Northampton County Council

NORTH WEST RELIEF ROAD
Environmental Impact Assessment Scoping Report
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1 INTRODUCTION

1.1 OVERVIEW

1.1.1 Northamptonshire County Council (NCC) has commissioned the undertaking of an Environmental Impact Assessment (EIA) for the proposed Northampton North West Relief Road (NWRR) that will be located on land approximately 1.2km south-east of Church Brampton and immediately east of the Brampton Heath Golf Centre (‘Proposed Scheme’). The location of the Proposed Scheme is illustrated on Figure 1.

1.1.2 The Proposed Scheme will connect the A5199 Welford Road, via Sandy Lane, with a proposed junction located adjacent to Grange Farm, which will provide access to the future Dallington Grange Kings Heath residential development. The Proposed Scheme forms part of a wider strategy to complete the ring road around the northern sector of Northampton that will ultimately connect the A4500 Weedon Road and M1 Motorway Junction 16 to the west, with the A34 Kettering Road and Kettering to the north.

1.2 REGULATORY REQUIREMENTS

1.2.1 The Town and Country Planning (Environmental Impact Assessment) Regulations (England and Wales) 2017, referred to herein as the ‘EIA Regulations’ implement the requirements of the European Directive on EIA in England. The Proposed Scheme is not listed under Schedule 1 of the EIA Regulations and therefore the requirement of an EIA is not mandatory. However, formal EIA Screening under the EIA Regulations must be carried out if the Proposed Scheme falls under Schedule 2, paragraph 10 (Infrastructure Projects) (f) Construction of Roads and would exceed 1 hectare (ha).

1.2.2 An EIA Screening Opinion was submitted to NCC in January 2018 and a response was received on the 22nd February 2018. NCC determined that the Proposed Scheme will require an EIA and advised on the topic areas that should be covered as part of the Environmental Statement (ES), please refer to Appendix A.

1.2.3 The undertaking of an EIA will ensure that the likely significant environmental effects, both positive and negative, of the Proposed Scheme, are assessed in a systematic way which will enable the significance of these effects to be clearly understood by NCC, statutory consultees, and key stakeholders, including the local community.

1.3 ABOUT THIS DOCUMENT

1.3.1 This document is a scoping report submitted under Regulation 15 of the EIA Regulations. The scoping report complies with the structure of the Interim Advice Note 125/09 Supplementary guidance for users of Design Manual for Roads and Bridges (DMRB) Volume 11 ‘Environmental Assessment’.

1.3.2 The purpose of this report is to inform NCC, statutory consultees, and key stakeholders about the proposed scope of the EIA, the findings of which will be presented in the ES that will accompany any subsequent planning application for the Project. Whilst at this stage the final design of the Proposed Scheme is not available, a considerable amount of background studies and baseline work have been completed to inform the design. The scoping report therefore presents the following information:

- A brief description of the nature and purpose of the Proposed Scheme and of its possible effects on the environment;
- Identification of any key environmental issues and constraints associated with the Proposed Scheme that will be included in the Environmental Statement (ES) or will be scoped out; and
- The appropriate level of assessment methodology for assessing the likely significant environmental effects to be considered per topic area.
2

THE PROPOSED SCHEME
2 THE PROPOSED SCHEME

2.1 SITE CHARACTERISTICS

2.1.1 The ‘site’ is defined as the area of land considered suitable for development of the Proposed Scheme and is represented by the red boundary shown on Figure 2. The site boundary is roughly defined by the A5199 Welford Road and Sandy Lane to the north, the Brampton heath Golf Centre to the west, the River Nene to the east, and the Rugby to Milton Keynes railway line to the south.

2.1.2 The majority of the site lies at the same elevation from the north to the south, with only the section crossing the Rugby to Milton Keynes railway line increasing from approximately 65m above ordnance datum (AOD) in an upward gradient to 80m AOD. The site is situated at the lowest gradient of a valley with steep upwards gradients from the site to both the east and west.

2.1.3 The site largely consists of agricultural fields which are intersected by small areas of woodland, hedgerows, and drainage channels that feed into the River Nene. A large proportion of the site boundary sits within a floodplain associated with the River Nene and is classified as Flood Zone 3. Flood Zone 3 is defined as land with a 1% (1 in 100) or greater annual probability of flooding from fluvial (river) sources.

2.1.4 There are no statutory environmental designations within or adjacent to the site boundary. The Upper Nene Valley Gravel Pits Special Protection Area (SPA) which also has a RAMSAR designation and a designation as a Site of Special Scientific Interest (SSSI) lies approximately 6.1km to the south-east of the site boundary. It is primarily designated for its assemblages of breeding and overwintering bird assemblages. Land within the site boundary has been identified as complementary habitat for the designated site, which directly connects the site to the Upper Nene Valley Gravel Pits SPA. Kingsthorpe Local Nature Reserve (LNR) is located 1.7km south-east of the site boundary and is designated for its importance as a part of the green corridor network linking up with the Brampton Valley Way.

2.1.5 National Cycle Route 6 (connecting Watford in London with Threlkeld in Cumbria) follows an off-road (old railway line) route alongside the River Nene to the east of the site boundary. Part of the site falls within a Special Landscape Area (SLA) identified within the Daventry Local Plan 1997 Saved Policies in recognition of special environmental qualities.

2.2 PROJECT COMPONENTS

2.2.1 The Proposed Scheme comprises a new relief road measuring approximately 1 mile in length. To the north, the new relief road will connect into Sandy Lane before connecting into the A5199 Welford Road. To the south, the new relief road will connect into a new roundabout, east of Grange Farm, which will provide access to the proposed Dallington Grange residential development. The Proposed Scheme is still in the design stage and as such, the infrastructure requirements including horizontal alignment and vertical alignment are still to be confirmed.

2.2.2 The Proposed Scheme is likely to include the following engineering components:

- Dual four-lane carriageway plus shared cycle/footway each side of the road and street lighting;
- Carriageway overbridge over the Rugby to Milton Keynes railway line;
- Embankments to raise the new road through the River Nene flood plain;
- New A5199 Welford Road bridge crossing the River Nene;
- New junctions connecting into Sandy Lane and new roundabout east of Grange Farm;
- Permanent diversion of Public Footpath CC6; and
- Permanent diversion of Public Footpath HW45 onto Bridleway HW6.

2.2.3 The carriageway type and speed limits associated with the new relief road are still to be confirmed.

2.2.4 An indicative illustration of the current route alignment is shown in Figure 2.
3

APPROACH TO THE EIA AND SCOPING PROCESS
3 APPROACH TO THE EIA AND SCOPING PROCESS

3.1 INTRODUCTION

3.1.1 The EIA Regulations require an EIA to be undertaken for a specified range of major development proposals. EIA was defined in the Department of the Environment, Transport and the Regions Circular 02/99 as:

"...a means of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps to ensure that the importance of the predicted effects, and the scope for reducing them, are properly understood by the public and the relevant competent authority before it makes a decision."

3.1.2 The output of an EIA, in the form of an Environmental Statement (ES) is used to inform the decision-making process of the consenting authority. The following key stages will form part of the iterative EIA process:

- **EIA Scoping**: Consultation with statutory consultees and other stakeholders to obtain their views on the proposal; identify potential impacts; identify existing environmental information and to agree methods for the assessment of these impacts. Further information is provided in Section 3.2.
- **Baseline studies**: Identification of existing environmental conditions, receptors, and sensitivities through a review of existing information and field studies as required;
- **Design freeze**: Once the baseline information has been recorded and key receptors identified, the final Proposed Scheme will be fixed and will form the basis against which the impact assessment is measured.
- **Assessment of effects and their significance**: An assessment of the significance at local, regional, national and international scales of potential effects;
- **Mitigation**: There are three forms of mitigation which are integrated into the Proposed Scheme as part of the EIA at different stages. ‘Primary Mitigation’ refers to modifications made to the location or design of the Project during the pre-application phase that will become an inherent part of the project, and do not require additional action to be taken. ‘Secondary Mitigation’ refers to actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the ES. ‘Tertiary Mitigation’ refers to actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are standard practices used to manage commonly occurring environmental effects (e.g. considerate contractors’ practices that manage activities which have potential nuisance effects).
- **Residual effects**: Identification and reporting of residual effects after mitigation.

3.1.3 There is no required format for an ES, but it must provide the information specified in part 2 of Schedule 4 of the EIA Regulations, and as much of the relevant information in part 1 of Schedule 4 as is reasonably required to assess the effects of the Proposed Scheme and which the developer can reasonably be required to compile. Please refer to Section 3.5.

3.2 SCOPE OF THE EIA

3.2.1 Once the requirement for an EIA has been established, ‘scoping’ is the next important stage because it sets the parameters for the rest of the process. The purpose of scoping is to define environmental effects which need to be assessed as part of the EIA. This recognises that there may be some environmental aspects of the Proposed Scheme that will result in no significant effects and which does not therefore need to be considered further in the more detailed assessment phase. Elements that are likely to result in significant effects or impacts are therefore identified during scoping to be assessed in greater detail in the EIA. If the scope of the EIA is defined too narrowly, a critical area of uncertainty or an unexpected adverse effect may emerge later in the process, with potential consequences for the design and timetable for development. If the scope is defined too loosely, then time, expense and effort may be wasted on pursuing unnecessary detail.

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1 Circular 02/99: Environmental impact Assessment, Development of Communities and Local Government (DCLG), 1999
3.2.2 Careful consideration has been given to the scale and nature of the Proposed Scheme, in the context of site specific and local environmental baseline conditions. The intention has been to scope issues considered to be potentially significant into the EIA. Where a particular issue has not been included within the proposed scope of the EIA, this is not to suggest that there will be no associated effects, but rather that these will not be significant. It is hoped that all consultees can agree a focussed scope leading to a carefully considered but concise ES.

3.2.3 The environmental topic areas to be considered and the extent of the assessment work proposed for each is referred to as the technical scope. The technical scope of the EIA for the Proposed Scheme will seek to meet the requirements of the EIA Regulations. Given the nature of the Proposed Scheme, the location of the site, and the Screening Response received from NCC, the ES will describe the likely significant effects of the Proposed Scheme on the following environmental topics:

- Air quality;
- Climate change;
- Cultural heritage (including archaeology);
- Ecology and biodiversity;
- Geology and soils;
- Landscape and visual;
- Materials and waste;
- Noise and vibration;
- People and communities; and
- Road drainage and the water environment.

3.2.4 These environmental topics have been evaluated as part of this scoping exercise to determine the extent to which they should be included in the EIA, having regard to whether there are likely to be significant effects that relate to them. Section 4-13 provides further details for each environmental topic regarding the assessment approach to be applied during the EIA.

3.3 REPORTING ALTERNATIVES

3.3.1 The EIA Regulations require that the ES contains a description of ‘reasonable alternatives’ considered as part of the design process. This may include alternatives designs which are relevant to the objectives of the Proposed Scheme and its specific characteristics. The ES must report the main reasons for selecting the chosen option, including a comparison of the environmental effects. The ES will include content to:

- Identify, describe and evaluate the likely significant effects on the environment of implementing the Proposed Scheme, and reasonable alternatives considering the objectives and the geographical scope of the Proposed Scheme;
- Summarise the reasons for choosing the Proposed Scheme, in the light of the other reasonable alternatives dealt with; and
- Outline the reasons for selecting the alternatives dealt with, including a description of how the assessment was undertaken including any difficulties encountered in compiling the required information.

3.4 THE EIA ASSESSMENT METHODOLOGY

3.4.1 Once the scope of the EIA is agreed, and the necessary surveys have been completed, potential ‘effects’ will be verified and assessed by analysing the identified magnitude of change against the established sensitivity of the environmental receptor. For ease of comparison across topic areas this assessment will utilise a standard matrix and terminology, although this may not be appropriate for all topic areas.

3.4.2 The assessment will establish whether identified effects are ‘significant’ and will also make it clear whether these effects are judged to be minor, moderate, or major, and whether they are direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development. The assessment of effects will also distinguish between the construction, operational and decommissioning phases of the Proposed Scheme and where appropriate, take account of cumulative effects.

3.4.3 Each environmental topic will clearly identify mitigation measures which are an inherent part of the design of the Proposed Scheme and will establish a level of significance before and after additional mitigation or control measures that may be required to address an identified significant effect.
THE DESIGN MANUAL FOR ROADS AND BRIDGES (DMRB)

3.4.4 All aspects of the development and design of highway schemes are governed by guidance set out in the 15 volumes of the Highway England’s Design Manual for Roads and Bridges (DMRB). Guidance on the environmental assessment of highway schemes is given in Volume 11, with guidance on environmental mitigation in Volume 10. DMRB Volume 11 advises on the environmental topics to be included in an EIA, and the methods to be used in the assessment for each of those topics. The EIA of the Proposed Scheme will refer to the most up-to-date, relevant guidance contained in DMRB or as Interim Advice Notes (IANs).

CUMULATIVE ASSESSMENT

3.4.5 Cumulative impacts arise where the effects of one development combine with the effects of another, with the result that, usually, a larger (and possibly more significant) effect might arise. The EIA Regulations require the likely significant cumulative environmental effects of a development to be considered. As part of the ES, the technical assessments for each topic will consider the potential for cumulative or in-combination effects. Cumulative effects will be considered in terms of:

- The interaction and combination of environmental effects, and indirect effects of the Proposed Scheme affecting the same receptor, either within the site or in the local area; and
- The interaction and combination of environmental effects of the Proposed Scheme with committed projects and activities affecting the same receptor. Committed development is defined as a development for which planning consent has been granted.

3.4.6 There is no single widely accepted published methodology for the assessment of cumulative environmental effects. However, several best practice guidance documents are available, including those published by Department of Communities and Local Government (DCLG) and the European Commission and these will be referred to during the EIA process. The Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions provides the following guidance on cumulative effects:

“In practical terms, the extent of the assessment in terms of how far into the past and into the future will be dependent upon the availability and quality of information…it is only reasonable to consider current events and those that will take place in the foreseeable future. Furthermore, the assessment can only be based on the data that is readily available.”

3.4.7 The guidance above identifies that a cumulative impact assessment should only consider those schemes that can reasonably be presumed to go ahead and for which sufficient information is available. This is usually taken to be those schemes that have the benefit of planning permission. Cumulative effects will be considered on an issue-by-issue basis and the scope of the EIA will be expanded where necessary to include them in the assessment of each topic.

CONSULTATION

3.4.8 Under the terms of Regulation 13 (4) of the EIA Regulations, it is anticipated that NCC will consult with, at least, the consultation bodies identified in Regulation 2(1) of the EIA Regulations before issuing their Scoping Opinion.

3.4.9 Consultation with statutory and non-statutory consultees is an essential part of defining the scope as these organisations will have an important role in guiding and shaping the EIA process. It is intended that this scoping report will form the basis of discussions with many of the consultees, although consultation has already been initiated and will be maintained with key consultees throughout the development stages.

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Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, European Commission, 1999
3.4.10 At this stage, it is envisaged that, as a minimum, the following consultation bodies will be notified:

- NCC internal Officers;
- Natural England;
- Historic England;
- Archaeological advisor to the planning authority;
- Environment Agency; and
- Anglian Water.

3.5 STRUCTURE OF THE ENVIRONMENTAL STATEMENT (ES)

3.5.1 The ES would be produced in four volumes:

- Volume I: Non-Technical Summary (NTS) of the detailed ES;
- Volume II: Written Statement;
- Volume III: Supporting Technical Appendices; and
- Volume IV: Supporting Figures and Plans.

3.5.2 The written statement (Volume II) structure is likely to be as follows, subject to any changes to the scope identified through the consultation process:

- Chapter 1: Introduction;
- Chapter 2: Design evolution and alternatives;
- Chapter 3: Proposed scheme;
- Chapter 4: Environmental assessment methodology
- Chapter 5: Air quality;
- Chapter 6: Climate change;
- Chapter 7: Cultural heritage;
- Chapter 8: Ecology and biodiversity;
- Chapter 9: Geology and soils;
- Chapter 10: Landscape and visual;
- Chapter 11: Materials and waste;
- Chapter 12: Noise and vibration;
- Chapter 13: People and communities; and
- Chapter 14: Road drainage and the water environment.

3.5.3 The individual environmental topic chapters within the written statement (Volume II) will look to follow a consistent format:

- Introduction;
- Scope, assumptions, and limitations;
- Methodology;
- Avoidance and primary mitigation measures;
- Assessment of effects;
- Other (secondary or tertiary) mitigation measures;
- Summary of likely residual significant effects;
- Cumulative effects; and
- Monitoring.

3.5.4 The ES will be provided in hard copy and electronic format.
AIR QUALITY
AIR QUALITY

4

4.1 OVERVIEW

4.1.1 This chapter sets out the proposed methodology for assessing the potential effects on air quality. This will largely relate to construction dust and particulate matter which may arise during both the construction and operational phases of the Proposed Scheme.

4.2 BASELINE CONDITIONS

4.2.1 Baseline air quality information has been gathered using local monitoring data from Northampton Borough Council’s (NBC) and Defra’s Local Air Quality Management (LAQM) continuous monitoring network, Defra’s background mapping, and Defra’s Pollution Climate Mapping (PCM) model.

4.2.2 Indicative meteorological conditions have been taken from Coventry Airport for 2016. The data was provided as a wind rose showing prevailing wind direction and speed.

LOCAL ENVIRONMENT

4.2.3 The potential impacts of the Proposed Scheme will be considered in relation to sensitive receptors. Of importance to the Proposed Scheme are Air Quality Management Areas (AQMA), residential properties, and ecological receptors.

NORTHAMPTON BOROUGH COUNCIL AQMA

4.2.4 NBC currently has seven AQMA declared. All AQMA were declared for the exceedance of the annual mean objective of Nitrogen Dioxide (NO2).

4.2.5 Of the seven AQMA declared by NBC, Harborough Road (declared 2008) and, to a lesser extent, St James (declared 2005) are the most at risk of impact from the Proposed Scheme (both through the redistribution of traffic across the network). The Harborough Road AQMA lies just over 2 km south east of the Proposed Scheme. The AQMA runs along the A508 Harborough Road, from the junction with Kingsthorpe Grove to just north of Broughton Green Rd.

LOCAL EMISSION SOURCES

4.2.6 Within the local vicinity of the Proposed Scheme, current emissions sources are from vehicular traffic on the A508 Harborough Road and A5199 Welford Road east of the site. Emission sources may also include Lodge Farm Industrial Estate located to the south west of the site.

BACKGROUND AIR QUALITY DATA

4.2.7 The background pollutant concentrations were taken from Defra’s national modelling. In Table 1, the concentrations are well below the relevant objectives for PM10, PM2.5, and NO2, and it is predicted that they will improve over time. This is the result of a predicted overall reduction in emissions from all emission sources from all sectors, both in the UK and in Europe. Defra's mapped data also include information on the contribution from different emissions sectors e.g. industry, roads etc. For the purposes of this study, the data presented contains contributions from all sources, to give a complete picture of the modelled air quality at the Proposed Scheme.

<table>
<thead>
<tr>
<th>Year</th>
<th>Nitrogen Oxides NOx</th>
<th>Nitrogen Dioxide NO2</th>
<th>Particulate Matter PM10</th>
<th>Particulate Matter PM2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>18.3 – 27.8</td>
<td>13.3 – 19.3</td>
<td>13.8 – 18.9</td>
<td>9.6 – 13.3</td>
</tr>
<tr>
<td>Objective</td>
<td>30µg/m³ *</td>
<td>40µg/m³</td>
<td>40µg/m³</td>
<td>25µg/m³</td>
</tr>
</tbody>
</table>

Note: * Objectives set for the protection of ecosystems and under UK regulations do not apply in urban areas.
4.2.11 Background concentrations are low near the Proposed Scheme. They increase in the urban area but remain well within the objectives. Background concentrations of nitrogen dioxide were well within the objective and averaged 15.4 µg/m³ across the site and diffusion tube locations. Particulate matter (as PM10 and PM2.5) background concentrations are well below the objective of 40 µg/m³ and 25 µg/m³ respectively, with averages of 17.0 µg/m³ and 11.7 µg/m³ across the area.

**LOCAL AIR QUALITY MONITORING DATA**

4.2.12 Air quality across Northamptonshire is currently good, although pockets of poor air quality exist. NBC has undertaken monitoring across each of its seven active AQMAs, as well as some monitoring outside of these AQMA near the site.

4.2.13 Of the monitoring undertaken, the sites within the Harborough Road AQMA (the nearest to the scheme site) provide the highest concentrations. Table 2 sets out the monitored concentrations at the various sites between 2012 and 2016.

<table>
<thead>
<tr>
<th>Site Id</th>
<th>Distance to Kerb (m)</th>
<th>Site Type</th>
<th>Annual Mean NO₂ Concentration (µg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barrack Rd 2</td>
<td>3.0</td>
<td>Roadside</td>
<td>37.7</td>
</tr>
<tr>
<td>Kingsley Rd</td>
<td>7.0</td>
<td>Roadside</td>
<td>32.4</td>
</tr>
<tr>
<td>Abington Grove</td>
<td>3.0</td>
<td>Roadside</td>
<td>44.5</td>
</tr>
<tr>
<td>ARUN (Spring Park) 1</td>
<td>N/A</td>
<td>Urban Background</td>
<td>-</td>
</tr>
<tr>
<td>ARUN (Spring Park) 2</td>
<td>N/A</td>
<td>Urban Background</td>
<td>-</td>
</tr>
<tr>
<td>ARUN (Spring Park) 3</td>
<td>N/A</td>
<td>Urban Background</td>
<td>-</td>
</tr>
<tr>
<td>Harborough Rd 2</td>
<td>3.0</td>
<td>Roadside</td>
<td>37.2</td>
</tr>
<tr>
<td>Harborough Rd 3</td>
<td>8.0</td>
<td>Roadside</td>
<td>35.1</td>
</tr>
<tr>
<td>Harborough Rd 4</td>
<td>3.0</td>
<td>Roadside</td>
<td>41.8</td>
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<td>Harborough Rd 5</td>
<td>4.0</td>
<td>Roadside</td>
<td>45.7</td>
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<td>Harborough Rd 6</td>
<td>2.0</td>
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<td>47.1</td>
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<td>Harborough Rd 7</td>
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<td>43.4</td>
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<td>Harborough Rd 8</td>
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<td>Roadside</td>
<td>59.7</td>
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<td>Harborough Rd 9</td>
<td>4.0</td>
<td>Roadside</td>
<td>56.6</td>
</tr>
<tr>
<td>Harborough Rd 10</td>
<td>2.0</td>
<td>Roadside</td>
<td>40.8</td>
</tr>
<tr>
<td>Harborough Rd 11</td>
<td>3.0</td>
<td>Roadside</td>
<td>39.7</td>
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<tr>
<td>Harborough Rd 12</td>
<td>3.0</td>
<td>Roadside</td>
<td>45.5</td>
</tr>
<tr>
<td>Kingsthorpe Grove 1</td>
<td>3.0</td>
<td>Roadside</td>
<td>37.4</td>
</tr>
<tr>
<td>Kingsthorpe Grove 2</td>
<td>3.0</td>
<td>Roadside</td>
<td>36.3</td>
</tr>
<tr>
<td>Wellingborough Rd 1</td>
<td>3.0</td>
<td>Roadside</td>
<td>39.7</td>
</tr>
</tbody>
</table>

Objective 40

- Exceedances of the Objective highlighted in **bold**

4.2.14 As presented in Table 2, annual mean NO₂ concentrations have approached or exceeded the AQ objective of 40ug/m³ at all the roadside sites used in this study. At the urban background sites, the concentrations are well below the relevant objective. These data are likely to be representative of background concentrations within the assessment extents.
SENSITIVE RECEPTORS

Construction Phase

4.2.15 The Institute of Air Quality Management (IAQM) assessment is undertaken where there are:
- ‘Human receptors’ within 350m of the site boundary, within 50m of the route(s) used by construction vehicles on the public highway, or up to 500m from the site entrance(s); and/or
- ‘Ecological receptors’ within 50m of the site boundary, within 50m of the route(s) used by construction vehicles on the public highway, or up to 500m from the site entrance(s).

