both the proposed scheme and the project to result in a cumulative effect upon properties to the south, particularly along Waveney Drive.	<p>The applicant has identified mitigation measures for air quality during construction that will reduce effects to no greater than slight adverse at the nearest residential receptor.</p> <p>With regard to noise, a construction management plan will keep noise during construction to those considered acceptable by Waveney District Council.</p>	<p>As the nearest receptors to this project are approximately half a kilometre from the proposed scheme, it is unlikely that construction air quality will lead to a cumulative effect.</p> <p>Noise during construction is unlikely to be a significant effect given the distance between the project and the proposed scheme.</p>

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
Lowestoft Tidal Barrier	Employment	No information regarding construction dates or the number of construction workers is available. There is the potential to create a cumulative effect with regard to recruiting construction employees	Not known at this stage	Not significant as the nature of construction of both schemes are unlikely to require a similar skill set of a significant number of construction workers. Further assessment will be conducted and produced in the ES.
	Construction Dust and Noise	No information relating to air quality impacts and noise emissions are available.	Not known at this stage	<p>It is considered unlikely, given the distance between the project and the proposed scheme and the nature of the construction that the respective study areas for the construction noise and dust assessment will overlap.</p> <p>Should further information on the project become available, the assessment will be incorporated within the ES.</p>
	Ecology	As raised in the Scoping Opinion, the impact upon the CWS at the Outer Harbour should be considered in cumulation between the proposed scheme and the project	Not known at this stage	<p>The proposed scheme has not identified that there are any effects upon the CWS and that birds will not be adversely affected by the proposed scheme.</p> <p>Should further information on the project become available, the assessment will be incorporated within the ES.</p>

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
	Private Assets	ABP has suggested there may be cumulative effects on the operation of the Port if the construction programmes align	Not known at this stage	As noted in Chapter 15, slight adverse temporary effects on the Port are associated with proposed scheme's construction. It is not anticipated that the navigation channel will be impinged for any length of time during the construction of the proposed scheme, there is no information in this respect with regard to the Tidal Barrier.

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
East Anglia Three	Employment, construction traffic	East Anglia THREE Limited estimates 285 construction workers will be required to construct the onshore cable route, and that between 356 and 870 jobs associated with the offshore construction would be realised at the regional level. ⁵⁴	<p>The East Anglia ONE development required the production of a Skills Strategy⁵⁵ in association with the local planning authorities, the objectives of which were to:</p> <ul style="list-style-type: none"> • To utilise existing parent company skills programmes where and when possible and appropriate • To make best use of existing local and national education and skills infrastructures and add value to these where appropriate • To promote employment and re-skilling opportunities in the communities most closely associated with the development of EA ONE • To ensure the necessary balance of demand and supply of skills to support the delivery of EA ONE and leave a legacy. <p>It was considered by the Secretary of State no additional mitigation beyond this was required to address the effects of the East Anglia THREE development.</p>	Not significant. The nature of construction of both schemes are unlikely to require a similar skill set of a significant number of construction workers at the same time. The scale of employment generated by the proposed scheme is much less than that associated with the East Anglia THREE project.

⁵⁴ <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-000413-6.1.28%20Volume%201%20Chapter%2028%20Socio%20Economics%20Tourism%20and%20Recreation.pdf>

⁵⁵ <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001866-East%20Anglia%20Three%20Limited%2030.pdf>

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
	Traffic	Additional construction traffic within the proposed scheme's study area	<p>Traffic Management Plan – albeit construction traffic routes are focussed around the cable corridor, some 55km to the south.</p> <p>Travel Plan – Requirement 28 of the DCO provides for a Port Travel Plan to be agreed with the relevant planning authority after consultation with the relevant highway authority once the main port for the construction and operation of the windfarm is confirmed</p>	Not significant. The nature of construction related traffic movements associated with the proposed project are unlikely to result in significant movements through the study area for the proposed scheme and as identified in Chapter 19, the construction traffic associated with the proposed scheme is not a significant effect. Traffic impacts associated with the project are adequately controlled by that DCO.
Sizewell C Nuclear Reactor	Employment	It is likely that approximately 5600 people will be required during the peak construction of the scheme, with the gravity model assuming a proportion of those would come from the socio-economic study area (Lowestoft & Great Yarmouth). ⁵⁶	EDF proposes to produce an Economic Strategy & Skills Education and Employment Strategy to mitigate the effects of and exploit the opportunities provided by the Sizewell C development.	Not significant as the nature of construction of both schemes are unlikely to require a similar skill set of a significant number of construction workers at the same time given the staggered programmes. The mitigation proposed by that project should address the effects associated with it. The total number of people estimated to be employed by the project at peak construction is also almost 50 times greater than the proposed scheme.

⁵⁶ http://sizewell.edfenergyconsultation.info/wp-content/uploads/2016/11/EDF_SZC_Stage2_ConsultationDoc_sfw.pdf

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
	<p>Traffic - construction</p>	<p>Traffic information provided at EDF's Stage 2 consultation indicated an assumption that 15% of HGV traffic arriving at the Sizewell C construction site would arrive from the north (i.e. north of Yoxford). A Park and Ride site is proposed at Darsham with 1,000 spaces to provide capacity for construction workers arriving along the A12 corridor, north of Darsham</p>	<p>No mitigation is proposed for the volume of HGV movements on the A12 north, consequently it is assumed that there are no impacts requiring mitigation on this route.</p> <p>A direct bus is proposed from Lowestoft to site to mitigate the traffic movements associated with construction worker traffic.</p> <p>It is anticipated that a Traffic Management Plan and Travel Plan would be produced as part of the application</p>	<p>Not significant. Although the scale of the Sizewell C project is substantial, it is unlikely that construction traffic associated with the proposed scheme will interact significantly with construction traffic associated with Sizewell C, based on the current understanding of likely routing. As discussed in Chapter 19, the construction traffic from the proposed scheme is not likely to result in a significant effect.</p>

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
Sanyo Development Site DC/15/2004/R G3, Application permitted 22 January 2016	Employment	No information regarding construction dates or the number of construction workers is available. There is the potential to create a cumulative effect with regard to recruiting construction employees	A full assessment of the availability of skilled workforce to quantify if there is likely to be a shortfall of skilled workforce	Further assessment will be conducted for the ES once a construction program / information is made available.
	Traffic	Potential traffic issues during construction phases, more information will become available once optioneering phase has been completed and further reports are released	Develop a transport strategy to control movement of HGV's on the local network to avoid specific time periods and be of appropriate size and volume for the route A Traffic Assessment will establish a worst case traffic scenario and mitigate against potential impacts.	Further assessment will be required to assess potential construction traffic issues between the project and the proposed scheme as they are located within close proximity of one another. Through consultation and the introduction of suitable mitigation it is likely that project related traffic interactions will not be significant.
Brooke Peninsula and Jen Weld Development (DC/13/3482/OUT)	Employment	No information regarding construction dates or the number of construction workers is available. There is the potential to create a cumulative effect with regard to recruiting construction employees	A full assessment of the availability of skilled workforce to quantify if there is likely to be a shortfall of skilled workforce	Further assessment will be conducted for the ES once a construction program / information is made available.

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
	Traffic	Potential traffic issues during construction phases, more information will become available once optioneering phase has been completed and further reports are released	A Traffic Assessment will establish a worst case traffic scenario and mitigate against potential impacts.	Further assessment will be required to assess potential construction traffic issues between the project and the proposed scheme as they are located within close proximity of one another. Through consultation and the introduction of suitable mitigation it is likely that project related traffic interactions will not be significant.
Lowestoft Tidal Barrier	<p>Employment</p> <p>Construction Dust and Noise</p>	<p>No information regarding construction dates or the number of construction workers is available. There is the potential to create a cumulative effect with regard to recruiting construction employees</p> <p>No information relating to air quality impacts and noise emissions are available.</p>	<p>Not known at this stage</p> <p>Not known at this stage</p>	<p>Not significant as the nature of construction of both schemes are unlikely to require a similar skill set of a significant number of construction workers. Further assessment will be conducted and produced in the ES.</p> <p>It is considered unlikely, given the distance between the project and the proposed scheme and the nature of the construction that the respective study areas for the construction noise and dust assessment will overlap.</p> <p>Should further information on the project become available, the assessment will be incorporated within the ES.</p>