4.2.16 It is within these distances that the impacts of dust soiling and increased particulate matter in the ambient air will have the greatest impact on local air quality at sensitive receptors.

Operational Phase

4.2.17 In terms of locations that are sensitive to pollutants emitted from engine exhausts, these will include places where members of the public are likely to be regularly present over the period prescribed in the Air Quality Standard (AQS). For instance, on a footpath where exposure will be transient (for the duration of passage along that path) comparison with a short-term standard (i.e. 15-minute mean or 1 hour mean) may be relevant. At a school or adjacent to a private dwelling, where exposure may be for longer periods, comparison with a long-term standard (such as 24-hour mean or annual mean) may be more appropriate. Box 1.1 of LAQM (Technical Guidance 16) provides examples of the locations where the air quality objectives should/should not apply.

4.2.18 Sensitive human receptors are any location at which people may be at risk of adverse health effects because of relevant exposure to increased pollution levels. These receptors will represent locations where people are likely to be exposed to elevated pollution levels for the appropriate length of time. Within this early stage of assessment, it is appropriate to consider the impacts of the Proposed Scheme on groups of residential properties, based on their proximity to the Proposed Scheme, rather than individual properties. Human receptors within 2km of the site have been identified as the most susceptible to adverse air quality impacts as a direct result of the Proposed Scheme. Both existing and proposed receptors (within the planning domain at the time of assessment) will be considered during the assessment. To maintain consistency with other environmental topics, the locations of the grouped receptors considered within this assessment are presented below. These are:
- Church Brampton: Existing settlement (~100 residences) 1.2km to the north-east of the site;
- Brampton Hills Cottages: Existing residences (~5), 0.6km northwest of the northern extent of the site;
- Brampton View Nursing Home: Existing care home complex (~20 residences) within 400m to the east of the northern extent of the site;
- Kingsthorpe – large settlement (>200 residences) around 0.5km to the east of the scheme.
- Proposed development of Dallington Grange (number of receptors unknown): To the south of the site;
- Existing and proposed residential development of Dallington Gateway (number of receptors unknown): To the south of the site;
- Golf course grounds (not included within the air quality assessment due to limited potential for long term human exposure to pollution from the Proposed Scheme); and
- A428 roadside receptor: Single property, 300m to the north of the southern extent of the site.

4.3 POTENTIAL EFFECTS

CONSTRUCTION PHASE

4.3.1 The following potentially significant effects will be considered for the construction phase:
- Dust and particulate matter generation during demolition, earthworks and construction;
- The dispersion of dust via “track out” of construction vehicles; and
- Vehicle emissions from heavy construction vehicles.

OPERATION EFFECTS

4.3.2 The following potentially significant effects will be considered for the construction phase:
- Redistribution of traffic flow across the road network;
- Variation in congestion levels/vehicle emission rates; and
- Reduction of total trip lengths.
4.4 PROPOSED METHODOLOGY
The exact scope of the air quality assessment for the Proposed Scheme will be confirmed through consultation with NBC. The air quality assessment will be completed with reference to the following documents:

- DMRB (Volume 11, Section 3, Part 1, HA 207/07, dated May 2007);
- IAN 170/12: Updated air quality advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1 ‘Air Quality’ (HA207/07);
- IAN 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);
- Defra LAQM Review and Assessment Technical Guidance (LAQM.TG16) (2016); and

CONSULTATION

4.4.1 The site lies within the administration boundary of NBC, therefore consultation with their Environmental Health Department will be undertaken to agree the scope of works for the assessment and to obtain relevant data regarding the existing air quality near the site.

ASSESSMENT METHODOLOGY

4.4.2 The project team will undertake a qualitative assessment of the potential air quality impacts arising during the preparation and construction phase of the proposed Scheme, using the IAQM’s publication ‘Guidance on the Assessment of Dust from Demolition and Construction’. For the purposes of this assessment, the road network developments to the A428 towards Grange Farm were considered to already be in place before the implementation of this scheme. Consequently, the impacts from the construction of these roads were excluded from this assessment. Variation in traffic levels along these roads caused by the re-routing of additional traffic with the implementation of the scheme during the operation phase, however, was considered. The project team will undertake a qualitative assessment of effects of traffic emissions generated during the construction of the Proposed Scheme.

4.4.3 The project team will undertake an assessment of the impact on air quality due to emissions from traffic associated with the Proposed Scheme once operational, using the detailed dispersion model ADMS-Roads. The dispersion modelling will establish the impact of the proposed Scheme on relevant pollutant concentrations (NO2, PM10 and PM2.5) both with and without the Proposed Scheme at a number of existing sensitive receptors adjacent to the proposed Scheme and affected roads. This assessment will include:

- Identification of the roads likely to be affected by the operational phase of the proposed Scheme using a combination of DMRB and LAQM.TG16 guidance as appropriate; and
- Identification of the presence of existing and future sensitive locations where people might experience a change to air quality because of the Proposed Scheme.

4.4.4 Roads near the site will be considered if they are predicted to be affected in accordance with the following criteria specified within DMRB:

- Road alignment will change by 5m 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 10km/hr or more; or
- Peak hour speed will change by 20km/hr or more.

MITIGATION

4.4.5 Recommendation of suitable mitigation measures to reduce air quality impacts during the construction and operational phases, followed by an assessment of residual effects.

CUMULATIVE IMPACTS

4.4.6 As assessment of cumulative effects will also be undertaken, if appropriate.
5

CLIMATE CHANGE
5 CLIMATE CHANGE

5.1 OVERVIEW

5.1.1 This section of the scoping report deals with climate change. The requirement to consider climate change results from the 2014 amendment to the EIA Directive (2014/52). The Directive has been fully transposed into UK law in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and came into force in the UK on the 16 May 2017. The Directive requires:

“A description of the likely significant effects of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.”

5.1.2 As such there are two components to the climate assessment - greenhouse gas (GHG) emissions and climate resilience. A full climate vulnerability assessment (the impact of the climate on the project) has been completed to inform the scoping report, please refer to Appendix B.

5.1.3 The GHG scoping assessment of the project (the impact of the project on climate change), can be found in this section. It sets out the proposed assessment methodology for climate and identifies those impacts that can be scoped out of the EIA.

STUDY AREA

5.1.4 The greenhouse gas (GHG) assessment is not restricted by geographical area but instead includes any increase or decrease in emissions because of the Proposed Scheme, wherever that may be. This includes:

- Construction and decommissioning emissions in the Proposed Scheme footprint but also related to the transport of materials to and from the site, their manufacturing and disposal (this may be far from the scheme location e.g. emissions for manufacture of concrete and steel); and
- Operational emissions resulting from the Proposed Scheme but also emissions (or reduction in emissions) which result from the end-use of the Scheme and any shifts in transport modes/patterns which may occur. Such emissions include those for traffic using the Proposed Scheme as well as the surrounding regional road network. Electricity consumption (e.g. for lighting) will typically result in emissions at power generation stations throughout the national electricity grid.

5.2 BASELINE CONDITIONS

GREENHOUSE GAS EMISSIONS

5.2.1 In the baseline (do nothing) scenario, GHG emissions occur constantly and widely because of human and natural activity including energy consumption (fuel, power), industrial processes, land use and land use change. The GHG assessment will only consider where the Proposed Scheme results in additional or avoided emissions in comparison to the baseline scenario and it’s assumed evolution.

5.2.2 The baseline conditions therefore focus on those emissions sources subject to change between the baseline scenario and the Proposed Scheme. However, emissions from 2015 within Northamptonshire and nationally are presented in Table 3 for context³.

---

Table 3 – GHG emissions in 2015 for in Northamptonshire and nationally

<table>
<thead>
<tr>
<th>Year</th>
<th>Northamptonshire (ktCO2)</th>
<th>National (ktCO2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Industry and Commercial Electricity</td>
<td>811.1</td>
<td>66,596.4</td>
</tr>
<tr>
<td>B. Industry and Commercial Gas</td>
<td>416.5</td>
<td>34,486.4</td>
</tr>
<tr>
<td>C. Large Industrial Installations</td>
<td>0.4</td>
<td>38,954.2</td>
</tr>
<tr>
<td>D. Industrial and Commercial Other Fuels</td>
<td>238.0</td>
<td>17,376.5</td>
</tr>
<tr>
<td>E. Agriculture</td>
<td>50.3</td>
<td>4,953.0</td>
</tr>
<tr>
<td>Industry and Commercial Total</td>
<td>1,516.3</td>
<td>162,366.5</td>
</tr>
<tr>
<td>F. Domestic Electricity</td>
<td>436.9</td>
<td>38,094.9</td>
</tr>
<tr>
<td>G. Domestic Gas</td>
<td>660.1</td>
<td>58,568.1</td>
</tr>
<tr>
<td>H. Domestic 'Other Fuels'</td>
<td>67.8</td>
<td>10,674.6</td>
</tr>
<tr>
<td>Domestic Total</td>
<td>1,164.8</td>
<td>107,337.6</td>
</tr>
<tr>
<td>I. Road Transport (A roads)</td>
<td>1,124.6</td>
<td>53,624.2</td>
</tr>
<tr>
<td>J. Road Transport (Motorways)</td>
<td>513.7</td>
<td>27,405.1</td>
</tr>
<tr>
<td>K. Road Transport (Minor roads)</td>
<td>478.7</td>
<td>40,495.3</td>
</tr>
<tr>
<td>L. Diesel Railways</td>
<td>31.4</td>
<td>2,050.8</td>
</tr>
<tr>
<td>M. Transport Other</td>
<td>31.2</td>
<td>2,245.1</td>
</tr>
<tr>
<td>Transport Total</td>
<td>2,179.7</td>
<td>125,820.4</td>
</tr>
<tr>
<td>N. LULUCF Net Emissions</td>
<td>3.6</td>
<td>-8,996.1</td>
</tr>
<tr>
<td>Grand Total</td>
<td>4,864.5</td>
<td>386,528.4</td>
</tr>
<tr>
<td>Population ('000s, mid-year estimate)</td>
<td>723.0</td>
<td>65,110.0</td>
</tr>
<tr>
<td>Per Capita Emissions (t)</td>
<td>6.7</td>
<td>5.9</td>
</tr>
</tbody>
</table>

5.2.3 The construction of the Proposed Scheme, by nature, is additional. As such the ‘do nothing’ (baseline) scenario involves no construction activities, and therefore the construction baseline is zero emissions.

5.2.4 The total end-user GHG emissions from traffic flows in the ‘do nothing’ scenario is modelled as part of the air quality assessments (in accordance with the Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 Air Quality; HA 207/07) as required by the Road Investment Strategy. The modelling includes the total greenhouse gas emissions for all vehicles covered by the traffic model, covering the strategic and local road network around the Proposed Scheme and its surrounding region. At present, this data for the end-user emissions is not available for inclusion but this data will be reported in the next stage of climate assessment.
5.2.5 The operation and management of the existing assets under the baseline scenario are likely to require a small number of components (for example, light bulbs and signage) as well as some bulk material (cement, concrete, sand and gravel) for minor works and repairs of the highway and ancillary infrastructure. These materials will have embodied emissions associated with them, and the installation of these materials will result in emissions due to the transport of these materials, and plant use. These baseline emissions are expected to be small, and as such will not be quantified.

5.3 POTENTIAL IMPACTS

5.3.1 The impacts of GHG relate to their contribution to global warming and climate change. These impacts are global and cumulative in nature, with every tonne of GHG contributing to impacts on natural and human systems. GHG emissions result in the same global effects wherever and whenever they occur and, therefore, the sensitivity of different human and natural receptors is not considered.

5.3.2 GHG are natural and man-made gases occurring in the atmosphere which absorb and emit infrared radiation thereby maintaining the Sun’s energy within the Earth’s atmosphere. There is an overwhelming scientific consensus that the major increase in the concentration of GHG from man-made sources is contributing to global warming and climate change.

5.3.3 The seven main GHG defined by the Kyoto Protocol are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride. In combination, these GHG emissions are commonly expressed in terms of carbon dioxide equivalents (CO2e) according to their relative global warming potential. For this reason, the shorthand ‘carbon’ may be used to refer to GHG.

5.3.4 It is expected that most emissions will occur during construction and operation.

CONSTRUCTION PHASE

5.3.5 The Proposed Scheme has the potential to result in increases in GHG emissions associated with construction activities (such as manufacturing of materials and construction processes). During construction, notable sources of emissions are anticipated to include ‘embedded carbon’: emissions during extraction and manufacturing of construction materials including those associated with the pavement for the new highway (i.e. asphalt and aggregate) and construction of the new bridges (i.e. structural and reinforced steel and concrete).

OPERATIONAL PHASE

5.3.6 The Proposed Scheme may result in changes to end-user traffic emissions throughout its operational life, which could be an increase or decrease depending on the effect on traffic flows and speeds. Any increase in emissions and the corresponding concentrations of GHGs present in the atmosphere will contribute to global warming and climate change. There may also be operational effects in terms of emissions for operation and maintenance of the scheme infrastructure due to energy (e.g. electricity for lighting) and materials consumption (e.g. asphalt repairs).

5.4 ASSESSMENT METHODOLOGY

DESIGN, MITIGATION AND ENHANCEMENT MEASURES

Construction Phase

5.4.1 The magnitude of greenhouse gas emissions associated with the construction phase of the Proposed Scheme can be minimised by, amongst others:

- Minimising the quantities of materials required to construct the project;
- Maximising the use of construction materials and products with recycled or secondary and low carbon content, from renewable sources, and offering sustainability benefit;
- Using locally-sourced materials where available and practicable to minimise the distance materials are transported from source to site;
- Using more efficient construction plant and delivery vehicles, and/or those powered by electricity from alternative/lower carbon fuels; and
- Using innovative construction methods to reduce plant use.
Operational Phase

5.4.2 The magnitude of greenhouse gas emissions associated with the operational phase of the Scheme can be minimised by, amongst others:

- Designing, specifying and constructing the Scheme with a view to maximising the operational lifespan and minimising the need for maintenance and refurbishment (and all associated emissions);
- Designing, specifying and constructing the Scheme with a view to maximising the potential for reuse and recycling of materials/elements at the end-of-life stage;
-Specifying high efficiency mechanical and electrical equipment such as lighting and telecoms; and
- Operating, maintaining and refurbishing the Scheme using best-practice efficient approaches and equipment.

METHODOLOGY

5.4.3 The assessment approach considers the likely magnitude of GHG emissions (or avoided emissions) in comparison to the baseline scenario with no Scheme development. It considers emissions throughout the lifecycle of the Proposed Scheme including:

- Construction stage e.g. embodied emissions associated with materials, transportation of materials to site and waste/arisings from site, and the construction process;
- Operation e.g. operation of lighting and controls, maintenance and replacement of original materials, as well as emissions (or avoided emissions) from end-user vehicles; and
- End of life (decommissioning) stage e.g. deconstruction and management of materials, arisings and waste.

For all lifecycle stages and sub-stages of the Scheme, the assessment will include the following:

- Collection of available data/information on the scale of GHG emitting activities (e.g. tonnes concrete, litres of fuel, kWh electricity) for the baseline scenario and for the Proposed Scheme. In each case this will cover the whole study period; and
- Calculation of the GHG emissions by applying a suitable emissions factor (tCO2e per unit of emissions generating activity).
- The lifecycle stages and corresponding emissions sources that could be included in the assessment are outlined in Table 4.

Table 4 – Key Emissions Sources During the Scheme Lifespan

<table>
<thead>
<tr>
<th>LIFECYCLE STAGE (AS PER PAS 2080&lt;sup&gt;4&lt;/sup&gt;)</th>
<th>POTENTIAL SOURCES OF EMISSIONS (NOT EXHAUSTIVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTRUCTION</td>
<td></td>
</tr>
<tr>
<td>Product stage (manufacture and transport of raw materials to suppliers): A1-3&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Embodied emissions associated with extraction and manufacturing of the required raw materials.</td>
</tr>
<tr>
<td>Transport of materials to site: A4</td>
<td>Emissions from fuel and electricity used in vehicles transporting materials to site</td>
</tr>
<tr>
<td>Plant and equipment used during construction: A5</td>
<td>Emissions from fuel and electricity used in plant and equipment on site</td>
</tr>
<tr>
<td>Transport of waste: A5</td>
<td>Emissions from fuel/energy used in vehicles transporting materials to away from site</td>
</tr>
<tr>
<td>Disposal of waste: A5</td>
<td>Emissions from the final disposal of waste materials.</td>
</tr>
<tr>
<td>Land use, land use change and forestry: A5</td>
<td>Change in emissions associated with the clearance and disposal of biomass due to the scheme</td>
</tr>
</tbody>
</table>

<sup>4</sup> BSI, 2016, Carbon Management in Infrastructure
<sup>5</sup> PAS2080 reference
**LIFECYCLE STAGE (AS PER PAS 2080⁴) | POTENTIAL SOURCES OF EMISSIONS (NOT EXHAUSTIVE)**

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>POTENTIAL SOURCES OF EMISSIONS (NOT EXHAUSTIVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation: B1</td>
<td>Electricity used for lighting</td>
</tr>
<tr>
<td>Maintenance, repair, replacement, refurbishment: B2-5</td>
<td>Embodied emissions, and emissions from transport and plant associated with maintenance, repair, replacement, and refurbishment.</td>
</tr>
<tr>
<td>Land use, land use change and forestry: B8</td>
<td>Change in emissions associated with the existence of the scheme hindering or promoting the sequestration of carbon dioxide into biomass.</td>
</tr>
<tr>
<td>End-user emissions (regional traffic flows) – traffic: B9/D</td>
<td>Vehicles using highways infrastructure affected by the scheme</td>
</tr>
</tbody>
</table>

**EMISSIONS CALCULATIONS**

5.4.4 Emissions calculations for all sources other than end user emissions (traffic), will be completed within an industry recognised carbon calculation tool which focuses on emissions throughout the project lifecycle. For this assessment, Highways England’s carbon tool will be used. Traffic emissions will be quantified in accordance with the Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 Air Quality; HA 207/07. Values will be reported as tonnes of carbon dioxide equivalents (tCO₂e).

**ASSESSMENT OF VALUE, MAGNITUDE AND SIGNIFICANCE OF EFFECTS**

5.4.5 In line with the National Networks NPS, significance of GHG impacts is assessed by comparing estimated GHG emissions arising from the Scheme with the respective UK carbon budgets (see Table 15.4 which have been set by the UK government covering 2018 to 2032. There are currently no agreed thresholds for what level of greenhouse gas emissions is considered significant in an EIA context. A judgement is however made regarding the potential significance and the need for assessment.

**Table 5 – National Carbon Budgets set by the Government**

<table>
<thead>
<tr>
<th>CARBON BUDGET PERIOD</th>
<th>UK CARBON BUDGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>Third: 2018-2022</td>
<td>2,544 MtCO₂e</td>
</tr>
<tr>
<td>Fourth: 2023-2027</td>
<td>1,950 MtCO₂e</td>
</tr>
<tr>
<td>Fifth: 2028-2032</td>
<td>1,725 MtCO₂e</td>
</tr>
</tbody>
</table>

**ASSESSMENT ASSUMPTIONS AND LIMITATIONS**

5.4.6 There is currently no specific guidance or carbon emissions threshold, which, if exceeded, is considered significant. The assessment will therefore be based on professional judgement.