Application Reference	Potential cumulative impact of 'other development'	Assessment of cumulative effect with NSIP	Mitigation proposed by the identified project's applicant	Preliminary assessment of residual Cumulative Effect
	Ecology	As raised in the Scoping Opinion, the impact upon the CWS at the Outer Harbour should be considered in cumulation between the proposed scheme and the project	Not known at this stage	The proposed scheme has not identified that there are any effects upon the CWS and that birds will not be adversely affected by the proposed scheme. Should further information on the project become available, the assessment will be incorporated within the ES.
		ABP has suggested there may be cumulative effects on the operation of the Port if the construction programmes align	Not known at this stage	As noted in Chapter 15, slight adverse temporary effects on the Port are associated with proposed scheme's construction. It is not anticipated that the navigation channel will be impinged for any length of time during the construction of the proposed scheme, there is no information in this respect with regard to the Tidal Barrier.

20.6 Conclusions and Effects

20.6.1 This CEA at this stage has concluded that adverse cumulative effects are unlikely, although conclusions have been drawn based upon the information that is available at present

20.6.2 Further assessment should be conducted to gather information including, where available, construction programmes, construction techniques and processes, and employment numbers.

20.7 Assessment still to be undertaken

20.7.1 The following will be presented in the ES:

- An update to the CEA based upon the latest knowledge of the other projects considered in this assessment and their progress towards operation; and
- A review of any new projects that may come into scope including the East Anglia One North proposal.

Consultation Report Appendix
4.8

Non-technical summary of the
PEIR

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The Lake Lothing Third Crossing, Lowestoft Development Consent Order



Lake Lothing
**THIRD
CROSSING**

Document:

Preliminary Environmental Information Report – Non-technical Summary

**Planning Act 2008 and 'The Infrastructure Planning (Environmental Impact
Assessment) Regulations 2009'**

For Consultation

Author: Suffolk County Council

Date: August 2017

1 - Introduction to proposed scheme

Suffolk County Council intends to make an application for development consent to the Secretary of State for Transport for the construction, operation and maintenance of a new bascule bridge highway crossing of Lake Lothing in Lowestoft.

If constructed, the proposed scheme would include the following:

- A new single carriageway road crossing of Lake Lothing, consisting of a multi-span bridge which comprises:
 - an opening bascule bridge over Lake Lothing, in the Port of Lowestoft;
 - a bridge over the East Suffolk Line, and reinforced earth embankment joining that bridge to the C971 Peto Way between Rotterdam Road and Barnards Way;
 - a bridge over the northern end of Riverside Road providing access to existing commercial property, and
 - a reinforced earth embankment following the alignment of Riverside Road to a remodelled junction with the B1531 Waveney Drive;
- The closure of Durban Road at its junction with Waveney Drive
- A new access road from Waveney Drive west of Riverside Road to provide access to existing property at Riverside Business Park that would otherwise become inaccessible due to changes in level on Riverside Road;
- Dedicated provision for cyclists and pedestrians which ties into existing networks;
- Associated changes, modifications and/or improvements to the existing local highway network as informed by traffic modelling. This could include improvements within the existing highway boundary to some existing junctions within the Consultation Area (as shown in Appendix B of the Statement of Community Consultation)
- Works to facilitate the construction of the above elements including:
 - Creation of temporary construction sites and accesses from the public highway;
 - Provision of new utilities and services and the diversion of existing utilities; and
 - Provision of drainage, lighting and landscaping; and
- Such ancillary, incidental and consequential changes and/or improvements as are required and permitted.



Figure 1: Photograph showing view of the proposed crossing location from the existing bascule bridge

2 - The role of the Preliminary Environmental Information Report (PEIR)

In early 2017 Suffolk County Council asked the Secretary of State for a Scoping Opinion of the proposed approach to the Environmental Impact Assessment. This identified the studies and assessments that should accompany the Development Consent Order (DCO) application in the Environmental Statement (ES) for the proposed scheme.