**SUMMARY**

5.4.7 Based on the emissions sources identified in Table 4, and using guidance from the Institute of Environmental Management and Assessment (IEMA), professional judgement has been used to determine which sources to scope in for further consideration the ES. A summary of this proposed scope is presented in Table 6.
Table 6 – Climate change scoping summary table

<table>
<thead>
<tr>
<th>EFFECT</th>
<th>SCOPED IN</th>
<th>SCOPED OUT</th>
<th>LEVEL OF ASSESSMENT</th>
<th>JUSTIFICATION/ REASONING</th>
<th>GUIDANCE USED</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSTRUCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product stage (manufacture and transport of raw materials to suppliers): A1-3</td>
<td>✓</td>
<td></td>
<td>Simple</td>
<td>Raw materials required the Scheme will result in embodied emissions and have the potential to be large.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Transport of materials to site: A4</td>
<td>✓</td>
<td></td>
<td>Simple</td>
<td>Construction stage emissions from fuel / energy consumption due to the delivery of material to site have the potential to be large.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Plant and equipment used during construction: A5</td>
<td>✓</td>
<td></td>
<td>Simple</td>
<td>Construction stage emissions due to the use of fuel / energy on site have the potential to be large.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Transport of waste: A5</td>
<td>✓</td>
<td></td>
<td>Simple</td>
<td>Emissions from fuel / energy consumption due to the transport of waste materials, particularly fill, have the potential to be large.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Disposal of waste: A5</td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>Emissions from the disposal of waste are unlikely to be large.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Land use, land use change and forestry: A5</td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>Emissions from the disposal of biomass are not expected to be large</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>OPERATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation: B1</td>
<td>✓</td>
<td></td>
<td>Simple</td>
<td>Emissions from lighting although expected to be small are direct operational emissions from the scheme, and therefore will be quantified.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Maintenance, repair, replacement, refurbishment: B2-5</td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>Maintenance, repair, replacement and refurbishment associated with the Scheme are not considered to be large emissions sources.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Land use, land use change and forestry: B8</td>
<td>✓</td>
<td></td>
<td>N/A</td>
<td>The reduction in carbon sequestration due to the scheme is not considered to be large.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>End-user emissions (regional traffic flows) – traffic: B9/D</td>
<td>✓</td>
<td></td>
<td>Simple</td>
<td>Changes to regional traffic flows are expected and this has the potential to result in a large change in GHG emissions.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>EFFECT</td>
<td>SCOPED IN</td>
<td>SCOPED OUT</td>
<td>LEVEL OF ASSESSMENT</td>
<td>JUSTIFICATION/ REASONING</td>
<td>GUIDANCE USED</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-----------</td>
<td>------------</td>
<td>---------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>END OF LIFE</td>
<td></td>
<td></td>
<td></td>
<td>Expected timescales for decommissioning are so far into the future that there is insufficient certainty about the likelihood, type or scale of emissions activity to determine their likely magnitude, even if they take place at all. As such these emissions sources will not be considered.</td>
<td>IEMA, 2017</td>
</tr>
<tr>
<td>Decommissioning process C1</td>
<td>✓</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transport and disposal of materials C2-4</td>
<td>✓</td>
<td>N/A</td>
<td></td>
<td></td>
<td>IEMA, 2017</td>
</tr>
</tbody>
</table>
6

CULTURAL HERITAGE
6 CULTURAL HERITAGE

6.1 OVERVIEW

6.1.1 The cultural heritage assessment will cover:

- Buried heritage assets (archaeological remains) within or immediately around the site
- Above ground heritage assets (structures and landscapes of heritage interest) within or immediately around the site; and
- The historic character and setting of designated heritage assets within and beyond the site (e.g. views to and from listed buildings and conservation areas).

6.1.2 The assessment will be undertaken as defined by DMRB guidance and in compliance with the NPSNN, NPPF. The methodologies used will adhere to the following relevant professional guidelines: Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Historic Environment Desk-based Assessment (2017) and CIfA Code of Conduct.

6.1.3 Two study areas will be applied for the assessment within the EIA. A study area of 300m from the Proposed Scheme footprint will be applied to non-designated assets, and a wider study area of 1km for statutory designated assets, conservation areas and historic landscapes. The study areas are based on accepted best practice and due to the scale and nature of the development.

6.2 BASELINE CONDITIONS

6.2.1 The following data sources have been consulted to inform the baseline review:

- The National Heritage List England (NHLE);
- Heritage Gateway (online Historic Environment Record Database);
- Northampton Borough Council website; and
- Online historic mapping.

6.2.2 There are no World Heritage Sites, Scheduled Monuments, Registered Parks and Gardens, Registered Battlefields or Conservation Areas in the site or within a 1km Study Area. There are nine Grade I listed building within 1km of the site:

- The Windmill Inn (NHLE 1052385);
- Woodlands (NHLE 1039684);
- 2, Northampton Road (NHLE 1067088);
- 43, 44 and 45 Lower Harlestone (NHLE 1067083);
- 48 and 49 Lower Harlestone (NHLE 1067084);
- Wash House between Numbers 49 and 50 (NHLE 1203429);
- 46 and 47 Lower Harlestone (NHLE 1281701);
- Wash House between Numbers 45 and 46 (NHLE 1356886); and
- 50, 51, and 52 Lower Harlestone (NHLE 1356887).

6.2.3 The River Nene valley is rich in evidence for prehistoric settlement activity and a review of the available online Historic Environment Records identifies a number of potential buried archaeological sites in and around the site ranging in date from the Neolithic period through to the Iron Age. The River Nene valley is also recognised as being an important location of Roman pottery production, and pots produced in this area are found in sites throughout the country.

6.2.4 According to British Geological Society (BGS) online digital data (mapapps.bgs.uk) the site is underlain by Whitby Mudstone Formation, following the River Nene along with superficial alluvium deposits of clay, silt, sand and gravel. The southernmost section of the site, proposed to provide access via a new junction to Dallington Grange Kings Heath Development, is underlain by Northampton Sand formation, comprising sandstone, limestone and ironstone. The geology in and around the site is potentially of archaeological importance.
6.3 POTENTIAL EFFECTS

CONSTRUCTION PHASE

6.3.1 The likely significant environmental effects of the construction phase which will be considered in the ES Chapter will include partial or complete loss to buried heritage assets, if present, where ground disturbance is proposed. Any ground disturbance resulting from the Proposed Scheme has the potential to truncate or remove entirely any buried heritage assets present within its footprint, especially since the Proposed Scheme is on a rural site where such assets are likely to be at a relatively shallow depth below ground level.

6.3.2 Noise caused by machinery and passing construction traffic is highly likely to result in a temporary adverse impact on the setting on the potential non-designated heritage asset, Grange Farm. There is also a potential for an adverse impact on the setting of the nine Grade II Listed Buildings near the site.

OPERATION EFFECTS

6.3.3 The likely significant environmental effects of the operational phase which will be considered in the ES Chapter are permanent changes to the setting of designated assets within the study area. Any potential impact on the setting of designated assets will need to be assessed because it could potentially affect the heritage significance of that asset.

6.3.4 Operational effects on buried heritage assets have been scoped out on the basis that once the Proposed Scheme has been completed, no further ground disturbance would occur and consequently there would be no additional environmental effects.

6.4 PROPOSED METHODOLOGY

LEGISLATIVE CONTEXT

6.4.1 Legislation, policy and guidance relevant to the archaeology assessment is listed below:

- Planning (Listed Buildings and Conservation Areas) (P(LBCA)) Act 1990;
- CIfA [Chartered Institute for Archaeologists] Dec 2014a, Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment;
- CIfA [Chartered Institute for Archaeologists] Dec 2017, Standards and guidance for historic environment desk-based assessment;
- DCLG [Department of Communities and Local Government] March 2012, National Planning Policy Framework;
- DCLG [Department of Communities and Local Government] March 2014, Conserving and Enhancing the Historic Environment: Planning Practice Guide;
- Historic England, 2017 The Setting of Heritage Assets; and

METHOD OF ASSESSMENT

6.4.2 The methodology used to determine the significance of heritage assets, the severity of any impacts upon them and the resulting significance of environmental effect is based on that typically used in EIA. Following the characterisation of the baseline conditions, the methodology used to characterise the potential effects on likely heritage assets within the site will include:

- Quantifying predicted heritage assets that may be affected by the Proposed Scheme;
- Evaluating the significance of heritage assets, based on existing designations and professional judgement where such resources have no formal designation and considering evidential, historical, aesthetic and communal value as outlined in Historic England’s Conservational Principles (EH 2008). This will consider factors which may have affected asset survival;
- Predicting the magnitude of change (impact) upon the known or potential heritage significance of assets during the construction phase and operation/completed phase and the likely resulting significance of environmental effect;
- Considering the mitigation measures that have been included within the Proposed Scheme and any additional mitigation that might be required in the design and construction or operational lifetime of the Proposed Development to reduce or offset likely adverse effects; and
- Quantifying any residual effects (those that might remain after mitigation).
6.4.3 In terms of assessing the setting of designated heritage assets, the scope has included those assets that may be subject to a 'significant' change to their setting in accordance with the stepped approach set out in Historic England guidance on setting (Step 1). This allows objective identification of the elements of the historic significance of heritage assets and the extent and degree of the contribution of setting to that significance. It considers distance, location and position of intervening development, infrastructure, vegetation and landscape features; and the location and direction of key views. The degree of the impact of the proposed Scheme on these elements can then be evaluated as major, moderate, minor, negligible or none.

6.4.4 The ES chapter will set out the planning framework in respect of buried heritage assets (archaeological remains) and above ground heritage assets (structural remains of historic interest including the listed buildings, conservation area, and the scheduled monument) and their setting. The chapter will be supported by a technical appendix in the form of a full illustrated historic environment desk-based assessment (HEDBA). This will include a detailed baseline compiled through a broad and standard range of data sources, including the Northamptonshire Historic Environment Record (HER), the Historic England National Heritage List, local authority data sources along with published works and cartographic sources, and topographic, geology and geotechnical data, where available. The work will be undertaken in accordance with the requirements of the National Planning Policy Framework (NPPF) and to standards specified by the Chartered Institute for Archaeologists and Historic England.

6.4.5 The chapter will also be supported by a geoarchaeological desk-based assessment which will form a technical appendix. The purpose of this document will be to present a model of any buried deposits of archaeological significance and assess the potential impacts because of the Proposed Scheme. The assessment will be prepared by a suitably qualified geoarchaeological specialist in adherence to the relevant Historic England guidance.

6.4.6 The ES will be supplemented with information obtained through a geophysical survey. The geophysical survey will be undertaken by a suitably qualified contractor and in adherence to the relevant CIfA standards and guidance. The aim of the geophysical survey will be to identify the presence of buried remains which could be of archaeological origin. The results of the investigation will be presented as a technical appendix to the ES.

**BASELINE CHARACTERISATION**

6.4.7 To determine the full historic environment potential of the site, a broad range of standard documentary and cartographic sources, including results from any archaeological investigations in the site and a study area around it will be examined to determine the likely nature, extent, preservation and significance of any known or possible buried heritage assets that may be present within or adjacent to the site.

6.4.8 The assessment would also include a site walkover inspection to determine the topography of the site and existing land use/the nature of the existing buildings on the site, and to provide further information on areas of possible past ground disturbance and general historic environment potential. The walkover would extend to select designated heritage assets beyond the site to consider potential impacts to their setting (e.g. visible changes to historic character and views).

**CONSULTATION**

6.4.9 The assessment will include liaison (email and/or phone), where necessary, with the Archaeological Advisor to the local planning authority (LPA) and Historic England.

**SIGNIFICANCE CRITERIA**

6.4.10 Initially, the value or importance of a heritage asset is judged from very high to uncertain based on the criteria set out in DMRB (Volume 11 Section 3 Part 2 Annex 5 (Table 5.1), Annex 6 (Table 6.1) and Annex 7 (Table 7.1). These present a general guide to the attributes of cultural heritage assets and it should be noted that not all the qualities listed need be present in every case and professional judgement is used in balancing the different criteria. Cultural heritage significance is also defined in Annex 2 of the NPPF as 'The value of a heritage asset to this and future generations because of its heritage interest'. The NPPF is clear that 'heritage interest' may be archaeological, architectural, artistic or historic.

6.4.11 The CIfA 'Standard and Guidance for Historic Environment Desk-based Assessment' (2017), considers that an assessment of the significance of heritage assets should identify the potential impact of proposed or predicted changes on the significance of the asset and the opportunities for reducing that impact. Policy 129 of NPPF states that this evidence should be considered when considering the impact of a proposal.
6.4.12 The level of harm to cultural heritage significance of the asset, or the magnitude of the impact as prescribed by DMRB, is the basis of assessing impact. To assess the level of harm or potential impact of any future development on built heritage or buried archaeological remains, consideration will be afforded to:

- Assessing any impact and the significance of the effects arising from any future development of the study area;
- Reviewing the evidence for past impacts that may have affected the archaeological sites of interest identified during the desk-based assessment; and
- Outlining suitable mitigation measures, where possible at this stage, to avoid, reduce, or remedy adverse impacts.

6.4.13 Key impacts have been identified as those that would potentially harm the significance of the heritage asset. Each potential impact will be determined as the predicted deviation from the baseline conditions, in accordance with current knowledge of the site and the Proposed Scheme.

6.4.14 The magnitude, or scale of an impact is often difficult to define, but will be termed as major, moderate, minor or negligible, based on the criteria set out in DMRB (Volume 11 Section 3 Part 2 Annex 5 (Table 5.3), Annex 6 (Table 6.3) and Annex 7 (Table 7.3).

6.4.15 The interaction between the value of the heritage asset and the potential magnitude of impact produce the impact significance. The overall significance of impact is then determined using the matrix presented in Table 5.1 of the DMRB (HA208/07).

LIMITATIONS AND ASSUMPTIONS

6.4.16 The main limitation to the assessment is the nature of the archaeological resource; buried and not visible, which means it can be difficult to predict accurately the presence and likely significance of buried assets, and consequently the impact upon them, based primarily on a desk based sources. The principal source of information is the Northamptonshire HER. The information provides an initial indication of assets present rather than a definitive list of all potential archaeological assets because the full extent of a buried heritage resource cannot be known prior to site-specific archaeological field investigation.

6.4.17 Notwithstanding this limitation, the methodology is robust, utilising reasonably available information, and conforms to the requirements of local and national guidance and planning policy. Typically, appropriate standard archaeological evaluation techniques are utilised to reduce the uncertainties inherent in any desk-based assessment, as part of an overall mitigation strategy.

6.4.18 The assessment relies on available data, and best endeavours have been made to ensure that the data are accurate and up to date. It is assumed that information on the Northamptonshire HER database is accurate.
7

ECOLOGY AND BIODIVERSITY
7 ECOLOGY AND BIODIVERSITY

7.1 OVERVIEW

7.1.1 The Proposed Scheme will directly affect, or has potential to fragment habitat suitable for a range of protected species and species of conservation concern. In the absence of suitable mitigation, potential effects are likely to be significant. Consideration may be required as to whether the Proposed Scheme may contribute towards cumulative effects upon statutory designated sites, for example, because of changes to air quality during the operational phase. This will be confirmed once traffic modelling data becomes available.

7.2 BASELINE CONDITIONS

7.2.1 Internationally Designated Sites

There are no statutory environmental designations within or adjacent to the site boundary. The Upper Nene Valley Gravel Pits Special Protection Area (SPA), which also has a RAMSAR designation and a designation as a Site of Special Scientific Interest (SSSI), lies approximately 6.1km to the south-east of the site boundary. It is primarily designated for its assemblages of breeding and overwintering bird assemblages.

UK Statutory Designated Sites

In addition to the Upper Nene Valley Gravel Pits SSSI, there are two further SSSI within 10km of the Proposed Scheme; Pitsford Reservoir SSSI and Bugbrooke Meadows SSSI. The Pitsford Reservoir SSSI, located approximately 4.5km north-east of the site, is designated for its wintering waterfowl and for being the largest water body in Northamptonshire. The Bugbrooke Meadows SSSI, located approximately 7.5km south-west of the site, is designated for its grassland communities.

There are seven LNR present within 10km of the site, Kingsthorpe LNR is the closest and is located approximately 1.7km south-east of the site. Kingsthorpe LNR is designated for its importance as a part of the green corridor network linking up with the Brampton Valley Way.

Desktop Research

A desktop assessment was undertaken which comprised a review of existing ecological baseline information available in the public domain and examining aerial photography (where available) to understand the baseline receptors likely to be present on site. As part of this process, records of non-statutory designated sites, protected or notable species, and bat records within 2km of the site were requested from Northamptonshire Biodiversity Records Centre (NBRC). Non-statutory designated sites

There is a total of 27 non-statutory designated sites within 2km of the site, these designations consist of eight Potential Wildlife Sites (PWS) and 19 Local Wildlife Sites (LWS) two of which are also a Country Park (CP), two Wildlife Trust Reserves (WTR) and one a Pocket Park (PP). The Proposed Scheme would cross through Grange Farm Fields PWS and a PWS referred to as ‘438’. A total of 13 non-statutory designated sites located within 1km of the site. In addition, the site lies within a Nature Improvement Area. Protected and notable species

There are numerous protected and notable species records within 2km of the site, including; common toad Bufo bufo, grass snake Natrix natrix, common lizard Zootoca vivipara, otter lutra lutra, badger Meles meles, kingfisher Alcedo atthis, redwing Turdus iliacus, and fieldfare Turdus pilaris. In addition, there are numerous records of noteworthy plant, invertebrate and bird species within 2km of the site.

There are records within 5km the site for a number of bat species including: unidentified pipistrelle bat Pipistrellus sp., common pipistrelle Pipistrellus pipistrellus, soprano pipistrelle Pipistrellus pygmaeus, brown long-eared bat Plecotus auritus, Daubenton’s bat Myotis daubentonii, whiskered bat Myotis mystacinus, noctule Nyctalus noctula, Leslier’s bat Nyctalus leisleri and Barbastelle bat Barbastella barbastellus.

There are records of non-native invasive plant species within 2km of the site including: parrot’s-feather Myriophyllum aquaticum, Japanese knotweed Fallopia japonica and New Zealand pygmy weed Crassula helmsii.
Aerial Photography Review

7.2.9 The Proposed Scheme runs parallel to the River Nene, crossing a number of tributaries passing through a floodplain covered by a mixture of arable farmland and grassland. The route of the Proposed Scheme crosses several linear features including; hedgerows (potentially qualify as 'Important Hedgerows' under the Hedgerows Regulations (1997)), mature tree lines, and field ditches/drainage. The habitats in this area are of between low (arable fields) and high (hedgerows, wetlands, mature trees, watercourses) ecological value. The habitats present are considered to have the potential to support the following protected species:

- Badgers;
- Bats (roosting, foraging and commuting);
- Breeding birds;
- Great crested newts and other amphibians;
- Common reptile species; and
- Riparian mammals including otters and water voles.

Waterbodies

7.2.10 The Brampton arm of the River Nene flows approximately 60m to the east of the site. Brampton Brook flows immediately to the north of the Northampton to Rugby railway line, this watercourse will be crossed by the Proposed Scheme. The Proposed Scheme also crosses several water bodies associated with agriculture including field ditches and drains that all appear to either flow directly into the River Nene, or connect to other tributaries that feed into the river. In addition to the numerous linear water features, several standing water bodies are present within 500m of the Proposed Scheme. These include several newly constructed ponds within Brampton Heath Golf Course and several field and garden ponds.

PRELIMINARY ECOLOGICAL APPRAISAL (PEA) AND PROTECTED SPECIES SURVEYS

7.2.11 A Preliminary Ecological Appraisal (PEA), including; an extended Phase 1 Habitat Survey of the site, and Background Data Search, was carried out in 2017. The PEA was carried out in line with good practice guidelines (CIEEM, 2013). Following the PEA, surveys for protected were scheduled for 2018. These surveys are currently ongoing at the time of writing this report. The results of these surveys will be used to inform ecological mitigation, including the requirement for European Protect Species (EPS) mitigation licenses, and the construction management plan. The findings will also be used to inform the EcA for the Scheme. Further details about the methodology and timing of these surveys is provided in Section 7.4. The following results have been drawn from the surveys to date.

Badgers

7.2.12 The Proposed Scheme is likely to pass through habitats suitable for foraging and commuting badgers, as well as habitats that provide opportunities for sett building. No evidence of badgers was recorded during the PEA survey in 2017. No specific badger surveys have been carried out at this time, however, surveys are planned for 2018. Evidence of badgers, including; latrines, setts and live badger sightings, have been recorded during other species surveys within the site.

Bats

7.2.13 A number of features suitable for bat roosts, in the form of buildings, trees, and bridges, were identified during the PEA in 2017 and Preliminary Roost Assessment (PRA) surveys in April 2018. Dusk emergence and dawn re-entry surveys of all buildings, trees and bridges within 50m of the Proposed Scheme footprint are currently ongoing. During the Phase 1 survey in 2017, habitats have been identified that offer moderate quality foraging and commuting opportunities for bats. Bat activity transect surveys and static detector surveys are currently ongoing.

Great Crested Newts

7.2.14 Existing waterbodies within 500m of the Proposed Scheme footprint, including linear features such as ditches, as well as field and garden ponds, have the potential to support great crested newts. Habitats within the Proposed Scheme footprint are also suitable for terrestrial great crested newts.

7.2.15 Presence/absence surveys of all waterbodies identified as suitable for great crested newts within 500m of the Proposed Scheme footprint, that are not separated by barriers to great crested newt migration, were carried out between April and June 2018. No great crested newts were recorded during these surveys and it is assumed great crested newts are not present within 500m of the Proposed Scheme footprint.
Common Toad

7.2.16 Common toads were recorded during the great crested newt presence/absence surveys. Like great crested newts, common toads annually migrate from terrestrial habitats to waterbodies to breed. Common toads are listed under Section 9(5) of the Wildlife & Countryside Act (1981). Common toads also receive protection under the Natural Environment and Rural Communities (NERC) Act (2006).

Otters

7.2.17 The Proposed Scheme runs close to the River Nene and severs a number of tributaries and other watercourses. The River Nene and other watercourses which dissect the site have been identified as suitable for otters and provide suitable opportunities for holt/den construction. Terrestrial habitats across the site have also been identified as providing suitable opportunities for den construction, including natal dens.

7.2.18 An initial survey for otters was conducted in spring 2018 along the River Nene and other watercourses within, and near to, the Proposed Scheme, as well as terrestrial habitats suitable for den buildings adjacent to the Proposed Scheme. Evidence of otter activity in the form of feeding remains, spraints and camera footage of otters has been recorded along the entire length of the River Nene running parallel to the Proposed Scheme. A second summer survey has been scheduled for July-September 2018.

Common Reptiles

7.2.19 Terrestrial habitats across the site have been identified as suitable for common reptile species. Surveys for reptiles are currently ongoing, however, a grass snake *Natrix natrix* was observed along the banks of the River Nene during other protected species surveys.

Water Vole

7.2.20 The Proposed Scheme runs close to the River Nene and severs a number of tributaries and other watercourses. The River Nene and other watercourses which dissect the site have been identified as suitable for water voles. An initial survey for water voles was conducted in spring 2018 along the River Nene and other watercourses within, and near to, the Proposed Scheme. Evidence of water voles has been found along the River Nene. A second summer survey has been scheduled for July-September 2018.

Breeding Birds

7.2.21 The Proposed Scheme is likely to pass through habitats suitable for breeding birds.

Schedule 1 Birds

7.2.22 The Proposed Scheme is likely to pass through suitable foraging habitats for barn owls. Suitable nesting features for barn owls have also been identified within 1.5km of the Proposed Scheme. Barn owl surveys are currently ongoing; however, barn owls have been recorded foraging across habitats within and adjacent to the Proposed Scheme in other protected species surveys.

7.2.23 Sections of the River Nene, as well as other watercourses that dissect the site have been identified as suitable for nesting and foraging kingfishers. Surveys for kingfishers have not been carried out at the time of writing but have been scheduled for 2018.

7.3 POTENTIAL EFFECTS

7.3.1 The following potentially significant effects will be considered for the construction phase:

- Impact on compensatory land associated with Upper Nene Valley Gravel Pits SPA;
- Disturbance and/or destruction of active badger setts, severance of foraging and commuting habitats used by multiple ‘clans’ (social groups) of badgers;
- Direct loss of existing bat roosts;
- Direct loss of hedgerow habitats;
- Indirect impact on bat roosts and foraging/commuting habitats because of light pollution and noise pollution, particularly light sensitive species such as brown long-eared bats;
- Direct loss and fragmentation of foraging and commuting habitats suitable for bats;
- Direct loss of breeding bird and kingfisher habitats;
- Direct loss and fragmentation of foraging and commuting habitats suitable for barn owls, including potential barn owl nests;
- Disturbance and/or severance of otter and water vole foraging and commuting activity as well as direct loss of potential otter den habitats; and
- Direct loss of habitats suitable for common reptiles.
7.3.2 The following potentially significant effects will be considered for the operational phase:

- Disturbance of active badger setts and increased road traffic mortalities;
- Indirect impact on bat roosts and foraging/commuting habitats because of light pollution and noise pollution, particularly light sensitive species such as brown long-eared bats, as well as increased road traffic mortalities;
- Indirect impact on breeding bird and kingfisher habitats;
- Indirect impact on barn owl nests as well as increased road traffic mortalities;
- Severance of common toad commuting corridors and increased road traffic mortalities;
- Disturbance and/or severance of otter and water vole foraging and commuting activity as well as increased road traffic mortalities; and
- Increased road traffic mortalities of common reptiles.

7.4 PROPOSED METHODOLOGY

SURVEY EFFORT

7.4.1 To provide a robust baseline dataset to inform the Ecological Impact Assessment (EcIA) of the Proposed Scheme, the baseline ecological surveys set out below are being proposed or are currently underway. The results of these surveys will also be used to inform ecological mitigation, including the requirement for European Protect Species (EPS) mitigation licenses, and the construction management plan:

- **Badger surveys:** A badger survey of the Proposed Scheme footprint and adjacent habitats within 30m will be carried out in line with Harris, Creswell & Jefferies (1989). This survey will involve a search of all accessible habitats for evidence of badger activity including; setts, latrines, footprints, paths, ‘push throughs’ in fences, hairs and evidence of feeding;

- **Bat surveys:** Bat surveys will involve:
  - Preliminary roost assessments (PRAs) will be carried out in accordance with Collins (2016);
  - Bat roost inspections surveys will be carried out in accordance with Collins (2016);
  - Emergence/re-entry surveys of all suitable roost will be carried out in accordance with Collins (2016);
  - Activity surveys, involving walked transect in combination with static detector surveys will be carried out in accordance with Collins (2016);
  - Bat crossing point surveys will be carried out in accordance with DEFRA approved survey methods, Altringham & Berthinussen (2015).

- **Great crested newt (GCN) surveys:** Surveys will include Habitat Suitability Index (HSI) assessments of all waterbodies within 500m of the Proposed Scheme footprint that are not beyond barriers to GCN movement. Presence/absence surveys of any waterbodies identified as being suitable for GCN will follow. In any ponds where GCN presence is confirmed, further population estimate surveys will be carried out. The HSI assessments, presence/absence surveys and population estimate surveys will be carried out in line with good practice guidelines ARG UK (2010) and English Nature (2001);

- **Otter surveys:** The surveys will explore the suitability of the River Nene and other watercourses across the site for otters. These will include a single spring survey visits carried out between March and May 2018 followed by a second summer visit carried out between July and September 2018. These surveys will be carried out in line with good practice guidelines Chanin (2003). The surveys will involve a search for evidence of otter activity including (but not exclusively); feeding remains, spraints, prints and holts/dens. In addition, the survey will involve a search of surrounding habitats identified as suitable for den buildings for potential otter dens;

- **Common reptile surveys:** Presence/absence surveys in areas of habitat identified as suitable for common reptile species within the Proposed Scheme footprint and habitats suitable for common reptiles within 50m of the Scheme footprint will be conducted. Surveys will involve the placement of artificial ‘refugia’ in areas of suitable habitats to attract basking reptiles. These refugia will then be checked on seven separate occasions from May to September 2018. Surveys will be carried out in line with good practice guidelines Gent & Gibson (1998) and Froglife (1999);

- **Water vole surveys:** The survey will explore the suitability of the River Nene and other watercourses across the site for water voles. These will include a single spring survey visits carried out between March and May 2018 followed by a second summer visit carried out between July and September 2018. The surveys will be carried out in line with good practice guidelines, Strachan (2011), and involve a search for evidence of water vole activity including; feeding remains, ‘lawns’, burrows, prints. and latrines;
Barn owl surveys: Barn owl surveys of the Proposed Scheme footprint and suitable habitats within 1.5km will be carried out where accessible. These surveys will be carried out in line with good practice guidelines, Shawyer (2011), and involve a review of aerial imagery of habitats within 1.5km of the Scheme. The aerial photography will be used to identify habitats that may be suitable for foraging barn owls as well as identifying potentially suitable nesting features. This will then be followed by field visit to confirm the suitability of habitats for foraging barn owls and inspect previously identified nest features for evidence of nesting barn owls;

Kingfisher surveys: The survey will explore the suitability of the River Nene and other watercourses across the site for nest and foraging kingfishers. These surveys will be carried out in line with good practice guidelines NRA (2009); and

Hedgerow surveys: Surveys of all hedgerow habitats that will be severed by the Proposed Scheme will be carried out to determine whether they qualify as ‘Important Hedgerows’ under the Hedgerows Regulations Act (1997). This will be carried out in line with good practice guidelines DEFRA (2007).

CONSULTATION

7.4.2 The primary stakeholders in the study area have been identified as;
- Northampton County Council Ecologist – Tina Cuss;
- Northampton Borough Council;
- Natural England; and
- Local landowners.

ECOLOGICAL IMPACT ASSESSMENT (ECIA)

7.4.3 The EcIA will be carried out in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3, Part 4 (Ecology and Nature Conservation) and current good practice guidelines published by the Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2006).

7.4.4 Receptors will be scoped in to the final assessment if effects have the potential to be significant above site scale (in accordance to the geographic scale of reference (IEEM, 2006)), have legal implications, or have been requested for inclusions through consultation with relevant stakeholders. Each receptor will be evaluated within the geographic scale of reference and potential effects assessed against the Proposed Scheme. Secondary mitigation measures will then be considered (taken in this context to include mitigation and compensatory measures), and residual effects assessed.

HABITATS REGULATION ASSESSMENT (HRA) SCREENING

7.4.5 Habitat Regulations Assessment (HRA) and Appropriate Assessment (AA) are required under the Habitats Directive (Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Fauna and Flora) and the Birds Directive (Directive 79/409/EC on the Conservation of Wild Birds) for any projects or plans that could introduce a significant effect on a European site.

7.4.6 The HRA process consists of several stages, of which one or more may be required depending upon the first stage known as ‘screening’. The screening stage is the process of identifying potentially relevant European sites, and whether the likely impacts of the Proposed Scheme upon the qualifying features of the site, either alone or in-combination with other plans and projects, are likely to be significant. If it is concluded at this stage that there is no potential for significant effects, there is no requirement to carry out subsequent stages of the HRA.

7.4.7 The Proposed Scheme is located approximately 6.1km from the Upper Nene Valley Gravel Pits SPA. An HRA screening report will be prepared by the project team for the Proposed Scheme. The results and recommendations of the HRA Screening Report will be shared with Natural England and NCC upon completion.
8 GEOLOGY AND SOILS

8.1 OVERVIEW

8.1.1 Soils and geology are a key factor in determining the environmental character and quality of any given geographic area. Underlying rocks are a key determinant of landform, while the physical and chemical properties of the rocks and the overlying soils influence the type and variety of vegetation that will grow, agricultural quality, flood risk and water storage capacity.

8.1.2 Geological conditions and resources can also determine the distribution and scale of some industries, particularly the extractive industries such as mining and quarrying and other industries dependent on extracted minerals. Such industries, even if long since closed, can themselves have long-term effects on the environment, through alteration of landforms and of the nature of surface deposits, changes in drainage or the contamination of land.

8.1.3 Construction can have a significant effect on geological and soil resources, while the nature and condition of soil and underlying rocks can be a key constraint on scheme design. Under some circumstances, construction work can also compound the environmental effects caused by previous activity, for instance by mobilising contamination left in the ground by former industrial activities.

8.1.4 The potential effects of the construction of the Proposed Scheme on the soil, superficial and bedrock geology are considered in this section of the report.

8.2 BASELINE CONDITIONS

The baseline conditions have been established within the Preliminary Sources Study Report (PSSR) for the scheme dated June 2018.

GEOLOGY

8.2.1 The relevant British Geological Survey (BGS) geological maps for the area (Sheet 185, Northampton, 1: 50,000 scale, Solid and Drift Edition, 1990; Sheets SP76NW and SP76SW, Northamptonshire, 1: 10,000 scale, Solid and Drift, 1958) and BGS online viewer GeoIndex have been reviewed.

8.2.2 Superficial deposits comprising Alluvium are shown adjacent to the River Nene and the Brampton Brook. Alluvium typically comprises normally consolidated, soft to firm, silty clay, but can contain layers of sand, peat and gravel.

8.2.3 The solid geology comprises Northampton Sand Formation and Whitby Mudstone Formation. The Northampton Sand Formation is typically formed of sandy ironstone and underlies the site on upper slope sides, in the area occupied by the Golf Courses to the west, the surroundings of Grange Farm in the southern part of site, and to the south of the railway. The Northampton Sand Formation is noted to comprise lenses of mudstone and limestone with abundant marine fauna (although this is not evident in weathered sections). Typical thickness of the Northampton Sand Formation is 4-8m, but can reach up to 21m.

8.2.4 The Mudstone Formation belongs to the Upper Lias Group and typically comprises stiff blue grey clay with an approximate thickness of 120m and stratigraphically lies beneath the Northampton Sand formation. Within the Whitby Mudstone Formation there is the potential for relict shear zones leading to low residual soil shear strengths. The Whitby Mudstone Formation is situated within the River Nene valley, underlying the Alluvial deposits.

MINING AND MINERALS

The site is not within a zone of mining instability or within a coal mining affected area. British Geological survey records shows a small quarry to the west of site, with workings in the Northampton Sand. However, as most of site is underlie by the Whitby Mudstone Formation, any risk posed to the scheme from mining is low.

HYDROGEOLOGY

8.2.5 Environment Agency records classify the Northampton Sand Formation as a Secondary A Aquifer, and the Whitby Mudstone Formation as Unproductive Strata. The superficial deposits (Alluvium) are classified as a Secondary A Aquifer. The site is not located in a groundwater Source Protection Zone (SPZ) and there are no groundwater abstractions recorded on or within 500m of the site.
HYDROLOGY

8.2.6 The main water courses in the area are the River Nene and Brampton Brook, which are both recorded as main rivers by the Environment Agency. The River Nene flows approximately north to south across the centre of the site, and to the east of the proposed alignment, meandering within its alluvial plain. The Brampton Brook watercourse is located to the north of the railway line and flows in an easterly direction, joining the River Nene to the south of the area of study.

8.2.7 The River Nene has been assessed under the Water Framework Directive as having a poor ecological quality and a good chemical quality. Brampton Brook has been monitored by the EA; the most recent ecological quality is assessed as moderate and chemical quality is assessed as good.

8.2.8 A spring is marked on the ordinance survey mapping in the eastern region of the adjacent golf course, approximately 200m west of the site. Drains of small length (250-350 m) also illustrated on the maps flow eastwards down the golf course hillside and join the River Nene at the toe of the slope traversing the site in a west to east direction.

AGRICULTURAL LAND

8.2.9 The area is classified as Grade 3 (a/b not defined) on the BMV Agricultural Land Classification. No faults are shown to be present at the location of the site.

SENSITIVE ECOLOGICAL HABITATS

8.2.10 Two Non-Statutory Ecological Designated Sites are located within the study area, one concerns the whole site which is indicated as “Potential Wildlife Site” and the second one is Local Wildlife Site named “Kingsthorpe Ditch” to the southeast of the site.

POTENTIAL SOURCES LAND CONTAMINATION

8.2.11 During the site walkover, fly tipped materials were noted south of the railway line observed to contain plastic, ceramics and wood, scrap metal and potentially asbestos. Suspected asbestos containing sheets were also noted along the site boundary.

8.2.12 No landfill sites are recorded within a 250m radius of the site. Other potential sources of contamination include railway land, and fertilisers/pesticides associated with agricultural land.

8.3 POTENTIAL EFFECTS

8.3.1 It is anticipated that where excavations are required, the soil will be reused as part of earthworks, thus minimising any impacts from waste soil. This will be further considered as part of the EIA. It is understood that there will be an area of significant earthworks to raise the road near the bridge crossing the railway line. The bridge will be at least 6.5m above ground level; however, the height, extent and source of fill material for the earthworks are yet to be quantified. The source and composition of this material would require testing to ensure chemical and geotechnical suitability.

8.3.2 Potential contaminant sources have been identified including agricultural use and the possibility of Made Ground, as well as potential unidentified contaminants which may result in significant harm to current or future receptors at the Proposed Scheme.

8.3.3 Given that part of the Proposed Scheme is in the flood plain of the River Nene and that saturated ground and areas of marshland/ponding water were observed during the walkover survey, it can be reasonably assumed that groundwater will be encountered at a shallow depth within the Alluvial deposits. It is suggested that the groundwater levels are monitored during the site-specific ground investigation. The Proposed Scheme is not anticipated to directly impact on known sensitive land uses.

8.4 PROPOSED METHODOLOGY

8.4.1 Highways England has developed a set of criteria for establishing the environmental value of individual assets (HA205/08, HA, 2008b); however, new guidance is not currently available for the Geology and Soils topic. Until new guidance is published for all environmental sub topics IAN 125/09 (HA, 2009a) provides supplementary advice for users of DMRB Volume 11 and clarifies the assessment approach to be used where up to date topic specific guidance has not yet been published.
8.4.2 A Stage 2 assessment will be carried out in accordance with DMRB Volume 11 Section 3 Part 11 (HA, 1993b) to identify any impacts on potential areas of contamination which may affect the Proposed Scheme. The results of this assessment will be reported in the ES with significance of impacts assessed in line with HA 205/08.

8.4.3 The potential impacts will take into consideration both the construction and operational phases of the Proposed Scheme. Contaminated land related issues will be assessed in accordance with Model Procedures for the Management of Contaminated Land (CLR11). The document advocates the use of a conceptual site model to establish the links between a hazardous source and a sensitive receptor via an exposure pathway. The concept behind this approach is that, without each of the three fundamental elements (source, pathway and receptor), there can be no risk from contamination. Thus, the mere presence of a contamination hazard at a particular site does not necessarily imply the existence of associated risks.
9

LANDSCAPE AND VISUAL
9 LANDSCAPE AND VISUAL

9.1 OVERVIEW

9.1.1 The assessment of landscape and visual effects are separate but linked procedures. In terms of landscape effects, IAN 135/10 notes that, ‘the landscape is considered as an environmental resource’ and references the GLVIA (2nd Edition) paragraph 2.14 which states that landscape effects are derived ‘from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape’.

9.1.2 Visual effects ‘relate to the changes that arise in the composition of available views because of changes to the landscape, to people’s responses to the changes, and to the overall effects with respect to visual amenity’ (GLVIA 2nd Edition para 2.15). Visual assessments should therefore describe key potential visual locations and receptors which may experience a change in the existing view because of the Proposed Scheme.

9.1.3 It should be noted that GLVIA 2nd Edition 2002, has been superseded by GLVIA 3rd Edition 2013 and that the 3rd Edition is to be used in identifying the effects of the Proposed Scheme on landscape resources and specific views and general visual amenity.

9.1.4 The Landscape and Visual Effects chapter of the ES will collate existing information on local landscape character and visual receptors within and surrounding the Scheme, and their value or sensitivity. Consideration will also be given to the information publicly available on adjacent sites, particularly in relation to local character areas and viewpoint locations where they have been agreed with NCC.

9.1.5 An assessment will then be made of the potential effects of the Scheme upon the key identified landscape and visual receptors and will identify appropriate mitigation measures, where applicable. Both landscape and visual effects will be considered at operation and construction stages.

9.2 BASELINE CONDITIONS

TOPOGRAPHY AND VEGETATION

9.2.1 The site and its context contains a diverse range of land use comprising areas of woodland; pasture and arable farmland, with hedgerow boundaries; golf course and flood plain.

9.2.2 A railway line crosses the site dissecting all four route options north of Grange Farm. The feasibility report produced by MGWSP in 2012 highlights an area of vegetation immediately north of the railway. This area of mature trees and shrubs has been identified by NCC as being an important feature.

LANDSCAPE DESIGNATIONS

Conservation Areas

9.2.3 Harlestone, Chapel Brampton, Kingsthorpe and Dallington Conservation Areas and extent of Boughton Hall Parkland Conservation Area are all situated within 2km of the site. These are areas of built form protected from development to maintain their character and setting within the landscape.

Registered Parks and Gardens

9.2.4 Boughton Hall is approximately 1.5km to the north-east of the northern end of the proposed scheme.

9.2.5 The hall has early 18th century gardens and a pleasure ground set within parkland which was greatly reworked in the second half of the 18th century by William Wentworth, second Earl of Stafford. Boughton Hall is situated at a high point within the southern part of the park, commanding extensive views. The main access drive enters from Market Harborough Road to the west. The gardens and pleasure ground are located on a level terrace south-west of the Hall, enclosed by woodland. The Parkland is to the north.

Public Rights of Way (PRoW)

9.2.6 PRoW cross the site and can be found in the vicinity. Public footpaths provide links from the settlements on the outskirts of Northampton, Kingsthorpe and Kingsheath with the wider landscape and Dallington/Harlestone Heath. The long-distance footpaths Midshires Way and Northamptonshire Round are found to the west of the site.
LANDSCAPE CHARACTER

9.2.7 The site lies within the National Character Area Northamptonshire Uplands Landscape Character Area (NCA 95). The key characteristics of the Northamptonshire Uplands Landscape Character Area (NCA 95) are as follows:

- Gently rolling rounded hills and valleys with many long, low ridgelines and great variety of landform. Wide, far-reaching views from the edges and across the ridgetops;
- The Upper Nene Valley divides the gently undulating Northamptonshire Heights to the north from the hillier Cherwell/Ouse plateau (the ‘Ironstone Wolds’) to the south and has been exploited for sand and gravel;
- Rivers rise and flow outwards in all directions, including the rivers Cherwell, Avon, Welland, Tove, Ouse, Nene and Ise, and the area forms the main watershed of Middle England;
- Sparse woodland cover, but with scattered, visually prominent, small, broadleaved woods, copes and coverts, particularly on higher ground;
- Mixed farming dominates with open arable contrasting with permanent pasture;
- Typical ‘planned countryside’ with largely rectangular, enclosed field patterns surrounded by distinctive, high, often A-shaped hedgerows of predominantly hawthorn and blackthorn, with many mature hedgerow trees, mostly ash and oak. Some ironstone and limestone walls in places and some localised areas of early irregular enclosure;
- Nucleated villages often on hill tops or at valley heads with low densities of dispersed settlement. Extensive new developments in villages along main transport corridors and in the two main towns;
- A dense network of narrow lanes with wide grassy verges, often following ridges, crossed by many strategic road and rail corridors, including the M1, M40, A14, West Coast Main Line railway, Great Western Railway line and the Oxford and Grand Union canals; and
- The many historic houses, parks and gardens open to the public.

9.2.8 The site lies within the Northampton, Harlestone Heath, and the Bramptons Landscape Character Area (LCA), which is of moderate sensitivity. Its key characteristics are:

- Broad valley slopes dissected by numerous tributary streams;
- Ironstone geology expressed in local vernacular buildings and in rich red soils;
- Rolling landform, extensive views and sense of exposure on some prominent locations;
- Steep slopes adjacent to more elevated landscapes;
- Numerous water bodies including the county’s largest reservoir;
- Productive arable farmland in medium and large-scale fields predominates on elevated land although sheep and cattle pastures also prevalent, often in smaller fields adjacent to watercourses;
- Agricultural practices create a patchwork of contrasting colours and textures extending across valley slopes;
- Where broadleaved woodlands and mature hedgerow trees combine, these impart a sense of a well treed landscape;
- Hedgerows generally low and well clipped although intermittent sections show evidence of decline;
- Well settled with numerous villages and towns;
- Landscape directly and indirectly influenced by the proximity of many of the county’s urban areas; and
- Building materials vary although vernacular architecture and churches display the local ironstone.

VISUAL BASELINE

9.2.9 The topography of the area is gently rolling hills and valleys and therefore creates potential for visual impacts upon residents in the isolated properties within the vicinity from properties on the fringe of surrounding urban areas and from users of nearby roads and PROWs. Generating a 3D computer model to establish a Zone of Theoretical Visibility (ZTV) or Zone of Visual Influence ZVI will establish a study area for the proposed scheme.

9.2.10 The communities living within 2km of the proposed scheme include those living in the suburban fringe of Northampton; New Duston (<300 m, existing roads and industrial estate intervene); Dallington/ Kings Heath (< 1km, open views north/ north-west over fields and heathland); and Kingsthorpe (<500 m, homes to the north-west of this district around Welford Road (A5199) have open views west across the river valley to the golf course and wider rural landscape beyond. Existing railway and cycle path infrastructure cut across with belts of trees provide some immediate screening).
9.2.11 Additionally, there are residential receptors with potential views in the peripheral villages of Harlestone, Lower Harlestone (1km+), Upper Harlestone, Church Brampton (1.2km, gentle rise with golf course including belts of trees intervening), Chapel Brampton (1km) and Boughton (1.5km, existing roads intervene).

9.2.12 There are several isolated farmsteads within the area including Fleetland Farm, Heath Farm, Wykes Lodge, Grange Farm, Brampton Grange, Rectory Farm and Westview Farm. Brampton View Care village is situated just north of the junction of Northampton Road (A5199) and Brampton Lane where the proposed scheme terminates.