The PEIR presents the Environmental Impact Assessment (EIA) work that has been undertaken to date and the potentially significant environmental effects of the proposed scheme. Its conclusions are preliminary based upon the information that is available to date and are subject to change as new surveys and assessment is undertaken. Any surveys that have been identified as pending will be assessed and presented in the ES. This Non-Technical Summary provides a brief overview of the contents of the PEIR.



Figure 2: Photograph showing proposed crossing location over Lake Lothing

3 - Alternatives

Alternatives considered during the development of the proposals for the LLTC included alternative locations to the proposed alignment across Lake Lothing and structures, such as a tunnel. The adoption of the route of the proposed scheme was informed by the need to meet scheme objectives, the relative land take compared to alternative options, the scheme cost and the likely environmental effects. Within the broad alignment of the proposed scheme, alternative junction arrangements and the form of the bascule bridge itself have been considered as the scheme design has progressed.



Figure 3: Photograph showing existing bascule bridge while open

4 - Air quality

Studies on air quality to date have focused upon the potential impacts of the construction of the proposed scheme and particularly with emissions of dust. An assessment of road traffic air quality emissions during the operational phase of the proposed scheme is ongoing and will be presented within the ES.

The assessment has identified that air quality during the construction phase will not be significantly adversely affected at the nearest properties to the proposed scheme with suitable mitigation measures in place.

With regard to emissions from construction related vehicles, information provided by Kier Infrastructure on how the proposed scheme could be constructed has shown that the number of likely vehicle movements during the construction phase is unlikely to cause a significant effect.

An assessment of the preliminary traffic data has shown that traffic along the roads in the areas of Lowestoft that experience the highest nitrogen dioxide levels are forecast to fall markedly and it is therefore likely that an improvement in air quality can be expected in these locations. These areas are predominantly around the existing A47 Bascule Bridge and its approach roads.



Figure 4: Photograph showing air quality diffusion tubes



Figure 5: Photograph showing traffic queues in Lowestoft

5 - Cultural heritage

The assessment on cultural heritage has focused upon the potential impacts upon designated heritage assets, buried archaeology and the historic landscape. There are two listed buildings to the east of the proposed scheme; the Port House and the Royal Norfolk and Suffolk Yacht Club as well as the South Lowestoft Conservation Area.

Investigations are ongoing with regard to buried archaeology and trial pits that are being excavated during the ground investigation are being supervised by a qualified archaeologist. Samples will also be taken from peat and other historical geological deposits for testing to identify if evidence of archaeology is present. Studies on the historic landscape will identify the likely effect that the proposed scheme could have upon the historical setting of Lake Lothing.



Figure 6: Photograph of Lowestoft central railway station building

6 - Visual Impact and townscape character

The proposed scheme is likely to be visible from a number of locations around Lake Lothing and the wider area of Lowestoft. The assessment of visual impact has focused upon the extent to which the proposed scheme will be visible and 3D computer modelling software has been used to identify these locations. The assessment

upon townscape character has presented the character of the town of Lowestoft.

A number of proposed viewpoints have been identified from where the visual impact assessment of the proposed scheme will be undertaken. These locations have been identified as being representative of current visual receptors as well as representative of future development around the Lake.

Photomontages of the proposed scheme will be prepared from these locations and presented in the ES.



Figure 7: Plan showing the Zone of Theoretical Visibility studied for the proposed crossing

7 - Nature conservation

Studies on nature conservation have focused upon the potential impacts of the proposed scheme upon designated sites of ecological importance, habitats and protected species.

The assessment has identified, at this preliminary stage, that sites designated for their ecological importance will not be significantly affected by the proposed scheme, although further additional studies, particularly with regard to the potential disturbance of contaminated sediment, will be undertaken to confirm this.

The habitats along the route of the scheme have been, or are programmed to be, assessed for their ecological importance and potential for protected species. At this stage, the habitats identified on site have been identified as being suitable to host protected species and are not valuable for their flora.