9.2.13 People who are engaged in outdoor recreation, including users of PRoW whose attention is likely to be focused on the landscape or on views are visual receptors susceptible to change. People engaged in outdoor sport e.g. golf are likely to be less sensitive to change but should be considered as visual receptors of medium sensitivity. Travellers on road or rail tend to fall into an intermediate category of moderate susceptibility to change.

9.3 POTENTIAL EFFECTS

9.3.1 Site preparation, earthworks and construction may significantly affect the local landscape character (including the quantum of trees and vegetation), public rights of way (location and quality) and the setting or character of designated landscape sites and public open space. As well as local visual amenity from surrounding public rights of way, designated heritage assets, surrounding residences or highway users, particularly in relation to the bridge construction. The bridge construction will also significantly affect local topography if earth embankments are used. Effects may be direct as well as indirect, and both temporary and permanent. Construction effects are likely to be greater than at operation due to uncharacteristic plant, materials, and construction activities.

9.3.2 Operation of the Proposed Scheme may significantly affect the local landscape character, the character of the Scheme site (including growth of any new tree and vegetation planting), public rights of way, designated heritage assets and the local visual amenity from surrounding public rights of way, surrounding residences or highway users. Effects may be direct as well as indirect, and are likely to be permanent at operation. Due to the relatively flat landscape, traffic crossing the proposed bridge may be the most visible element of the Scheme.

CONSTRUCTION

9.3.3 The following potentially significant effects will be considered for the construction phase:

- Effects on the topography of the site;
- Effects on the woodland blocks within 500m of the site;
- Effects on the quantum of trees and hedgerows within the site;
- Effects on local landscape character of the site and within 1km of the site;
- Effects on views from and setting of heritage features (listed buildings and conservation areas, in consultation with the heritage specialist); and
- Effects on views from surrounding residents, highways, PRoW, and users of local roads/railway line.

OPERATION

9.3.4 The following potentially significant effects will be considered for the operational phase:

- Effects on the setting and character of woodland blocks within 500m of the site;
- Effects on local landscape character of the site and within 1km;
- Effects on views from and setting of heritage features (listed buildings and conservation areas, in consultation with the heritage specialist); and
- Effects on views from surrounding residents, highways, PRoW, and users of local roads/railway line.

9.4 PROPOSED METHODOLOGY

9.4.1 The assessment of landscape and visual effects will be completed in accordance with the methodology set out in the Design Manual for Roads and Bridges Volume 11 Section 2, Interim Advice Note 135/10 Landscape and Visual Effects Assessment (The Highways Agency, 2010). Reference will also be made to the industry standard best practice guidance provided in Guidelines for Landscape and Visual Impact Assessment, 3rd Edition published by the Landscape Institute and Institute of Environmental Management and Assessment (2013). The landscape and visual assessment for IAN 135/10 outlines the two potential stages, Simple Assessment and Detailed Assessment.
9.4.2 A Simple Assessment should be used when it is considered unlikely that the scheme would have any significant landscape and/or visual effects. For landscape effects this situation may occur when the landscape resource is in a poor or degraded condition; when impacts are temporary or minor in scale (e.g. the addition of new signage to an existing signed road, managed motorway schemes, minor improvements such as the introduction of a local junction or roundabout). For visual effects this situation may occur where there are no sensitive receptors (e.g. a scheme in a commercial or industrial area) or where there are no nearby receptors (e.g. residential properties some distance away).

9.4.3 A Detailed Assessment should be used when significant landscape and/or visual effects are anticipated. For landscape effects this situation may occur when the landscape resource is of distinctive quality with a range of landscape elements in good condition; or when impacts are significant in terms of duration and scale (e.g. major new road improvements, road widening schemes; major lighting schemes). For visual effects this situation may occur where there are sensitive receptors in the immediate vicinity (e.g. a recreational path or residential properties) or where there are large numbers of sensitive receptors (e.g. a residential suburb which overlooks the scheme).

9.4.4 It is considered that, although there are limited public rights of way and residential receptors in the vicinity, the landscape is in good condition and the construction of the bridge may increase the visibility of the Scheme in the local landscape. It is therefore anticipated that a detailed assessment is likely to be required as there may be some significant effects on either landscape or visual receptors because of the Proposed Scheme. The methodology for a detailed assessment is outlined below.

9.4.5 Determination of the landscape baseline (‘Do Minimum’) context through:

- A desk-based review of relevant documents, including landscape/townscape character assessments, previous EIAs, relevant planning documents and relevant websites for OS mapping, aerial photographs and mapping to identify key landscape/townscape designations/receptors and policies;
- Consultation with the Local Authority via e-mail/telephone to identify key features/receptors of interest, concern or value. Consultation will be undertaken with the Local Authority only;
- Site visit(s) to identify local landscape character and determine local landscape components, value and condition; and
- Identification of the sensitivity of the landscape (i.e. its ability to accommodate change of the type proposed).

9.4.6 Determination of the visual baseline (‘Do Minimum’) context through:

- A desk-based review of relevant documents, including landscape/townscape character assessments, previous EIAs, relevant planning documents and relevant websites for OS mapping, aerial photographs and mapping to identify key visual receptors;
- Production of a digital Zone of Theoretical Visibility (ZTV) to help identify the study area;
- Consultation with the Local Authority via e-mail/telephone to agree the location of assessment viewpoints and number/type of views. Consultation will be undertaken with the Local Authority only;
- Site visit(s) to carry out photography at agreed viewpoint locations; and
- Identification of the sensitivity of the key visual receptors.

9.4.7 Assessment of Effects (determination of magnitude and types of impact and determination of Significance of Effect) through:

- Description of the proposed Scheme during construction and operation;
- Identification of the magnitude of change to the 'do minimum' scenario, including scale and nature of the impact, duration and whether it is adverse or beneficial;
- Considering the magnitude of impact arising from the Scheme on each of the features and elements that make up landscape character in conjunction with their sensitivity; and
- The sensitivity of the receptor to the magnitude of the change in visual amenity arising from the Scheme.

9.4.8 Cumulative landscape and visual effects in association with other proposed developments will be considered as required, along with identification of mitigation and enhancement where appropriate.

9.4.9 In accordance with IAN 135/10 Annex 2 The sensitivity of landscape and visual receptors will be identified on a 3-point scale (high, moderate or low). The magnitude of effect by a 5-point scale (no change; negligible, minor, moderate or major). Significance of effects will subsequently be assessed ranging from Very Large Adverse to Neutral to Very Large Beneficial).
9.4.10 The text will be accompanied by suitable figures and plans including:

- Topography and Landscape Character Plan (@ 1:25,000);
- Landscape Designations Plan (@1:25,000)
- Viewpoint Location Plan and Zone of Visual Influence (@ 1:25,000);
- Viewpoint Photograph Sheets;
- Visual Impact - Properties Plan (@ 1:5,000)

9.4.11 The following plans undertaken by others and submitted as part of the application will also be considered:

- Outline Landscape Design (1:2,500)
- Typical Cross Sections (1:500)
- Vegetation Lost to Scheme (1:5,000)

9.4.12 An arboriculture survey will also take place in accordance with BS 5837:2012 which will include a:

- Tree condition and value survey;
- Tree constraints Plan;
- Arboriculture Impact assessment; and
- Arboriculture Method Statement.
10 MATERIALS AND WASTE

10.1 OVERVIEW

10.1.1 This chapter considers the implications of the Proposed Scheme on the consumption of materials, and the generation and disposal of waste. It sets out the proposed methodology and identifies those elements that are within the scope of the EIA. The assessment methodology proposed in this chapter is based on guidance set out in Interim Advice Note (IAN) 153/11 (Highways Agency, 2011) Environmental Assessment of Material Resources.

10.1.2 In accordance with the stated guidance, and as the Proposed Scheme value will exceed £300,000 (excluding VAT but including the cost of labour, plant and materials, overheads and profit), an assessment of the impacts and effects of consuming materials is required. Due to the scale and nature of the Proposed Scheme, a detailed assessment is recommended.

10.1.3 The following elements have been scoped into the assessment:

- The consumption of materials and products (from primary, recycled or secondary, and renewable sources, and including materials offering sustainability benefits) including the generation and use of arisings recovered from site; and
- The production and disposal of waste to landfill.

10.2 BASELINE CONDITIONS

10.2.1 The sensitive receptors that may be affected by the Proposed Scheme include:

- The materials required for delivery (including site arisings from construction, demolition and excavation activities, from which may be derived positive value); and
- Local and regional management facilities that may be required to process waste generated during Scheme delivery.

MATERIALS

10.2.2 The Proposed Scheme will require material to be imported on-site and surplus material to be disposed of as waste. This usually arises from two sources as follows:

- Existing site materials e.g. concrete from demolition of an existing structure and excavation of material from earthworks; and
- Materials brought on to the site but not used for its intended purpose e.g. damaged goods.

10.2.3 Gross quantities of materials use and waste generated will be required to determine the comparable materials and waste profiles of the alternatives being considered.

10.3 POTENTIAL IMPACTS AND EFFECTS

10.3.1 A detailed assessment will be made of the impacts and effects of the Scheme from material consumption (including site arisings) and waste generation and disposal. The methodology for conducting the detailed assessment will follow the guidance set out in Interim Advice Note 153/11.

10.3.2 It is important to note that whilst no specific sensitivity / value and magnitude thresholds and criteria are provided in IAN153/11, the process and information required for the assessment of significant effects from materials and waste is well established in the guidance.

10.3.3 The Environment Agency and other statutory waste specialists will be consulted as part of the materials assessment, as appropriate.

10.4 PROPOSED METHODOLOGY

VALUE OF ENVIRONMENTAL RECEPTORS AND RESOURCES

10.4.1 The receptors which could be impacted upon include waste facilities and waste management strategies.
10.4.2 An assessment will be undertaken to identify how the use of materials conforms to high level strategy targets outlined in the following policy documents (this list is not exhaustive):

- The Waste (England and Wales) (Amendment) Regulations 2012;
- National Planning Policy Framework 2012;
- Waste Prevention Programme for England 2013; and

MATERIALS AND SITE ARISINGS

10.4.3 An assessment of the impacts of consuming materials required during site construction plus the first full year of operation (to 2020-21), will be undertaken by considering the origins and sources of materials, including their general availability (production, stock, sales) and the proportion of re-used or recycled materials they contain.

10.4.4 The assessment will consider the relative volume of materials that need to be consumed, understanding that, typically, the larger a development footprint and associated groundworks, the greater the requirement to consume resources. Site arisings (from construction, demolition and remediation / preparation / excavation activities) will be evaluated as part of the assessment of materials, to determine the volume of excavations that can be retained for re-use or (as a last resort) be sent to landfill as waste. The assessment will consider the nature of impacts (adverse/beneficial, permanent/temporary, direct/indirect) from materials and site arisings, and use professional judgement to determine the significance of effect.

WASTE

10.4.5 An assessment of the remaining landfill capacity in the east midlands will be used to determine the impacts of waste generated during site construction and the first full year of operation, using information collated from Northamptonshire Minerals and Waste Local Plan (2017).

10.4.6 The assessment will consider the volume of waste generated by the Proposed Scheme and its potential impact on remaining landfill capacity; this will be completed for inert and non-inert (non-hazardous and hazardous) waste types. The assessment will consider the nature of impacts (adverse/beneficial, permanent/temporary, direct/indirect) from waste generated and disposed of, and use professional judgement to determine the significance of effect.
11

NOISE AND VIBRATION
11 NOISE AND VIBRATION

11.1 OVERVIEW

11.1.1 This section has been prepared with reference to the guidance contained in DMRB Volume 11, Section 3, Part 7 Noise and Vibration (HD 213/11).

11.1.2 The operation of the Proposed Scheme has the potential to cause increases in road traffic noise and vibration, which could affect noise-sensitive receptors in the area. In addition to the introduction of road traffic to a new location, changes in noise level could also occur along those sections of road indirectly affected by changes in traffic flows because of the Proposed Scheme. The effect at any location should be considered in terms of the “absolute” noise and vibration levels as well as the “change” in those levels, both of which could have a bearing on the effect of the Proposed Scheme. Account must also be taken of whether the changes would occur abruptly or gradually over time.

11.1.3 The construction of the Proposed Scheme could also result in elevated noise and vibration levels temporarily at nearby (existing and future) receptors, especially where works occur at night. Effects are assessed by considering the existing levels, which could be different for different receptors, and absolute construction related noise and vibration levels.

11.2 BASELINE CONDITIONS

11.2.1 The receptors mostly likely to be affected by the Proposed Scheme are located either close to existing roads, in particular the Welford Road (A5199), Sandy Lane and Northampton Road, whereby road traffic will be the dominant source of noise, or well away from roads and any other significant sources of noise, where no one particular source will be dominant. For those dwellings away from roads, sources of noise are generally limited to birdsong and the movement of trees/leaves. Dwellings to the west of Welford Road (A5199) would also be susceptible to noise from the Rugby to Milton Keynes Railway Line.

11.2.2 The majority of nearby private residential properties are located along or off Welford Road (A5199). Properties are also located to the south of the Proposed Scheme, with approximately 840m of intervening agricultural land. The closest residential property to the Proposed Scheme is Dallington Grange Farm, approximately 160m west. Other than the dwellings in the area, another sensitive receptor would be the Brampton Heath Golf Centre and Northamptonshire Golf Club, approximately 170m west of the Proposed Scheme. Kings Heath Primary School is located 1.3km south east of the Scheme.

11.2.3 No baseline noise measurements have been undertaken to date. However, it is likely that noise levels near receptors potentially affected (positively or negatively) by the Proposed Scheme will fall within a wide range. There are several Noise Important Areas (NIAs) to the south of the Proposed Scheme associated with Harlestone Road, and to the east along the A508. However, these NIAs are located 1.4-2km from the Proposed Scheme with intervening screening, so are unlikely to be significantly affected.

11.3 POTENTIAL EFFECTS

CONSTRUCTION EFFECTS

11.3.1 The level of construction noise and its effect on the nearest receptors will vary during the construction period, and will depend on the methods of working and timing and phasing of activities. The way plant and activities are handled by individual operatives can also have a bearing. The main sources of construction noise are expected to include:

- Demolition and removal of existing sections of highway and existing structures;
- Excavation and earth-moving/profiling activities;
- Surfacing activities; and
- Deliveries of plant and materials.

11.3.2 The construction works will be linear in nature, whereby the associated construction activities (such as those described above) will be transient to some extent.
11.3.3 The works for the junctions at either end of the Proposed Scheme and the bridge over the railway line would be focussed on those points over longer periods and so receptors in proximity are at greater risk of disturbance. These dwellings, i.e. those to the west of Welford Road (A5199) and Dallington Grange Farm, are in the region of 150-200m from the Proposed Scheme and so the potential for negative effects exists.

11.3.4 The night-time period is particularly sensitive in terms of the potential effects from noise and vibration. Therefore, where night-time working is required, which might be the case where the works tie-in to existing carriageways and in proximity to the railway, disturbance could occur over a greater area.

11.3.5 The highest levels of vibration are likely to occur during any piling, compaction or breaking-out works; although, typically such works are of limited duration (at least at any particular location), with the risk of damage to buildings being highly unlikely. Vibration will also be produced as a result of resurfacing works where a vibratory roller is used, but this is likely to be sufficiently distant from the nearest receptors, as well as being of limited duration, such that significant effects are unlikely.

11.3.6 In addition to the on-site activities described above, heavy vehicle movements on the local network associated with the construction works have the potential to result in elevated levels of noise and vibration for receptors near the construction traffic routes. Typically, however, where these movements are limited to main roads in the area, the change in noise levels is usually insignificant.

11.3.7 Noise, and to a lesser extent vibration, can also arise close to any satellite areas (including site compounds) used for storage and welfare facilities, especially when in use outside of normal working hours.

OPERATION EFFECTS

11.3.8 The Proposed Scheme may result in both positive and negative noise (and vibration) effects. Negative effects may occur due to the use of the Proposed Scheme itself, especially in those residential areas off Welford Road to the west, where road traffic is not currently a dominant source of noise. Effects are also possible because of the redistribution of road traffic on the local road network, and where traffic redistribution is likely, then there may also be potential for positive effects on sections of roads where traffic is reduced because of the Proposed Scheme.

11.3.9 The magnitude of any change in noise is still to be determined. However, despite the potentially low background and ambient levels in some locations, the risk of significant effects being experienced is considered low, given the scale of the Scheme and the separation distance between the Proposed Scheme and the nearest dwellings, most of which lie more than 200m away.

11.3.10 Significant effects may arise at existing dwellings close to existing roads that may be affected by traffic redistribution, with these effects being potentially positive if traffic is reduced and negative if traffic is increased. However, due to the likely dominance of road traffic noise already along such roads, any change in noise levels is likely to be relatively small, resulting in any associated effects are also likely to be small.

11.3.11 The route is being designed to support the future economic development of Northampton by ‘unlocking’ residential development. In terms of future dwellings and development, it is understood these have been, or are being, designed with the Proposed Scheme in mind. Hence, no scheme-related effects are anticipated for proposed development and so these receptors are scoped-out of the assessment.

11.4 PROPOSED METHODOLOGY

INVESTIGATIONS

11.4.1 Based on the details of the Scheme, it has been determined that a comprehensive assessment is required, covering the following aspects:
- Permanent traffic noise effects (including night-time noise effects);
- Permanent traffic vibration effects;
- Temporary (i.e. construction) effects; and
- Cumulative effects.
11.4.2 The aims of this assessment are to determine whether significant noise and vibration effects are likely to arise and if so to advise on how those effects might be avoided or minimised. To this end, whilst the noise and vibration assessment will be guided by the general principles of the HD 213/11 Simple assessment, the full reporting requirements of HD 213/11 may not be followed. The intention is to apply the guidance in HD 213/11 in a proportionate manner, with adjustments as necessary to meet the assessment aims and to give due consideration to aspects that are relevant, but which are given less or no prominence in HD 213/11.

11.4.3 The assessment will consider the noise and vibration effects arising from the Proposed Scheme, as well as the effects arising from a cumulative scenario. For both, careful consideration will need to be given to the developments included in the do-minimum (baseline) and do-something scenarios. The proposed assessment requires the change in road traffic noise level to be determined at each dwelling (and other sensitive receptors) within the study area. A computerised 3D road traffic noise model will be used to facilitate the assessment.

STUDY AREA

11.4.4 The study area for the noise and vibration assessment will be defined in accordance with the guidance provided in HD 213/11, which is as follows:

- Identify the start and end points of the physical works associated with the Proposed Scheme;
- Identify the existing routes that are being bypassed or improved, and any proposed new routes, between the start and end points;
- Define a boundary one kilometre from the carriageway edge of the routes identified in (ii) above;
- Define a boundary 600 m from the carriageway edge around each of the routes identified in (ii) above and also 600 m from any other affected routes within the boundary defined in (iii) above. This area is called the ‘calculation area’;
- Identify any affected routes beyond the boundary defined in (iii) above; and
- Define a boundary 50 m from the carriageway edge of the routes identified in (v) above.

11.4.5 An affected route is where there is a possibility of a change of 1 dB LA10,18h or more in the short term (i.e. on opening) or 3 dB LA10,18h or more in the long term. The study area is therefore based on a combination of the Proposed Scheme footprint and the predicted change in traffic flows. The study area cannot be determined in full until the predicted traffic flows are available; although it will be at least 1km from the Proposed Scheme footprint.

TEMPORAL SCOPE

11.4.6 The temporal scope of the construction noise and vibration assessment will be determined by the programme of the works. The temporal scope of the operational noise and vibration assessment will be defined in accordance with HD 213/11. Accordingly, consideration will be given to both the “short term” and “long term” effects, which are defined as those occurring during the year of opening (short term) and between the year of opening and the worst-case year within 15 years of the year of opening (long term), which is typically the 15th year.

CONSTRUCTION EFFECTS

11.4.7 The assessment methodology contained in HD 213/11 requires the consideration of temporary construction effects. This guidance recommends the use of the BS 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1 Noise and Part 2 Vibration to determine the potential magnitude and significance of construction noise and vibration levels.

Noise

11.4.8 The noise levels will be predicted based on information on the likely plant (type, quantity and location), activities and construction programme outside the nearest receptors for the day, evening and night-time periods, as appropriate. The significance of the predicted noise levels will also be determined in accordance with the guidance in BS 5228-1.

Vibration

BS 5228-2 provides the latest recommendations for basic methods of noise vibration control where there is a need for the protection of persons living and working near, and those working on, construction and open sites.
OPERATIONAL EFFECTS

Noise

11.4.9 HD 213/11 notes that a methodology has not yet been developed to assign significance according to both the value of a resource and the magnitude of impact. Instead, HD 213/11 advises that the magnitude of traffic noise should be classified into levels of impact to assist with the interpretation of the Proposed Scheme.

11.4.10 For a Simple assessment, this includes presenting daytime noise level in the short term and long term, and night-time noise level change in the long-term. The summary tables contained within Annex 1 of HD 213/11 will be used to present such information.

11.4.11 Noise calculations will be undertaken for all residential properties and ‘sensitive receptors’ within 600 m of any affected route (as defined in HD 213/11). Calculations will be carried out in accordance with the methods prescribed in HD 213/11 and the Department for Transport’s Calculation of Road Traffic Noise (CRTN), as amended by Annex 4 of HD 213/11. Noise level predictions take account of many variables including; traffic flows (18-hour Annual Average Weekday Traffic), the percentage of heavy duty vehicles, average speed, and road surface type. Also accounted for within the prediction methodology are the distance and type of ground cover between source and receiver and the view of the road including the presence of any barriers or structures that might screen act as a screen.

11.4.12 For affected routes within the study area that are beyond 1km from the Proposed Scheme, an assessment will be undertaken by obtaining the Basic Noise Level (BNL) of these affected routes, as per the procedures in CRTN. The BNL is a measure of source noise at a reference distance of 10 m from the nearside carriageway edge.

11.4.13 To address the issue of significance, consideration will be given to the number of noise-sensitive receptors that are above the Significant Observed Adverse Effect Level (SOAEL). This level is defined in Defra’s Noise Policy Statement for England (published in 2010), although no numerical value is assigned. Consequently, to enable this element of the assessment to be completed, the daytime and night-time SOAEL will be quantified.

11.4.14 Baseline noise measurements will be undertaken as part of the assessment. The location of the noise monitoring will be agreed with the local authority environmental department. The noise measurements will be used for the purposes of validating the calculated baseline noise levels.

Vibration

11.4.15 The assessment of ground-borne and airborne vibration will be undertaken and presented in accordance with HD 213/11. For traffic induced airborne vibration, HD 213/11 recommends that where properties are within 40 m of the carriageway the percentage of those ‘bothered’ by airborne vibration is 10% lower than the corresponding figure for noise nuisance. Where noise levels are below 58 dB LA10, 18h, it will be assumed that residents would not be ‘bothered’ by vibration.

11.4.16 HD 213/11 also advises that should the level of vibration (peak particle velocity or PPV) at a receptor be predicted to rise to above a level of 0.3 mm s⁻¹, or an existing level above 0.3 mm s⁻¹ is predicted to increase, then this should be classed as an adverse effect. Methods are available to predict ground-borne vibration from roads; however, as stated in HD 213/11, these require detailed knowledge of the ground type and surface condition. This level of detail is unlikely to be readily available. For these reasons, the likelihood of traffic induced ground-borne vibration resulting in PPV’s greater than 0.3 mm s⁻¹ will be assessed on a qualitative basis.

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6 The BNL does not relate to any specific receptor, but rather is a measure of source noise, at a reference distance of 10 metres from the nearside carriageway edge of a specific length of highway. It is determined by obtaining the estimated noise level from the 18-hour traffic flow and then applying corrections for vehicle speed, percentage of heavy vehicles, gradient and road surface as described in CRTN.

7 The SOAEL is defined as the level above which significant adverse effects on health and quality of life occur.
12

PEOPLE AND COMMUNITIES

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12 PEOPLE AND COMMUNITIES

12.1 OVERVIEW
12.1.1 This section sets out the baseline conditions, likely significant effects and methodology for the assessment of effects in relation to people and communities.

12.2 BASELINE CONDITIONS

12.2.1 POPULATION
The site is situated within the Church Brampton area of Northamptonshire Borough. The 2016 Office for National Statistics (ONS) population estimates for Northamptonshire was 733,100. There is a lower proportion of individuals aged 16-64 in Northamptonshire (62.3%) compared with the averages across the East Midlands (62.6%) and Great Britain (63.1%).

12.2.2 DEPRIVATION
In the Indices of Multiple Deprivation 2015, Northampton was ranked 108 in England out of 326 local authorities and, as such, was in the top 40% most deprived areas. However, in the vicinity of the site area, the majority of the surrounding areas are in the 70% of least deprived areas.

12.2.3 EMPLOYMENT AND LOCAL ECONOMY
In Northamptonshire, the proportion of individuals estimated to be economically active in 2016 was 81.4% compared with an average of 77.3% in the East Midlands and 78.1% across Great Britain. The job density levels (i.e. the ratio of total jobs to the population aged 16-64) in Northamptonshire is 0.86. This is higher than the averages across the East Midlands (0.80) and Great Britain (0.84) and indicates more availability of employment opportunities within Northamptonshire. There were estimated to be 339,000 jobs in Northamptonshire in 2016, with 69.3% full-time and 30.7% part-time. The Services (Industry Sectors G-S) is the largest employment sector, accounting for 82.5% of total jobs. In Northamptonshire there are a greater proportion of jobs in the Wholesale and retail Trade; Repair of Motor Vehicles and Motorcycles (Sector G) at 18.6%, compared with an average of 17.1% across the East Midlands and 15.3% across Great Britain.

12.2.4 LAND USES AND PLANNING POLICY
The site area lies on the north-western edge of the Kingsthorpe suburb. The land uses within the site area is a mix of agricultural land, the River Nene floodplain, the Brampton Brook and Rugby to Milton Keynes railway line. Surrounding the site, land use is predominantly agricultural, except from the east to the south used instead for residential and industrial / commercial uses.

12.2.5 COMMUNITY FACILITIES
There are no education or healthcare facilities within or immediately adjacent to the site area. There are four primary schools within 2km, the closest of which is Whitehills Primary School situated 0.85km to the east of the site area. There are no secondary schools within 2km, the closest of which is the Kingsthorpe College, located approximately 2.6km to the east of the site area. There are also two general practitioner (GP) surgeries within 2km of the site area.

12.2.6 There are no education or healthcare facilities within or immediately adjacent to the site area. There are four primary schools within 2km, the closest of which is Whitehills Primary School situated 0.85km to the east of the site area. There are no secondary schools within 2km, the closest of which is the Kingsthorpe College, located approximately 2.6km to the east of the site area. There are also two general practitioner (GP) surgeries within 2km of the site area.

12.2.7 In addition, there are several hospitals, aged persons homes, dentists, churches, parish halls, and leisure facilities (including sports and fitness centres), libraries, railway / bus stations and pharmacists located within Kingsthorpe (and Northampton).

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8 Northampton Local Plan Proposals Map (2001), Northampton Borough Council
HIGHWAY NETWORK AND PUBLIC ROUTES

12.2.8 The existing local highway network includes the A5199 Welford Road and Brampton Lane to the east, Sandy Lane to the north, the A428 Harlestone Road to the west, and Mill Lane to the south.

12.2.9 National Cycle Route 6 (Brampton Valley Way) is located approximately 300m east of the site along the disused railway line. Bridleway HW6 runs across the southern edge of the site boundary, from Dallington Heath to Mill Lane. Public footpath HW45, located towards the southern end of the site, runs from the Brampton Valley Way and joins Bridleway HW6 south-west of Grange Farm via an underpass underneath the railway line. Public footpath CC6, located to the north-east of the site, runs from the Brampton Valley Path and joins the A5199 Welford Road to the east of the River Nene.

RECREATIONAL ACTIVITIES

12.2.10 NCC Open Space, Sport and Recreation Update Audit (2009) indicates that there is a deficiency of open space in Duston and Dallington. The open space that is available is also considered to be of high value to the local community.

12.2.11 The site consists of agricultural fields situated immediately to the east of Brampton Heath Golf Club/Northamptonshire County Golf Club. There are several multi-use parks and grounds located within 1km of the site, including the Spring Recreation Ground located approximately 500m from the site to the east of the A5199 Welford Road.

SENSITIVE RECEPTORS

12.2.12 The following sensitive receptors will be included but not limited to, in the assessment:

- Brampton View Care Home;
- Boughton Mill Equestrian Centre;
- Kings Heath Primary School;
- Whitehills Primary School;
- Brampton Heath Golf Centre;
- Northamptonshire County Golf Club; and
- Brampton Grange Wedding Venue, Northampton.

12.2.13 The following residential developments will also be considered as part of the assessment:

- New Duston;
- Hopping Hill;
- Dallington;
- Kingsthorpe;
- Church Brampton;
- Chapel Brampton; and
- Boughton.

12.3 POTENTIAL EFFECTS

CONSTRUCTION PHASE

12.3.1 Whilst temporary closures of the roads surrounding the site are anticipated for health and safety purposes during the construction phase, there is not anticipated to be a significant reduction in footfall due to the location of the site (i.e. isolated site away from village / town centres). Therefore, effects associated with disruption to local businesses because of a reduction in footfall in the locality during construction will not be considered in the ES.

12.3.2 It is assumed that site security arrangements for the proposed Scheme will be in line with the requirements set out within the Construction (Design and Management) Regulations 2015 and appropriate security (CCTV / security personnel) will be provided on-site. Therefore, effects in relation to crime and perception of crime will not considered further within the ES.
12.3.3 Whilst limited elements of the construction phase will require the employment of specialist contractors, it is assumed that most of the construction workforce will be from the local area and the resources and skills necessary to construct the proposed Scheme are available locally. Given most workers will reside close to the site it is anticipated that a high proportion of construction workers will continue to reside within their current locations. Therefore, there is unlikely to be a significant increase in workers moving into the local area and associated increased demand for local services, accommodation or on recreational / open space. Therefore, this will not be considered further within the ES.

12.3.4 Community facilities (excluding recreational assets) are primarily located within the communities of Kingsthorpe, to the east of the site area, and Northampton, to the south of the site area. The Proposed Scheme is not located in an area between a community and its local community facilities and therefore is not anticipated to cause any significant separation of residents / communities from the community facilities they utilise. Therefore, effects in relation to severance will not be considered further within the ES.

OPERATION EFFECTS

12.3.5 Given the nature of the Proposed Scheme, there are unlikely to be any on-site employment or significant indirect / induced employment opportunities during the operation phase. Therefore, this will not be considered further within the ES. In a similar vein, there are unlikely to be any significant changes to demands for local services, accommodation and recreational open space during the operation phase. Therefore, this will not be considered further within the ES.

12.3.6 Community facilities (excluding recreational assets) are primarily located within the communities of Kingsthorpe, to the east of the site area, and Northampton, to the south of the site area. The Proposed Scheme is not located in an area between a community and its local community facilities and therefore is not anticipated to cause any significant separation of residents / communities from the community facilities they utilise. Therefore, effects in relation to severance will not be considered further within the ES.

12.4 PROPOSED METHODOLOGY

GENERATION OF DIRECT, INDIRECT AND INDUCED EMPLOYMENT OPPORTUNITIES

12.4.1 The assessment of likely significant effects relating to employment opportunities during construction phase will be undertaken using Excel based analysis. All data sources used will be publicly available. The assessment will assume that the existing businesses may be relocated or potentially extinguished.

12.4.2 To estimate the number of jobs that would be created during the construction phase, the total cost of the Proposed Scheme will be divided by the average output per year for construction workers in the area. These figures will be evaluated against the total number of employees in Industry Sector F (Construction) within the study area to determine the magnitude of change. This figure will be offset against the number of jobs that might be lost / displaced because of the need to relocate any affected businesses (albeit such jobs may be in a different sector).

LOSS / DISTURBANCE OF ASSETS USED BY COMMUNITY RECEPTORS

12.4.3 The assessment for the construction and operation phases will focus on the effects on the current usage of the Brampton Heath Gold Course and the Brampton Care Home arising from the Proposed Scheme. The evaluation will consider the proportion of these assets that may be lost as part of the Proposed Scheme, the level of existing usage and the availability of alternative resources that can be used by community receptors within the surrounding area. Qualitative consideration will also be given to disturbance (e.g. lighting and noise) from the proposed Scheme on users of these assets.

LOSS / CHANGE IN ACCESSIBILITY TO PRIVATE LAND

12.4.4 The assessment for the construction and operation phases will be undertaken in accordance with the principles set out in DMRB. The assessment will focus on the importance of the land (i.e. whether it is imperative to a business operation), the availability of alternative land within the vicinity and proportion of the land-take as an overall of each land holding.
12.4.5 The DMRB defines amenity value as the relative ‘pleasantness’ of an experience and notes several factors which contribute to this, including receptor’s exposure to traffic – noise, dirt and air quality – and the effect of the proposed Scheme itself. Noise, dirt and air quality will be dealt with elsewhere in the ES. Therefore, the qualitative assessment of disruption and amenity value within the ES during the construction and operation phases within this chapter will focus on changes to fear / safety associated within the below:

- Ability to continue to use the route during construction and operation phases;
- The current condition of the recreational resource (e.g. width of route etc.);
- Distance of the recreational resource from the works / the proposed Scheme; and
- The presence of any barriers between the users of the recreational resource and associated plant / traffic.

12.4.6 The qualitative assessment during the construction and operation phases will be focussed on the anticipated delay (in terms of time) for vehicle receptors to travel through the area.

Changes in driver stress, defined as the adverse mental and physiological effects experienced by a vehicle traveller traversing a road network, will also be considered. The qualitative assessment during the construction and operation phases will consider the road layout, junction frequency, speed and flow per lane.
ROAD DRAINAGE AND THE WATER ENVIRONMENT
13 ROAD DRAINAGE AND THE WATER ENVIRONMENT

13.1 OVERVIEW
13.1.1 This chapter outlines the scope and proposed methodology for identifying potential effects arising from the Proposed Scheme on the drainage and water environment, this includes; waterbodies, flood risk, and the drainage regime. This chapter details the findings of a review of available hydrological, hydrogeological and flood risk desk study information obtained in relation to the study area. Consideration will also be given to any other committed developments within the vicinity of the Proposed Scheme.

13.2 BASELINE CONDITIONS
13.2.1 A preliminary desktop study has been undertaken to assess existing baseline conditions at the site.

HYDROLOGICAL SETTING

Brampton arm of the River Nene
13.2.2 The Brampton arm of the River Nene flows to the east of the Proposed Scheme, and is located approximately 60m to the east of the proposed junction with Northampton Road. The River Nene is a main river under the jurisdiction of the EA. The Brampton arm flows in a southerly direction to its confluence with the larger arm of River Nene approximately 4.3km downstream of the study area. The River Nene then continues to flow in an easterly direction to the south of Northampton. At the location of the proposed Scheme the Brampton arm of the Nene is located within the Anglian river basin district in the Brampton Branch - Lower catchment.

13.2.3 Water quality within the River Nene is monitored against the objectives of the Water Framework Directive (WFD). Current ecological quality is assessed to be poor and current chemical quality is assessed to be good. The poor ecological rating is attributed to poor biological quality elements. There are no statutory ecological designations associated with the River Nene within 1km of the Proposed Scheme, however, the river has the potential to support otter and water vole populations.

13.2.4 Review of the Environment Agency’s (EA) Water Abstraction Licenses map indicates licensed surface water abstractions from the River Nene at the following locations:
- Approximately 300m to the north of Proposed Scheme, where water is abstracted from the River Nene. The abstracted water is stated to be used for agricultural, industrial and commercial purposes including spray irrigation and process water; and
- Approximately 320m south of Brampton Lane to the east of the Proposed Scheme, where water is likely to be abstracted from a minor tributary of the River Nene. The abstracted water is stated to be used for industrial and commercial purposes and is located approximately 740m from the Proposed Scheme.

Brampton Brook
13.2.5 Brampton Brook flows immediately to the north of the Northampton to Rugby railway line. The watercourse is crossed by the Proposed Scheme. The watercourse is a main river under the jurisdiction of the EA and flows in an easterly direction to its confluence with the River Nene, located approximately 210m to the east of the Proposed Scheme. It is located within the Anglian river basin district in the Church Brampton Arm catchment.

13.2.6 Water quality of Brampton Brook is monitored against the objectives of the WFD. Current ecological quality is assessed to be moderate and current chemical quality is assessed to be good. There are no statutory ecological designations associated with Brampton Brook within 1km of the Proposed Scheme, however, the river has the potential to support otter and water vole populations.

13.2.7 Review of the EA’s Water Abstraction Licenses map indicates licensed surface water abstractions immediately to the north of the Northampton to Rugby railway line, where water is abstracted from the Brampton Brook. The abstracted water is stated to be used for agricultural, industrial and commercial purposes including spray irrigation and domestic use. The location of the abstraction is indicated to be located approximately 340m west of the Proposed Scheme.
GEOLOGY AND HYDROGEOLOGY

13.2.8 The hydrogeology of the site has been assessed using aquifer designation mapping available from the EA. It indicates that the Northampton Sand Formation is classified as a Secondary A Aquifer, and that the Whitby Mudstone Formation is classified as Unproductive Strata. The superficial deposits (Alluvium) are classified as a Secondary A Aquifer. The site is not located in a groundwater Source Protection Zone (SPZ). There are no groundwater abstractions recorded on or within 500m of the site. There is one groundwater discharge consent noted 100m south east of the site, operated by Northampton Telephones Sports and Social for an unknown discharge type and with a revocation date of 1st October 1996.

FLOOD RISK

Fluvial Flood Risk

13.2.9 Review of the EA’s Flood Map for Planning (Rivers and Sea) indicates that land adjacent to the River Nene is located within the high-risk Flood Zone 3. Flood Zone 3 is defined as land with a 1% (1 in 100) or greater annual probability of flooding from fluvial (river) sources. Modelling of the River Nene (Upper Nene) was undertaken in 2013 on behalf of the Environment Agency using detailed 1D-2D ISIS-TUFLOW modelling software. It is understood that this model does not include the Brampton Brook and it is therefore assumed that the flood extents of the Brampton Brook have been derived using a less detailed broad scale model.

13.2.10 The northern extent of the Proposed Scheme is located within the low risk Flood Zone 1 where the annual probability of fluvial flooding is less than 0.1% (1 in 1000). The southern extent of the Proposed Scheme crosses the floodplain of the River Nene approximately 250m west of the confluence with Brampton Brook. The current modelling of these watercourses does not consider the updated climate change recommendations published by the EA in March 2016. This guidance recommends a 25% to 65% increase in fluvial flood flows to account for the potential effects of climate change over the next 100 years. If climate change is considered, this will increase the risk of fluvial flooding to the northern extent of the Proposed Scheme.

13.2.11 Initial discussions with the EA have highlighted that the existing standard of protection from flooding in Northampton has been designed to the 0.5% Annual Exceedance Probability (AEP) design standard. A letter was issued on the 2nd February 2017 by the Environment Agency setting out their requirements for the study. In this letter the EA stated that to maintain this standard, new development in the upstream catchment should also be designed to this standard. This requirement is also presented in the West Northamptonshire Strategic Flood Risk Assessment (SFRA).

Surface Water Flood Risk

13.2.12 A review of the EA’s Risk of Flooding from Surface Water map indicates a similar flood extent to the fluvial flood risk for both the River Nene and Brampton Brook. The Flood mapping also indicates relatively minor overland flow routes that drain towards the River Nene near the Proposed Scheme, but none are considered to pose significant risk to the proposed relief road.

SENSITIVE RECEPTORS

13.2.13 The sensitive receptors that could be impacted by the proposals are the main rivers, the River Nene and Brampton Brook. Ecosystems dependent on these resources could be directly or indirectly impacted by changes to the hydrological and hydraulic conditions of the watercourses.

13.3 POTENTIAL EFFECTS

CONSTRUCTION PHASE

13.3.1 During construction, it is considered likely that significant effects to surface water features, groundwater features and flood risk could arise from:

- Increased pollution risks from spillage of fuels or other harmful substances that may migrate to local surface water and groundwater receptors;
- Increased sedimentation within watercourses caused by surface water runoff from areas of bare earth, construction materials such as aggregate and stockpiles of topsoil;
- Impacts to the hydromorphological, chemical and ecological quality of watercourses associated with works within or near watercourses such as the installation of culverts, bridges and outfalls as well as realignment of watercourses, including longer-term changes associated with sediment deposition; and
- Increased flood risk associated with temporary works within areas of fluvial flood storage, works to existing watercourse alignments and culverts, and associated with changes to catchment permeability and hydrology.

13.3.2 A Construction Environmental Management Plan (CEMP) will be prepared for the works that will include method statements for the proposed works, details of materials to be used, and an emergency response plan. The full CEMP will contain measures to protect both surface and groundwater quality, and other water resource aspects.

13.3.3 During the construction phase, consideration will be given to potential impacts to catchment hydrology and flow within existing watercourses. Temporary diversions may need to be established prior to undertaking the works to maintain existing catchments and flow regimes. Temporary drainage systems may also be required to capture, manage and attenuate flow prior to discharge to prevent increased flood risk.

**OPERATION EFFECTS**

13.3.4 During operation, it is considered likely that significant effects to surface water features, groundwater features and flood risk could arise from:

- Polluted surface water runoff containing silts and hydrocarbons that may migrate or be discharged to surface water features or groundwater resources via the proposed highway drainage system;
- Permanent impact to the hydromorphological and ecological quality of water features associated with works within or near water features such as the installation and alteration of culverts, bridges and outfalls as well as realignment of watercourses;
- Permanent impacts to catchment hydrology caused by the introduction of a barrier to natural overland flow and changes to natural catchment dynamics associated with the proposed highway drainage system and proposed watercourse diversions;
- Increased rates and volumes of surface water runoff from an increase in impermeable area or changes to the existing drainage regime leading to a potential increase in flood risk; and
- Increased flood risk to the Scheme and to people and property elsewhere caused by displacement of flood water storage or crossing of watercourses thus impacting flood flow conveyance.

13.3.5 To mitigate potential impacts during the operational phase, a robust surface water drainage system will be provided to ensure discharge from the Scheme does not increase flood risk elsewhere. The design standard will be confirmed with the Environment Agency and include allowance for climate change effects, in accordance with the feedback received from the EA. Consideration will be given to the provision of new drainage systems that provide sufficient attenuation and restrict the rate and volume of discharge to a rate agreed with NCC as the Lead Local Flood Authority (LLFA).

13.3.6 The new crossing of Brampton Brook will consider; the implications of flood risk up to the 1 in 200 annual probability events considering the potential effects of climate change, be designed in accordance with DMRB guidance, and be sensitive to ecological requirements. Any surface water flow routes that are affected by the Proposed Scheme will be reviewed with respect to; flood risk up to the 1 in 100 annual probability events considering the potential effects of climate change, be designed in accordance with DMRB guidance, and be sensitive to ecological requirements.

13.3.7 Surface water runoff is likely to contain high levels of sediment and hydrocarbons that can pollute surface water and groundwater features through direct migration or via the surface water drainage system. A robust treatment system will therefore be required. Multi-stage proposals that maximise passive treatment using Sustainable Drainage Systems (SUDS) will be considered.

13.3.8 Parts of the Proposed Scheme are located within the high-risk Flood Zone 3. Initial discussions with the EA indicate that any loss of fluvial flood storage will be compensated on a like-for-like basis to ensure no increased risk of flooding to the Scheme or elsewhere up to the 1 in 200 annual probability events considering the potential effects of climate change.
13.4 PROPOSED METHODOLOGY

LEGISLATIVE FRAMEWORK

13.4.1 The following legislative framework will be considered in the assessment:

- Flood and Water Management Act (2010);
- Flood Risk Regulations (2009);
- The Water Environment (Water Framework Directive) (England and Wales) Regulations (2017);
- The Groundwater (England and Wales) Regulations (2009);
- Land Drainage Act (1991 and 1994);
- The Water Resources Act (1991);
- The Environmental Permitting Regulations (2016);
- National Planning Policy Framework (March 2012);
- National Planning Practice Guidance (NPPG) Flood Risk and Coastal Change Planning Practice Guidance;
- National Flood and Coastal Erosion Management Strategy for England (September 2011);
- Anglian River Basin District River Basin Management Plan (March 2016);
- River Nene Catchment Flood Management Plan (December 2009);
- Northampton County Council - Local Development Scheme (February 2017);
- Central Area Action Plan (CAAP) (2013);
- Northampton Central Area Action Plan: Policy 5 - Flooding and Drainage Developer Guidance Note (2013);
- West Northamptonshire Strategic Flood Risk Assessment (SFRA) (December 2017);
- West Northamptonshire (Daventry and South Northamptonshire) Level 2 SFRA (June 2009); and
- Northampton Level 2 SFRA (February 2010).