With regard to protected species, studies and assessments have been, and continue to be, undertaken for:

- Bats;
- Reptiles;
- Invertebrates;
- Benthic species (species inhabiting the zone at the base of the lake);
- Fish; and
- Wintering and breeding bird species.

Bats have been identified as commuting within the proposed scheme corridor and studies are ongoing to identify these routes and whether the proposed scheme will cross these routes. Surveys undertaken have not identified any winter and summer roosts within the proposed scheme corridor.



Figure 8: Photograph of Leathes Ham, north of Lake Lothing



Figure 9: Photograph of Leathes Ham, north of Lake Lothing

Reptile surveys have been undertaken on land to both the north and south of Lake Lothing, and these will continue into the autumn of 2017. Reptiles have been found on grassland adjacent to the East Suffolk railway line and strimming of the vegetation prior to clearance under supervision of an ecologist would be undertaken to mitigate any negative impacts.

Bird surveys have been undertaken in both the winter and spring of 2017. This has identified a number of species that use Lake Lothing and the surrounding land, including a pair of breeding peregrine falcons on the grain silo building. However, neither the peregrines nor any other species identified to date is a constraint to the construction of the proposed scheme. Surveys are ongoing for invertebrates, fish and benthic species.



Figure 10: Photograph of a common lizard found on site

8 - Geology, soils, and contamination

The assessment of impacts upon geology, soils and contamination has identified the potential for contaminated land to be present along the proposed scheme corridor and this has informed the design of a ground investigation that is presently ongoing. The findings of this ground investigation will inform a further assessment on the degree of contamination that is present, as well as any risks to human health, ecology and groundwater that may occur during the construction of the proposed scheme. This assessment will be presented within the ES.



Figure 11: Photograph of ground investigations on site

9 - Noise and vibration

Noise and vibration assessments have focused at this PEIR stage upon the effects of construction upon residents and business near to the proposed scheme. An assessment of road traffic noise during the operational phase of the proposed scheme is ongoing and will be presented within the ES.

Background noise monitoring has been undertaken at six locations near the proposed scheme; three to the south and three to the north. These measurements have been undertaken during the day, evening and night.

Noise and vibration levels from proposed construction activities, have been used to assess the noise and vibration impact for the construction phase and mitigation has been proposed accordingly although significant effects are considered to be likely at this preliminary stage for some of the nearest residents to the proposed scheme.

With regard to noise from construction related vehicles, information provided by Kier Infrastructure on how the proposed scheme could be constructed has shown that the number of likely vehicle movements during the construction phase is unlikely to cause a significant effect.

An assessment of operational traffic noise is still to be completed, although it can be expected that there will be a fall in traffic noise on routes that experience a fall in traffic and vice versa for areas where the roads will experience an increase in traffic.



Figure 12: Photograph of a noise monitoring device



Figure 13: Photograph residential properties adjacent to the site

10 - Materials

The assessment on materials has focused on the waste that is likely to be generated during construction and the construction materials that are likely to be required and imported to site.

The assessment has identified that, at this PEIR stage, that there is likely to be sufficient waste management capacity to manage waste arisings although the nature of the material is still be confirmed as part of the ongoing ground investigation.

With regard to the use of materials, the studies have identified that the nature of the proposed scheme will not require construction materials that are not available and plentiful.



Figure 14: Photograph of existing conditions on proposed crossing location

11 - Private assets

The proposed scheme will require the acquisition of interests in, and rights over, land as well as the temporary use of land. A number of businesses in the vicinity of Riverside Road and Waveney Drive will be directly impacted, as will some residential property on Waveney Drive. There could be significant effects on these assets. The proposed scheme also affects the Port of Lowestoft, owned and operated by ABP and land owned by Network Rail and some other third parties.

SCC is in dialogue with affected parties in order to minimise the impacts where feasible and ensure that ongoing operations are compromised as little as possible. For example, the navigation channel will be maintained in Lake Lothing and a vessel simulation is being undertaken to understand the impact of the proposed scheme on port operation.



Figure 15: Image taken from vessel simulation

12 - Socio-economics and recreation/ community assets

The assessment upon socio-economics has focused upon the construction related employment that the proposed scheme is likely to require and the impacts upon the community including future access to facilities.

Information provided by Kier Infrastructure has identified that the proposed scheme is likely to require a peak of approximately 100 employees per day during construction, and that can be accommodated within the available labour force within the area.

With regard to community access, the proposed scheme will increase the opportunities for north south travel in Lowestoft hence greatly increasing access to community facilities.



Figure 16: Photograph of recreational vessels

13 - The water environment

The water environment baseline condition has been determined through desk study and site visits and surveys are proposed to obtain water quality and sediment data to further inform the baseline. Lake Lothing is an artificially modified tidal water body connected to the North Sea, which allows marine access to the upstream Oulton Broad, via Mutford Lock. Under the Water Framework Directive it has an ecological status of 'Poor' which can be attributed to its use as a harbour, both in terms of potential contamination of sediments, modifications to the channel and regular dredging regime.

A preliminary assessment of potential impacts has been undertaken which looks at construction related pollution; surface water and groundwater pollution from routine run-off; pollution from accidental spillages; changes to the patterns of erosion and deposition of sediments; groundwater flows and a Water Framework Directive Assessment. At this PEIR stage the assessments have not identified any significant effects although the assessments for routine run-off, accidental spillage and erosion/



Figure 17: Photograph of Lake Lothing looking east

deposition are dependent on data which is not yet available. These will be reported in the ES, although it is not anticipated that a significant effect will occur given the nature of the Lake Lothing environment.

14 - Flooding

The area surrounding Lake Lothing, including a large percentage of the land of the proposed scheme, is a floodplain as identified by the Environment Agency. An interim assessment of flooding impact from the proposed scheme, which has been based upon a larger bridge pier structure in Lake Lothing than what is being proposed in this consultation, has identified that the proposed scheme will lead to a small increase in existing flooding but will not lead to new flood risk elsewhere. Consultation with the Environment Agency will continue as the assessment is updated to identify the extent to which this risk is reduced through having a smaller bridge pier structure in Lake Lothing.

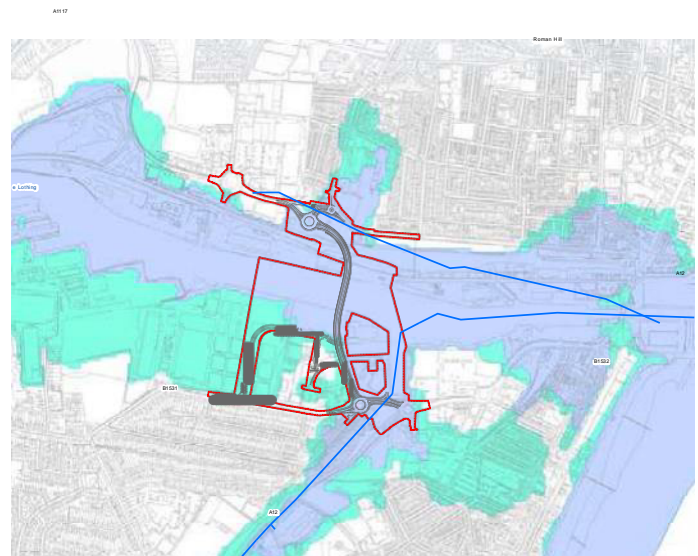


Figure 18: Plan showing the flood zone in Lowestoft this and need for mitigation.

15 - Traffic and transport

The assessment has focused upon the effect of the proposed scheme upon traffic in Lowestoft and how non-motorised users, such as pedestrians and cyclists, will be affected.

The assessment upon traffic has considered the capacity of the main road junctions that are both existing and proposed and how the proposed scheme would alter traffic flow through them. The assessment has identified that the proposed scheme would have a positive effect upon traffic flow through Lowestoft, particularly at the existing Lake Lothing crossings where there would be a reduction in flow. Some routes will however see an increase in traffic, such as Peto Way, Tom Crisp Way, Waveney Drive and Rotterdam Road, and further work will be undertaken to understand the consequences of



Figure 19: Photograph showing level crossing barriers and lighting

With regard to non-motorised users, the assessment to date has concluded that there would be significant beneficial effects upon severance due to the pedestrian and cycling infrastructure that will allow new access across Lake Lothing.