STUDY AREA

13.4.2 The study area will encompass surface water features up to 500m from the Proposed Scheme. This distance is considered appropriate for the assessment of direct effects (i.e. associated with overland migration of pollutants directly to surface features, pollutants conveyed in drainage systems, and works within the river channel).

13.4.3 Features that are in hydraulic connectivity with the study area will also be considered, including surface water abstractions and downstream watercourses. Based on the professional judgement of the assessor and current knowledge of the area, features located up to approximately 1km from the Proposed Scheme will be considered. This distance is considered appropriate for the assessment of indirect effects, although if sensitive features located further than 1km from the Proposed Scheme are identified to be at risk, these features will also be considered within the assessment.

13.4.4 The study area will encompass groundwater features within approximately 500m of the Proposed Scheme and groundwater abstractions up to a minimum of 1km from the Scheme. This distance is considered appropriate for the assessment of surface-borne pollutants migrating to groundwater features.

SCOPE OF THE ASSESSMENT

13.4.5 All surface water features and groundwater features identified within the baseline conditions section are scoped into the assessment. The aspects of the water environment that will be considered within this section include the ecological, chemical, and hydromorphological quality of surface water features, flood risk, and groundwater quality in so far that groundwater may be affected by surface-borne pollutants for both the construction and operation phases.

13.4.6 Surface water features and groundwater features that are located beyond 500m from the study area or are considered to not be hydraulically connected to the Proposed Scheme will not be considered in the assessment and are therefore scoped out.

13.4.7 Potential impacts to groundwater associated with impacts to groundwater flows and the release of contaminants contained in the ground will be assessed in Chapter 8 - Geology and Soils. Similarly, impacts to ecology, including sensitive and/or important aquatic species and habitats, will be assessed in Chapter 7 - Ecology and Biodiversity.
ASSESSMENT METHODOLOGY

13.4.8 The assessment will be undertaken in accordance with the DMRB Volume 11, Section 3, Part 10 (HD 45/09) and will involve a desk-based review of existing information, a site visit, and assessment of the Proposed Scheme effects in relation to flood risk and the quality of surface water and groundwater features.

Construction

13.4.9 The assessment of potential effects that may arise during construction will be a qualitative assessment that considers risks to the chemical quality of surface water and groundwater features associated with pollutants typically experienced during construction. Changes in flood risk during the construction phase will be assessed qualitatively based on professional judgement and any necessary mitigation proposed. The assessment will also consider the anticipated temporary drainage solution which will be implemented during the construction phase of the Scheme.

Operation

13.4.10 The assessment of potential effects to the water quality that may arise during operation will be informed by the methods outlined in HD 45/09 (namely Methods A, C and D) to assess potential effects to surface water and groundwater quality, including risks associated with spillage.

13.4.11 Method A will be used to undertake a simple assessment of the potential impact of routine runoff on the chemical quality of receiving surface waters. This will indicate if there is likely to be a risk of pollution that should be explored further or if the risks can be considered sufficiently low not to warrant any further investigation. No sampling of baseline water quality will be undertaken to inform the assessment and it is proposed that low flows will be determined using LowFlows2 software.

13.4.12 Method C will be used to assess the risk of pollution impacts from routine runoff on groundwater quality and is based on an assessment of the source-pathway-receptor protocol used in risk assessment procedures. This will be undertaken if soakaway drainage or unlined drainage channels are proposed.

13.4.13 Method D will be used to determine the potential impacts from accidental spillages predominantly due to road collisions involving the spillage of a potentially polluting substance somewhere on the length of the Proposed Scheme. It calculates the risk, assuming a spillage has occurred, that the pollutant will reach and impact on the receiving watercourse. This method considers local collision data, existing incident response arrangement and the vulnerability of receiving water bodies.

13.4.14 In addition to the core aspects of assessment as defined within DMRB (HD 45/09), the assessment of potential impacts to the water environment will also consider potential impacts to the hydromorphological quality of surface water features. This is likely to be associated with the introduction of new structures such as culverts and bridges, potential realignment of existing watercourses, and potential changes to watercourse hydrology associated with the introduction of a linear barrier or diversion of natural flow caused by the proposed surface water drainage system or cuttings that could affect baseflow to rivers. The findings of this assessment will also contribute to the assessment of potential ecological effects assessed within Chapter 7 - Ecology and Biodiversity. It is proposed that this assessment is qualitative and informed by desk-based study, site walkover and consultation with the Scheme ecologist.

FLOOD RISK ASSESSMENT (FRA)

13.4.15 A standalone Flood Risk Assessment (FRA) will be prepared to support the EIA in accordance with the NPPF (March 2012) and Planning Practice Guidance (PPG) and will be reported within the ES. The FRA will assess the potential implications of the Proposed Scheme on flood risk to people and property, as well as assess the potential risk of flooding to the Proposed Scheme. It is proposed that the following aspects will be considered:

- Potential impacts to flood flow conveyance on the Brampton Branch of the Nene and on Brampton Brook resulting from the construction of new culverts, bridges and embankments and diversion of watercourses that may be required as part of the Proposed Scheme;
- Potential impacts to the Scheme from all sources of flooding, including fluvial, surface water, groundwater, drainage systems and artificial sources; and
- Potential impacts to fluvial and surface water flooding associated with an increase in impermeable surfacing and/or changes to catchment hydrology associated with the proposed surface water drainage system.
13.4.16 Hydraulic modelling of the upstream reaches of the Brampton Branch of the River Nene and Brampton Brook is proposed to inform the FRA. A modelling method statement has been prepared and submitted to the EA for comment. Through discussions with the EA and working on the basis that the Proposed Scheme will be classified as essential infrastructure is has been agreed the following conditions should be met:

- The FRA should demonstrate the Scheme does not flood to the 1 in 1000 annual probability plus 65% climate change event (the upper end allowance).
- Floodplain compensation will be required to offset the impacts of the Scheme. Floodplain compensation should demonstrate no adverse impact to the 1 in 200 annual probability plus 65% climate change to maintain the standard of defences within Northampton.

13.4.17 Model output data will include pre- and post-development flood extents for the 20, 100, 200, 200 plus climate change, 1000 and 1000 plus climate change annual probability return period events.

13.4.18 It is proposed that a simplified approach is taken to inform the assessment of risk and mitigation for surface water flow paths affected by the Proposed Scheme, using hand calculations or software such as Culvert Master to inform the appropriate sizing and design of proposed diversions and watercourse crossings. These assessments will consider the potential effects of climate change.

**WATER FRAMEWORK DIRECTIVE (WFD)**

13.4.19 An assessment of the potential works against the objectives of the Water Framework Directive (WFD) will also be undertaken. A standalone WFD Assessment will be prepared, and the findings presented within the ES.

**CONSULTATION**

13.4.20 The primary stakeholders in the study area have been identified as: the Environment Agency, Northampton County Council (LLFA), Thames Water (the sewer authority), and local landowners.

13.4.21 A meeting was held with the EA on the 4 January 2018 to discuss the scope of the study and the requirements for the FRA. Following this meeting, and reflecting a formal communication from the EA on the 2 February 2017, a modelling method statement was supplied on 22 March 2018. The EA are statutory consultees in relation to flood risk and will be engaged further through the study as appropriate and will be asked to comment on the FRA once complete. The EA will also be consulted regarding potential impacts to the hydromorphological quality of the River Nene and Brampton Brook, including impacts associated with WFD objectives.

13.4.22 NCC will be consulted regarding the management of surface water runoff from the proposed Scheme, as well as the management of overland flow paths and other local sources of flood risk. Information regarding historic flooding events and flood management measures will also be requested from NCC.

13.4.23 Thames Water will be consulted if it is proposed to discharge any surface water runoff from the Proposed Scheme to the public sewerage network, although this is considered unlikely.

13.4.24 Local landowners will be engaged as appropriate where the findings of the FRA indicate potential impacts on their land resulting from the mitigation requirements for the Scheme.

**SIGNIFICANCE CRITERIA**

13.4.25 To assess the significance of effects from the Scheme on the water environment, the guidelines within Annex IV of Volume 11, Section 3, Part 10 of the DMRB (HD 45/09) will be followed. This promotes the following approach:

- Estimation of the importance of the attribute;
- Estimation of the magnitude of the impact; and
- Assessment of the significance of the impact based on the importance of the attribute and magnitude of the impact.

13.4.26 The importance of the receptors will be described using the criteria and typical examples as outlined in Table A4.3 of the guidance. The magnitude of the predicted effect on the receptors will be described using the criteria and examples as outlined in Table A4.4 of the guidance. The identification of significant effects will align to the matrix in Table A4.5 of the guidance. Where an effect is considered not to be significant or have no influence, irrespective of other effects, it will be classified as neutral.
OTHER SUPPORTING DOCUMENTS
14 OTHER SUPPORTING DOCUMENTS

14.1 SUPPORTING PLANNING STATEMENT

14.1.1 The Supporting Planning Statement will include a thorough review of planning policy context and appraisal, identifying the policy framework at the national, regional and local levels. National Planning Guidance will include Planning Policy Guidance Notes and Planning Policy Statements where relevant.

14.2 DESIGN AND ACCESS STATEMENT

14.2.1 The design and access statement will contain the design principles and concepts that have been applied to the Project in respect of amount, layout, scale, landscaping and appearance; it will also detail how issues relating to access have been dealt with including how relevant access policies have been considered. The statement will also explain the evolution of the proposals throughout the consultation process and how this has influences the design.

14.3 ARBORICULTURE SURVEY REPORT

14.3.1 The work will be undertaken by suitably qualified arboriculturists who are experienced in undertaking all aspects of development related arboricultural work. The survey report will include the following four elements:

DESK STUDY

14.3.2 The desk study provides the results of a review all known extant tree constraints which includes:

- Presence of tree preservation order and conservation area trees;
- Relevant designations within the site including the presence of ancient woodland or trees, or known veteran and notable trees; and
- Local planning policy.

TREE SURVEY

14.3.3 This will include a survey of all qualifying9 trees within and adjacent to the site boundary. All qualifying trees are inspected from ground levels using the Visual Tree Assessment (VTA) which is undertaken on the above ground proportion of the tree. This is a non-invasive method for ascertaining the physiological and structural condition of trees and may require the use of an acoustic mallet and small probe.

TREE CONSTRAINTS PLAN

14.3.4 A tree constraints plan will be provided for use by the designers to inform feasibility studies and subsequent designs. The plans will identify the above and below spatial constraints of the existing trees which includes their quality, position, crown spread, and root protection areas.

DETAILED ARBORICULTURAL REPORT

14.3.5 Following completion of the tree survey and constraint mapping a detail report will be compiled including the following:

- Tree survey schedule which includes details of all the arboriculture features which have been surveyed; and
- Detailed Arboriculture Report which identifies the direct and indirect effects of the Proposed Scheme on existing trees and will put forward proposals for suitable mitigation measures where required. The report will also include an Arboriculture Impact Assessment and Arboriculture Method Statement for the protection of the trees.

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9 Qualifying trees are those defined with a stem diameter of at least 75mm measured at 1.5m above ground level and external trees with a Root Protection Area (RPAs) that may be affected by any future in accordance with BS 5837:2012 trees in relation to design, demolition and construction.
14.4 TRANSPORT STATEMENT

14.4.1 A Transport Statement is a simplified form of Transport Assessment and is used for smaller scale developments that will not have a major impact on the transport network, but are still likely to have an impact at a local level on the immediate transport network. The objective of this report is to provide the Planning Authority and local highway authority (LHA) with sufficient information to consider the highway implications of the proposal in the planning process.

14.4.2 The scope and level of detail in a Transport Assessment or Statement will vary from site to site but the following will be considered within the scope of the proposed assessment:

- Information about the proposed development, site layout, (particularly proposed transport access and layout across all modes of transport);
- Information about neighbouring uses, amenity and character, existing functional classification of the nearby road network;
- Data about existing public transport provision, including provision/ frequency of services and proposed public transport changes;
- A qualitative and quantitative description of the travel characteristics of the proposed development, including movements across all modes of transport that would result from the Proposed Development and near the site;
- Data about current traffic flows on links and at junctions (including by different modes of transport and the volume and type of vehicles) within the study area and identification of critical links and junctions on the highways network;
- An analysis of the injury accident records on the public highway near the site access for the most recent 3-year period, or 5-year period if the proposed site has been identified as within a high accident area;
- An assessment of the likely associated environmental impacts of transport related to the development, particularly in relation to proximity to environmentally sensitive areas (such as air quality management areas or noise sensitive areas);
- Measures to improve the accessibility of the location (such as provision/enhancement of nearby footpath and cycle path linkages) where these are necessary to make the development acceptable in planning terms;
- A description of parking facilities in the area and the parking strategy of the development;
- Ways of encouraging environmental sustainability by reducing the need to travel; and
- Measures to mitigate the residual impacts of development (such as improvements to the public transport network, introducing walking and cycling facilities, physical improvements to existing roads).
Appendix A

ENVIRONMENTAL IMPACT ASSESSMENT SCREENING RESPONSE
Dear Sir/Madam,

TOWN AND COUNTRY PLANNING (ENVIRONMENTAL IMPACT ASSESSMENT) (ENGLAND AND WALES) REGULATIONS 2017: REGULATION 5 SCREENING OPINION

PROPOSAL: Construction of the Northampton North West Relief Road

Thank you for your e-mail and attached letter with plan requesting a screening opinion in respect of the proposed NWRR.

The development is not listed under Schedule 1 of the EIA Regulations and therefore the requirement of an EIA is not mandatory. Nevertheless, the development requires screening under the current EIA Regulations, Schedule 2, paragraph 10 (Infrastructure Projects) (f) Construction of Roads, as the development exceeds 1 hectare. Also, the National Planning Practice Guidance (NPPG) provides indicative thresholds to guide possible EIA development and advises that EIA is more likely to be required if the new road is over 2km in length.

Schedule 3 of the current EIA Regulations also lists the selection criteria for screening Schedule 2 development and notes that consideration should be given to the characteristics of the development, its location and the characteristics of the potential impact.

Based on the information provided as part of your screening request, we consider that the development will require Environmental Impact Assessment given that the area of the proposed scheme is 9.2 hectares and the geographical location of the proposed development is considered to be environmentally sensitive. We advise that the following topic areas are covered in the Environmental Statement:

- Air Quality/Dust/Health Impact

Planning Services
One Angel Square
Angel Street
Northampton NN1 1ED

w. www.northamptonshire.gov.uk
t. 01604 367019
e. pmoor@northamptonshire.gov.uk

This information can be provided in an alternative language or format such as large print or audio cd. Contact 01604 236014
- Noise & Vibration
- Ecology
- Arboriculture
- Landscape/Visual Impact
- Archaeology/Cultural Heritage
- Geology and Soils
- Transport
- Flood Risk
- Materials and Waste
- Socio Economic Effects
- Cumulative Effects
- Alternatives
- Climate Change

The ES should also include a statement of relevant expertise or qualifications as required by Regulation 18 (5) (b). Please do not hesitate to contact me if I can be of any assistance.

Yours faithfully,

Peter Moor
Principal Development Control Officer
Appendix B

CLIMATE RISK AND VULNERABILITY ASSESSMENT
NORTHAMPTON NORTH WEST RELIEF ROAD CLIMATE RISK AND VULNERABILITY ASSESSMENT

INTRODUCTION

To mainstream the consideration of climate risk and vulnerability, a proportionate assessment should be undertaken at an early stage of project development, including as part of the Environmental Impact Assessment (EIA) process. This will ensure that projects achieve an appropriate level of resilience in a cost-effective manner. The requirement to consider a project’s vulnerability to climate change results from the 2014 amendment to the EIA Directive (2014/52). The Directive has been fully transposed into UK law in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 and came into force in the UK on the 16 May 2017. The Directive requires:

“A description of the likely significant effects of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.”

This document presents an assessment of the vulnerability of the Proposed Scheme to the impacts of climate change before scoping vulnerabilities in or out of further assessment.

PROPOSED SCHEME

The proposed scheme is likely to consist of the following elements:

- Approximately one mile of new carriageway;
- Two bridges (located towards the north and south of the carriageway crossing the River Nene and railway line);
- Connection to the existing road network and proposed roundabout for the Dallington Grange development;
- Signage;
- Earthworks (embankments);
- Drainage infrastructure; and
- Vegetation.

STUDY AREA

The assessment of vulnerability of the Proposed Scheme to the impacts of climate change will be informed by regional scale information on historic and projected change in climate variables. The UK Climate Projections 2009 (UKCP09) provide data on projected change in climate variables for each of the administrative regions of the UK. The proposed scheme falls within the East Midlands region so this will form the study area for the vulnerability assessment.

ASSESSMENT APPROACH

This section outlines the full approach to assessment of climate vulnerability and risk in the EIA process. This approach aligns with the following UK and international guidance:

- European Commission (2013) Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment2;
- European Commission (2016) Climate change and major projects3; and

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The full approach consists of 4 steps:

- Step 1: Identify receptors and analyse policy context;
- Step 2: Climate vulnerability assessment;
- Step 3: Risk assessment; and
- Step 4: Adaptation measures.

In this Scoping Report, the results of Steps 1 and 2 will be presented to determine the level of vulnerability of the Proposed Scheme to the impacts of climate change and determine which vulnerabilities should be scoped in for further assessment (following Steps 3 and 4) at the next stage of the EIA process.

**STEP 1: IDENTIFY RECEPTORS AND ANALYSE POLICY CONTEXT**

During this stage, relevant receptors that may be affected by climate change are identified with consideration given to the impact of extreme weather and changes in climate on the project over its lifetime. These receptors may comprise both known (i.e. receptors affected by historic weather events) and unknown (new) receptors. This stage includes a definition of the policy context.

**STEP 2: CLIMATE VULNERABILITY ASSESSMENT**

This stage comprises an assessment of the vulnerability of the receptors identified in step 1 to projected climate change and extreme weather variables. The vulnerability of a receptor to extreme weather and climate change is a function of:

- The typical sensitivity of the receptor to climate variables – based on literature review and expert judgement; and
- The exposure of the receptor to projected change in climate variables – based on information on observed climate and projected climate (from UKCP09).

For each element of the vulnerability assessment (i.e. sensitivity and exposure), a vulnerability categorisation is assigned to each climate variable in relation to each receptor based on the following scale:

- High: High climate sensitivity or exposure;
- Medium: Moderate climate sensitivity or exposure; and
- Low: No significant climate sensitivity or exposure.

This is a qualitative assessment informed by expert opinion and supporting literature.

The vulnerability of receptors to climate variables is determined from the combination of the sensitivity and exposure categorisation, using the matrix shown in Table 1.1. At this point ‘Low’ vulnerabilities are scoped out of further assessment, whilst ‘High’ and ‘Medium’ vulnerabilities are taken forward to Steps 3 and 4.

<table>
<thead>
<tr>
<th>SENSITIVITY</th>
<th>EXPOSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>Medium</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>High</td>
<td>Low vulnerability</td>
</tr>
</tbody>
</table>
STEP 3: RISK ASSESSMENT

Firstly, hazards related to the ‘Medium’ and ‘High’ vulnerabilities are identified. Typical hazards are shown in Table 1.2.

Table 0.2 – Typical hazards associated with climate variables

<table>
<thead>
<tr>
<th>CLIMATE VARIABLE</th>
<th>CLIMATE-RELATED HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average air temperature change (annual, seasonal, monthly)</td>
<td>High temperatures, longer growing season</td>
</tr>
<tr>
<td>Extreme air temperature (frequency and magnitude)</td>
<td>Heatwaves</td>
</tr>
<tr>
<td>Average precipitation (annual, seasonal, monthly)</td>
<td>Flooding (fluvial, pluvial), ground stability, soil moisture deficit, snow, ice and hail</td>
</tr>
<tr>
<td>Extreme rainfall (frequency and magnitude)</td>
<td>Flooding, ground stability</td>
</tr>
<tr>
<td>Average wind speed change (annual, seasonal, monthly)</td>
<td>Wind loading</td>
</tr>
<tr>
<td>Gales and extreme winds (frequency and magnitude)</td>
<td>Storms (tracks and intensity), including storm surge</td>
</tr>
<tr>
<td>Humidity</td>
<td>Fog</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>High temperatures, storms and lightning</td>
</tr>
<tr>
<td>Sea level</td>
<td>Coastal flooding</td>
</tr>
</tbody>
</table>

The risk assessment is undertaken by considering the consequence and the likelihood of climate hazards to the Proposed Scheme elements. These determinants are then combined to develop a climate risk rating for each project element in respect to specific climate hazards (Table 1.3). The risk assessment is a qualitative assessment based on expert judgment, engagement with the project team and a review of relevant literature. This process is supplemented with quantitative data and information where available.

Table 0.1 – Risk rating matrix

<table>
<thead>
<tr>
<th>LIKELIHOOD OF HAZARD OCCURRING</th>
<th>CONSEQUENCE OF HAZARD OCCURRING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Very high</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Very low</td>
<td>Low</td>
</tr>
</tbody>
</table>

STEP 4: ADAPTATION MEASURES

In the final step, adaptation measures for the Extreme, High and Medium risks are identified through consultation with the project team and expert opinion. Taking account of the contribution of incorporated adaptation measures, a summary of the level of climate resilience of the Proposed Scheme elements to climate change is applied:

- High - a strong degree of climate resilience, remedial action or adaptation may be required but is not a priority;
- Moderate - a moderate degree of climate resilience, remedial action or adaptation is suggested; and
- Low – a low level of climate resilience, remedial action or adaptation is required as a priority.

Recommendations for supplementary climate change adaptation measures are then identified where necessary.
VULNERABILITY ASSESSMENT FINDINGS

This section presents the findings of the assessment of steps 1 and 2 to determine if there are significant vulnerabilities to climate change which need to be further assessed (through steps 3 and 4) in the next stage of the EIA process. Any such further assessment will be reported in the Environmental Statement.