It should be noted that the assessment has been based upon traffic movement predictions that are likely to be updated for the ES and therefore the conclusions should be considered to be preliminary.

16 - Cumulative developments

The assessment has considered cumulative impacts from projects which are proposed, or consented, but not fully constructed.

Those considered are:

- East Anglia THREE; a windfarm located offshore in the north sea;
- Sizewell C Nuclear Power Station; two new nuclear reactors at the existing Sizewell facility;
- Sanyo Development Site; a residential development to the south of Lake Lothing;
- Brooke Peninsula and Jeld Wen Development; a residential and commercial mixed use development to the south of Lake Lothing; and
- Lowestoft Tidal Barrier; a proposed barrier in the outer harbour.

The assessment has considered the impact of concurrent construction upon air quality, noise, employment and traffic and no significant effects have been identified at this stage. As greater information on these projects becomes available the assessment will be updated.



Photo courtesy of Sembmarine SLP

Figure 20: Photograph wind turbine parts awaiting shipping in the Port of Lowestoft

Consultation Report
Appendix 4.9

Consultation leaflet with consultation
extension dates

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Lake Lothing

THIRD CROSSING

CONSULTATION
EXTENDED
TO 23 OCTOBER 2017

HAVE YOUR SAY

on a new crossing over Lake Lothing
from Waveney Drive to Peto Way

PUBLIC CONSULTATION

Monday 4 September - Monday 23 October 2017



 **Suffolk**
County Council

Introduction

Suffolk County Council is seeking your views on our proposals for a new crossing over Lake Lothing in Lowestoft.

The existing bridges over the lake at Mutford Lock and the A47 Bascule Bridge are inadequate to meet current and future traffic demand. Delays and congestion are a common occurrence for drivers, particularly during peak hours, and pedestrians and cyclists often have long and difficult journeys as they travel across the town.

A crossing will open up opportunities for regeneration and create a new link between north and south Lowestoft.

This new crossing presents an opportunity to introduce a focal point for the town, enhancing its identity. This will help to regenerate the area and attract new investment in the local economy.

This is a significant project for Lowestoft and it is important residents, businesses, landowners and all those affected by, or interested in, the project have their say.

THE PROPOSED PROJECT

Our proposals for the Lake Lothing Third Crossing aim to improve journeys and connectivity, help meet the aspirations for economic prosperity and provide a new feature in the town for all users to enjoy for years to come.

The project will include a new multi-span bridge from Waveney Drive to Peto Way. The bridge will be a single carriageway road with facilities for pedestrians and cyclists.

The proposed design includes new roundabouts to the north and south of the lake to help connect the traffic smoothly into the existing road network, as well as provide public spaces for people to enjoy.

Changes to the road layout include a new access from Waveney Drive to Riverside Business Park and closure of Durban Road at its junction with Waveney Drive.



ENVIRONMENTAL IMPACTS

We aim to minimise impacts on the environment, local communities, local businesses, road users and residents as much as possible.

As part of the consultation, a report called the Preliminary Environmental Information Report (PEIR) has been produced to give information about the potential environmental effects and measures to reduce them. This report and the Non-Technical Summary can be viewed online or at the consultation events.

THIRD CROSSING BENEFITS



Reduce congestion and delay on the existing bridges over Lake Lothing



Reduce congestion in town centre



Reduce community severance between north and south Lowestoft

Your Local Consultation Events

We are holding a series of events to provide an opportunity to meet the project team and ask questions. Everyone who is interested in the project is welcome to attend any of our drop-in events.