STEP 1: IDENTIFY RECEPTORS AND POLICY CONTEXT

Receptors associated with the proposed scheme are as follows:
- Approximately one mile of new carriageway;
- Two bridges (located towards the north and south of the carriageway crossing the River Nene and railway line);
- Connection to the existing road network and proposed roundabout for the Dallington Grange development);
- Signage;
- Earthworks (embankments);
- Drainage infrastructure; and
- Vegetation.

The policy context for this assessment is set out in Table 1-4.

Table 0.4 – Policy context

<table>
<thead>
<tr>
<th>DOCUMENT</th>
<th>SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Planning Policy Framework (NPPF)</td>
<td>The National Planning Policy Framework (NPPF) was published on 27 March 2012 and replaces the majority of the Planning Policy Statements and Planning Policy Guidance. The Climate Change Act (2008) strengthened the institutional framework in respect of planning policy and managing the impact of climate change. In line with the objectives and provisions of the Climate Change Act (2008), the NPPF states that local authorities should adopt proactive strategies to mitigate and adapt to climate change.</td>
</tr>
</tbody>
</table>
| UK Climate Change Act (2008) | The Climate Change Act (2008) created a new approach to managing and responding to climate change in the UK, by:  
  - Setting ambitious, legally binding reduction targets.  
  - Taking powers to help meet those targets.  
  - Strengthening the institutional framework.  
  - Enhancing the UK’s ability to adapt to the impacts of climate change.  
  - Establishing clear and regular accountability to the UK Parliament and to the developed legislatures.  
Key provisions of the Act in respect of climate change adaptation includes a requirement for Government to report, at least every five years, on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed. The Act also introduced powers for Government to require public bodies and statutory undertakers to carry out their own risk assessment and make plans to address those risks. |
| Amendment to the EIA Directive (2014/52) | The requirement to consider a project’s (or Proposed Scheme’s) vulnerability to climate change results from the 2014 amendment to the EIA Directive (2014/52). The Directive requires: “A description of the likely significant effects of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change.” |
| Northamptonshire Corporate Environment Strategy, 2009 | Northamptonshire County Council will ensure our buildings and services are able to adapt to climate change. The County Council is also committed through the Northamptonshire Sustainable Communities Strategy and the Nottingham Declaration on Climate Change to reducing the impact of its activities on the environment. |
The 2017-2020 climate change strategy reviews progress since the last strategy and sets priorities for the next three-year period. It identifies the following significant risks: flooding, health and wellbeing risk from high temperatures, water shortages, risks to natural capital, risk to food production, new pests and diseases. A key objective for the built environment and infrastructure is to ensure that policies are effective in encouraging sustainable construction and development, and maximise opportunities for ‘greening’ the county through green infrastructure initiatives and activities.

National Indicator 188 (NI188) Planning to Adapt to Climate Change is a Local Area Agreement (LAA) target indicator for Northamptonshire. The aim of NI188 is to embed the management of climate risks and opportunities across the local authority and partners services and to take appropriate adaptive actions where required. Risks from changing climate variables are identified for highways and transport including failure of pavements, increased subsidence, drainage being overwhelmed.

STEP 2: CLIMATE VULNERABILITY ASSESSMENT

SENSITIVITY

Based on relevant guidance\(^5\), the climate variables which roads (including carriageway, signage, etc.) and bridges are typically sensitive to are shown in Table 1.5.

<table>
<thead>
<tr>
<th>Component</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rainfall</td>
</tr>
<tr>
<td></td>
<td>Annual average</td>
</tr>
<tr>
<td>Road</td>
<td></td>
</tr>
<tr>
<td>Bridge</td>
<td></td>
</tr>
</tbody>
</table>

These variables are used throughout the assessments of sensitivity, exposure and vulnerability. Given the inland location of the proposed scheme, variables associated with sea level and sea temperature are not included in the assessment.

Precipitation - highways are sensitive to high rainfall. An average increase in winter rainfall and an increase in extreme rainfall events may cause highways to be flooded due to flooding of local watercourses (fluvial flooding) or surface water flooding (pluvial flooding). Flooding may mean that highways are impassable and cause loss of amenity. Flooding may also cause damage to paved surfaces (leading to increased maintenance requirements). Prolonged rainfall or extreme rainfall events may also lead to destabilisation of soils and earthworks.

Temperature - highways and bridges are sensitive to high and low temperatures. Increases in annual average temperature and average summer temperature as well as extreme temperature events may cause damage to paved surfaces, including potential melting during periods of high temperature. Increased annual average temperature may also lead to longer growing seasons, resulting in greater vegetation maintenance requirements. Low temperatures can also cause damage to paved surfaces, particularly freeze-thaw conditions which lead to the formation of potholes.

Wind – bridges are sensitive to high winds which increase wind loading on the structure. High winds and storms can affect the stability of above-ground infrastructure and hasten material degradation. High winds can also cause wind-driven rain infiltration into building materials and surfaces which can increase maintenance costs and operational disruption. High winds also increase risk to bridge users (particularly high sided vehicles) and may lead to temporary closure. Road and footway users may also be sensitive to high winds. Associated infrastructure such as signage or signals could also be damaged by high winds.

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\(^5\) Standards Australia (2013) Climate Change Adaptation for settlements and infrastructure – a risk based approach. SAI Global Limited
Bridges are also sensitive to storms, particularly the risk of lightning strike. Electronic control equipment associated with bridges is likely to be highly sensitive to lightning strike.

**Soils** - a decrease in average summer rainfall or drought events could lead to drying out of soils and earthworks which could lead to subsidence or cracking. This could potentially cause damage to paved surfaces.

An increase in winter precipitation could mobilise pollutants in the soil whilst drier summers could lead to the accumulation of chemicals and pollutants which may cause increased salinity and acidification. More acidic soils and/or water may increase deterioration of building materials and lead to changes in vegetation on verges.

Based on the information described above, literature review and expert opinion, Table 1.6 outlines the climate sensitivity of the Proposed Scheme.

**Table 0.6 – Sensitivity assessment**

<table>
<thead>
<tr>
<th>CLIMATE VARIABLE</th>
<th>SENSITIVITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Roads</td>
</tr>
<tr>
<td>Precipitation</td>
<td></td>
</tr>
<tr>
<td>Annual average rainfall</td>
<td>Medium</td>
</tr>
<tr>
<td>Extreme rainfall</td>
<td>Medium</td>
</tr>
<tr>
<td>Drought</td>
<td>Medium</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Annual average temperature</td>
<td>Low</td>
</tr>
<tr>
<td>Extreme temperature</td>
<td>Medium</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>Low</td>
</tr>
<tr>
<td>Wind</td>
<td></td>
</tr>
<tr>
<td>Gales and extreme wind events</td>
<td>Medium</td>
</tr>
<tr>
<td>Storms</td>
<td>Low</td>
</tr>
<tr>
<td>Soil</td>
<td></td>
</tr>
<tr>
<td>Soil moisture</td>
<td>Medium</td>
</tr>
<tr>
<td>Stability</td>
<td>Medium</td>
</tr>
</tbody>
</table>

**EXPOSURE**

This section considers the exposure of the Proposed Scheme to current climate and climate change/changes in extreme weather.

**CURRENT CLIMATE**

The Proposed Scheme is located in the East Midlands region which has a warm, dry climate, compared to UK average. Information long term average observed climate variables over the period 1980 – 2010 is presented below. This information is taken from the UKCP09 report, The Climate of the United Kingdom and Observed Trends and the Met Office regional climate profile for the Midlands6.

**Precipitation**

Figure 1.1 shows the long-term average monthly rainfall for the East Midland region between 1981 and 2010. It shows that the region is considerably drier than most parts of the UK, with the lowest monthly rainfall in February and the highest in October. Northamptonshire is in a more sheltered area of the Met Office Midlands region (compared to the Peak District and Wales) and receives less than 600mm or rainfall per year6. Notable periods of high rainfall include6:

- Easter 1998 - a stationary band of heavy rain stretched across the Midlands from Worcester to Peterborough and resulted in floods in which 5 people died and 1000's were evacuated from their homes; and
- 20 July 2007, up to 18 hours of rainfall resulted in many places in the south Midlands receiving their highest daily rainfall on record. Thousands of homes and businesses were flooded and there was severe road and rail transport disruption across a wide area.

6 [https://www.metoffice.gov.uk/climate/uk/regional-climates/mi](https://www.metoffice.gov.uk/climate/uk/regional-climates/mi)
Figure 1.1 – Long term average mean monthly rainfall

Figure 1.2 shows the long-term average mean monthly temperature for the East Midland region between 1980 and 2010. It shows that the region is warmer than the UK average, with July being the warmest month and January being the coldest month. Mean annual temperatures over the region vary from around 8 °C to just over 10 °C.

Figure 1.2 – Long term average mean monthly temperature

Temperature

https://www.metoffice.gov.uk/climate/uk/regional-climates/mi
Extreme maximum temperatures can occur in July or August: notable temperature high temperature events in the region include⁷:

- 3 July 1976 - 35.9 °C was recorded at Cheltenham;
- 9 August 1911 - 36.7 °C occurred at Raunds, Northamptonshire; and
- 3 August 1990 - temperatures exceeded 34 °C widely over the Midlands, with 37.1 °C, Cheltenham.

Wind

Figure 1.3 shows the long-term average monthly mean wind speed in the south-east region between 1981 and 2010. It shows that the region is less windy than the UK average, with highest wind speeds occurring in January and lowest wind speeds occurring in July.

The Midlands region is one of the more sheltered parts of the UK: the strongest winds are associated with the passage of deep areas of low pressure close to or across the UK. The frequency and strength of these depressions is greatest in the winter half of the year, especially from December to February, and this is when mean speeds and gusts (short duration peak values) are strongest⁸. Notable gales in the Midlands region include⁸:

- 2 January 1976 - storm force winds with gusts of 70-80 knots
- 25 January 1990 - when gusts of 60-70 knots were recorded widely
- 27 October 2002 - gusts of around 60 knots.

Figure 1.3 – Long term average monthly mean wind speed

Projecting Climate

Information on projected climate is taken from the UK Climate Projections 2009. The UK Climate Projections 2009 (UKCP09) are the most up-to-date projections of climate change for the UK. Probabilistic projections of a range of climate variables are presented for different emissions scenarios⁹ and for a range of timeslices¹⁰ to the end of the 21st Century. The projections are provided at a resolution of 25km over land, and as averages for administrative and river basin regions.

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⁷ https://www.metoffice.gov.uk/climate/uk/regional-climates/mi
⁹ UKCP09 shows data for 3 possible emissions scenarios: low, medium and high. These are the Intergovernmental Panel on Climate Change (IPCC) scenarios B1, A1B and A1FI respectively. More information on the nature of these emissions scenarios can be found in the IPCC’s SRES report.
¹⁰ UKCP09 projections are given for seven overlapping 30-year time periods. Each period steps forward by a decade, with the first time period being 2010-2039. For simplicity, these time periods are referred to by the middle decade, starting with the 2020s (2010-2039) and ending with the 2080s (2070-2099).
Precipitation
Climate change is projected to lead to wetter winters and drier summers, with more extreme rainfall events. UKCP09 suggests that by the 2050s, mean winter precipitation is expected to increase by 15% (50th percentile) and by the 2080s, increase by 25% (50th percentile) under the High emissions scenario. For the summer, by the 2050s, mean summer precipitation is expected to decrease by 12% (50th percentile) and by the 2080s, decrease by 25% (50th percentile), under the High emissions scenario. Table 1.7 summarises changes in mean winter and summer precipitation for the 2050s and 2080s under the Low, Medium and High emissions scenarios.

Table 1.7 - Projected change in mean summer and winter precipitation (%) for the 2050s and 2080s under Low, Medium and High emissions scenario

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>EMISSIONS SCENARIO</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10TH</td>
<td>50TH</td>
<td>90TH</td>
<td>10TH</td>
</tr>
<tr>
<td>Summer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2050s</td>
<td>-33</td>
<td>-17</td>
<td>+4</td>
<td>-36</td>
</tr>
<tr>
<td>2080s</td>
<td>-34</td>
<td>-13</td>
<td>+11</td>
<td>-43</td>
</tr>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2050s</td>
<td>+1</td>
<td>+11</td>
<td>+25</td>
<td>+2</td>
</tr>
<tr>
<td>2080s</td>
<td>+3</td>
<td>+15</td>
<td>+32</td>
<td>+3</td>
</tr>
</tbody>
</table>

In addition to projected changes in seasonal rainfall (i.e. wetter winters and drier summers), it is likely that more rainfall will be delivered by ‘intense’ events, particularly in winter. Table 1.8 show the UKCP09 projections for changes in extreme precipitation in the East Midlands region in the 2050s and 2080s under Low, Medium and High emissions scenarios.

Table 1.8 - Projected change in extreme precipitation variables for the 2050s and 2080s under Low, Medium and High emissions scenario

<table>
<thead>
<tr>
<th>CHANGE IN VARIABLE</th>
<th>EMISSIONS SCENARIO</th>
<th>LOW</th>
<th>MEDIUM</th>
<th>HIGH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10TH</td>
<td>50TH</td>
<td>90TH</td>
<td>10TH</td>
</tr>
<tr>
<td>Wettest day in winter (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2050s</td>
<td>-10</td>
<td>+10</td>
<td>+20</td>
<td>0</td>
</tr>
<tr>
<td>2080s</td>
<td>0</td>
<td>+10</td>
<td>+30</td>
<td>0</td>
</tr>
<tr>
<td>Wettest day in summer (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2050s</td>
<td>-20</td>
<td>0</td>
<td>+20</td>
<td>-20</td>
</tr>
<tr>
<td>2080s</td>
<td>-20</td>
<td>0</td>
<td>+20</td>
<td>-20</td>
</tr>
</tbody>
</table>

Snowfall is closely linked with temperature, with falls rarely occurring if the temperature is higher than 4 °C. For snow to lie for any length of time, the temperature normally should be lower than this. With regards to future changes, rising winter temperatures are likely to reduce the amount of precipitation that falls as snow in winter. UKCP09 projects a reduction of mean snowfall, the number of days when snow falls and heavy snow events by the end of the 21st century. UKCP09 does not provide projections for the nearer-term for snow.

Temperature
Climate change is projected to lead to hotter summers and warmer winters. UKCP09 suggests that by the 2050s, mean winter temperature in the East Midland region is expected to increase by 2.5 °C (50th percentile) and by the 2080s, increase by 3.6 °C (50th percentile), under the High emissions scenario. For the summer, by the 2050s, mean summer temperature is expected to increase by 2.8 °C (50th percentile) and by the 2080s, increase by 4.5 °C (50th percentile), under the High emissions scenario. Table 1.9 summarises changes in mean winter and summer precipitation for the 2020s, 2050s and 2080s under the Low, Medium and High emission scenarios.
Table 0.9 - Projected change in mean summer and winter mean temperature (°C) for the 2050s and 2080s under Low, Medium and High emissions scenario

<table>
<thead>
<tr>
<th>PERIOD</th>
<th>EMISSIONS SCENARIO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW</td>
</tr>
<tr>
<td></td>
<td>10TH</td>
</tr>
<tr>
<td>Summer</td>
<td></td>
</tr>
<tr>
<td>2050s</td>
<td>1.0</td>
</tr>
<tr>
<td>2080s</td>
<td>1.2</td>
</tr>
<tr>
<td>Winter</td>
<td></td>
</tr>
<tr>
<td>2050s</td>
<td>0.9</td>
</tr>
<tr>
<td>2080s</td>
<td>1.3</td>
</tr>
</tbody>
</table>

In addition to changes in seasonal average temperatures, it is likely that there will be more extreme temperature events. By the 2050s, projections for daily maximum summer temperature for the East Midland region suggest increases of between 3 and 4°C, depending on emissions scenario (central estimate). By the 2080s, projections for daily maximum summer temperature suggest increases of between 4 and 6°C, depending on emissions scenario (central estimate).

Solar radiation

A recent (regional) study suggests that the England Mid and Wales region (including Northampton), is likely to see an increase in annual solar radiation by the 2050s of 4.7m-2 (Low), 4.4m-2 (Medium) or 5.1m-2 (High) under the central (50th percentile) estimate. By the 2080s, increases of 5.1m-2 (Low), 5.6m-2 (Medium) or 6.5m-2 (High) under the central (50th percentile) estimate are projected11. All regions of the UK are likely to have increased cloud cover (although there is large uncertainty around future projections of cloud cover) and therefore slightly less solar radiation during the winter.

Wind

The UKCP09 projections depict a wide spread of future changes in mean surface wind speed, however, there is large uncertainty in projected changes in circulation over the UK and natural climate variability contributes much of this uncertainty12. It is therefore difficult to represent regional wind extreme winds and gusts within regional climate models13.

Central estimates of change in mean wind speed for the 2050s are small in all ensemble runs (<0.2ms-1). A wind speed of 0.2 ms−1 (~0.4 knots) is small compared with the typical magnitude of summer mean wind speed of about 3.6–5.1 ms−1 (7–10 knots) over much of England14. Seasonal changes at individual locations across the UK lie within the range of −15% to +10%. Results suggest that there could be a future reduction in the summer westerly wind flows over the southern half of the UK. There may be an increase in westerly flows in the north during summer and an increase in southerly flows over the UK in winter.

Humidity

Relative Humidity is the most common measure of humidity. It measures how close the air is to being saturated. By the 2050s, projections for winter mean relative humidity in the East Midland region show changes of 0% under the high emissions scenario (central estimate) and by the 2080s, projected change to winter mean relative humidity is 0% (high emissions scenario, central estimate). The projection for summer mean humidity in the 2050s under the high emissions scenario is a decrease of up to 5% (central estimate). By the 2080s the decrease could be as much as 10% (high emissions scenario, central estimate).

Extreme climate change

A range of ‘extreme’ climate change scenarios (produced by Wade et al., 2015 have also been reviewed. Wade et al., (2015) considered a range of climate variables including heatwaves, cold snaps, low and high rainfall, droughts, floods and windstorms. The H++ scenarios represent the margins or beyond the 10th to 90th percentile range of the 2080s UKCP09 High emissions scenario as presented in the UKCP09 projections and reported here. These scenarios provide a high-impact, low-likelihood event to compare against more likely outcomes.

The H++ scenarios suggest that average summer maximum temperatures will exceed 30°C across most of the UK, with temperatures of the hottest days are also likely to exceed 40°C. The H++ scenarios for heavy daily and sub-daily rainfall suggest that, for the same period, there is a 60% to 80% increase in rainfall for summer or winter events based on a consideration of new high-resolution modelling and physical processes. This is within the UKCP09 distribution range for the 2080s High emissions “wettest day of the winter” variable but higher than uplifts previously considered for summer.

EXPOSURE ASSESSMENT

Based on the climate change projections for the East Midland region, Table 1.10 indicates the level of exposure of the proposed scheme to changes in climate variables.

Table 0.10 - Exposure assessment

<table>
<thead>
<tr>
<th>CLIMATE VARIABLE</th>
<th>EXPOSURE RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td></td>
</tr>
<tr>
<td>Annual average rainfall</td>
<td>Medium</td>
</tr>
<tr>
<td>Extreme rainfall</td>
<td>Medium</td>
</tr>
<tr>
<td>Drought</td>
<td>High</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>Annual average temperature</td>
<td>Medium</td>
</tr>
<tr>
<td>Extreme temperature</td>
<td>High</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>Medium</td>
</tr>
<tr>
<td>Wind</td>
<td></td>
</tr>
<tr>
<td>Gales and extreme wind events</td>
<td>Medium</td>
</tr>
<tr>
<td>Storms</td>
<td>Medium</td>
</tr>
<tr>
<td>Soil</td>
<td></td>
</tr>
<tr>
<td>Soil moisture</td>
<td>High</td>
</tr>
<tr>
<td>Stability</td>
<td>Medium</td>
</tr>
</tbody>
</table>

VULNERABILITY ASSESSMENT

The sensitivity and exposure analyses are combined to provide an overall assessment of vulnerability of the Proposed Scheme. Tables 1.11 and 1.12 presents the overall assessment of vulnerability for the road and bridge elements of the Proposed Scheme respectively.

---

**Table 0.11 – Vulnerability assessment (Road)**

<table>
<thead>
<tr>
<th>CLIMATE VARIABLE</th>
<th>SENSITIVITY RATING</th>
<th>EXPOSURE RATING</th>
<th>VULNERABILITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual average rainfall</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Extreme rainfall</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Drought</td>
<td>Medium</td>
<td>High</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual average temperature</td>
<td>Low</td>
<td>Medium</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>Extreme temperature</td>
<td>Medium</td>
<td>High</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>Low</td>
<td>Medium</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>Wind</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gales and extreme wind events</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Storms</td>
<td>Low</td>
<td>Medium</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>Soil</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil moisture</td>
<td>Medium</td>
<td>High</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Stability</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
</tbody>
</table>

**Table 0.12 – Vulnerability assessment (Bridge)**

<table>
<thead>
<tr>
<th>CLIMATE VARIABLE</th>
<th>SENSITIVITY RATING</th>
<th>EXPOSURE RATING</th>
<th>VULNERABILITY RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual average rainfall</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme rainfall</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Drought</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual average temperature</td>
<td>Low</td>
<td>Medium</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>Extreme temperature</td>
<td>Medium</td>
<td>High</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Solar radiation</td>
<td>Low</td>
<td>Medium</td>
<td>Low vulnerability</td>
</tr>
<tr>
<td>Wind</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gales and extreme wind events</td>
<td>High</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
<tr>
<td>Storms</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soils</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil moisture</td>
<td>Medium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stability</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium vulnerability</td>
</tr>
</tbody>
</table>

**CONCLUSION**

The risks associated with the medium vulnerabilities identified in Table 1.11 and Table 1.12 and the required adaptation measures will be further assessed in the next stage of assessment, following the methodology set out in the method section above.
Figure 2 - Current Route Alignment

Environmental Impact Assessment (EIA) Scoping Report
Site Boundary and Current Route Alignment

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Figure 3

Environmental Impact Assessment (EIA) Scoping Report
Environmental Designations

Key
- Site Boundary
- 2km Buffer Zone
- Ancient Woodland
- Local Nature Reserve
- Registered Parks and Gardens
- Scheduled Monument
- Listed Building
- Conservation Area
- Flood Zone 2
- Flood Zone 3
- Sustrans Local Route
  - Off Road
  - On Road
- Sustrans National Route
  - National Route (on road)
  - National Route (off road)

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