Location	Date	Time
Waveney District Council Council Offices, Riverside, 4 Canning Road, Lowestoft, Suffolk, NR33 0EQ	Friday 22 September 2017	2pm - 7pm
Commodore Mission Hall 26 Gorleston Road, Oulton Broad, Lowestoft, Suffolk, NR32 3AG	Monday 25 September 2017	2pm - 7pm
St Marks Church, Bridge Road, Oulton Broad, Lowestoft, Suffolk, NR33 9JX	Friday 29 September 2017	1pm - 7pm
Pakefield Church Hall, Pakefield Church Hall, Sunningdale Avenue, Lowestoft, Suffolk, NR33 7DB	Thursday 5 October 2017	1pm - 7pm

You can also view information at the deposit locations below during normal opening hours:

Waveney District Council Council Offices, Riverside, 4 Canning Road, Lowestoft, Suffolk, NR33 0EQ	Lowestoft Library Clapham Road South, Lowestoft, Suffolk, NR32 1DR	Oulton Broad Library Bridge Road, Lowestoft, Suffolk, NR32 3LR	Waveney District Council - Marina Customer Service Centre Marina, Lowestoft, Suffolk, NR32 1HH	Kessingland Library Marram Green, Hall Road, Kessingland, Suffolk, NR33 7AH	Suffolk County Council Endeavour House, 8 Russell Road, Ipswich, Suffolk, IP1 2BX
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 View documents and complete a questionnaire from 4 September at www.suffolk.gov.uk/lakelothing3rdcrossing



Encourage people to walk and cycle



Improve bus journey times and reliability



Reduce accidents



Open up opportunities for regeneration and development



Accommodate planned growth



Have your say

The consultation is your opportunity to express your views on the project. This consultation will run for six weeks from Monday 4 September - Monday 23 October 2017.

PLANNING APPLICATION PROCESS

The Secretary of State for Transport has directed that Lake Lothing Third Crossing is to be treated as a Project of National Significance for the purposes of the Planning Act 2008. As such, we are required to make an application for a Development Consent Order (DCO) to obtain permission to construct, operate and maintain the project.

Following the formal public consultation, we will carefully consider all responses received and produce a report on the consultation.

This report will form part of our DCO application, to the Secretary of State.

The Planning Inspectorate will examine the application and make a recommendation to the Secretary of State for Transport, who will decide on whether or not the project will go ahead.

We currently intend to make our application for development consent in early 2018.

Your comments

Between Monday 4 September, 12.01am and Monday 23 October 2017, 11.59pm you can use the following methods to respond to the public consultation:

- Go online to access the consultation documents and fill out a questionnaire at: www.suffolk.gov.uk/lakelothing3rdcrossing
- Complete a questionnaire or send other feedback to us at:
 LL3X Consultation Team
 Freepost RTUL-KAKE-BCTR
 PO Box 73943 (Lake Lothing)
 London
 EC4P 4HN
- View and pick up consultation documents and a questionnaire at Lowestoft, Oulton Broad and Kessingland Libraries, the council offices at Riverside, Waveney District Council's Marina Customer Service Centre or Suffolk County Council's Endeavour House in Ipswich.
- Attend a public consultation event and complete a questionnaire or leave one at a deposit location.

PROJECT PROGRESS



Contact the project team

Email: lakelothing3rdcrossing@suffolk.gov.uk Call: 03456 031 842 (open Mon-Fri 8.30am-6pm)

If you need help to understand this information in another language please call 03456 066 067.

Se precisar de ajuda para ler estas informações em outra língua, por favor telefone para o número abaixo. 03456 066 067

Portuguese

Jeigu jums reikia šios informacijos kita kalba, paskambinkite 03456 066 067

Lithuanian

Jabelli potrebujete pomoć u razumijevanju ove informacije u drugom jeziku zadržite na podany broj telefona. 03456 066 067

Polish

Dați ajutor pentru a înțelege această informație într-o altă limbă, vă rugăm să telefonați la numărul 03456 066 067

Romanian

এই তথ্যটি যদি অন্য ভাষাতে বুঝতে চান তাহলে দিগন্ত নম্বরে ডায়াল করুন 03456 066 067

Bengali

Если вам необходима помощь при понимании этой информации на другом языке, пожалуйста, позвоните по телефону 03456 066 067

Russian

If you would like more information in another format, including audio or large print, please call 03456 066 067.

