A47 WANSFORD TO SUTTON

Preliminary Environmental Information Report

PCF STAGE 3

HE551494-MMSJV-EGN-000-RP-LX-0003
23/07/18

Notice

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1. Introduction

1.1. The scheme

1.1.1. The A47 Wansford to Sutton dualling scheme consists of a new 1.6 miles (2.5 kilometre) dual-carriageway, which would be constructed partially off-line to the north and partially off-line to the south of the existing A47 (see Appendix A). The dual-carriageway would tie into the existing carriageway at the eastern roundabout at the A1 / A47 interchange and at the Nene Way Roundabout at the eastern end of the Proposed Scheme. At the western end, the Proposed Scheme would also include a free-flow link between the A1 southbound carriageway and the new eastbound carriageway of the A47. The existing Wansford east roundabout, would be enlarged as part of the proposals to accommodate A47 westbound traffic.

1.1.2. The A47 Wansford to Sutton dualling Scheme will hereafter be described as the 'Proposed Scheme'.

1.1.3. Subject to successfully passing through the Development Consent Order (DCO) process, the key timescales for the Proposed Scheme are as follows:

- start of construction work – 2020
- estimated duration of construction – 18 months
- open for traffic – 2021 – 2022

1.2. The purpose of the preliminary environmental information report

1.2.1. The purpose of this Preliminary Environmental Information Report (PEIR) is firstly to meet the requirements of the Environmental Impact Assessment (EIA) Regulations, but also to inform stakeholders, landowners and Statutory Environmental Bodies (SEB) of the on-going EIA work, and provide an opportunity for consultation. Preliminary Environmental Information (PEI) is defined in accordance with legislation, this therefore determines the type of information presented within the PEIR.

1.2.2. PEI is defined by the Infrastructure Planning EIA Regulations 2017, Regulation 12(2) as 'information referred to in regulation 14(2) which:

- (a) has been compiled by the applicant
- (b) is reasonably required to assess the environmental effects of the development (and of any associated development)

1.2.3. This PEIR therefore provides preliminary information regarding the assessment of the environmental impacts. It is to give stakeholders an understanding of the potential environmental impacts of the Proposed Scheme and of the measures proposed to reduce those impacts at this early stage of the EIA.

1.3. Availability of the PEIR

1.3.1. Copies of the PEIR will be available as part of the consultation material produced for the Proposed Scheme public consultations to be carried out in autumn 2018, a timetable for these events can be found in Table 4.2.

1.3.2. The Proposed Scheme summary information, the Statement of Community Consultation, policy guidance documents and other relevant technical documents will be available online and at various information points stationed at local community venues. These documents will be added to throughout the course of the DCO application processes. The online project web site address is: https:/highwaysengland.citizenspace.com/he/a47-wansford-to-sutton-dualling/

1.4. Summary of the Environmental Impact Assessment process

1.4.1. Environmental Impact assessment (EIA) is a process that identifies the likely environmental effects (both adverse and beneficial) of a proposed development. It ensures that the importance of these impacts is properly considered and that the opportunity for reducing any adverse effects are taken into account as part of the design development process.

1.4.2. EIA also ensures effects considered during the design development process are understood by the public, the relevant competent authorities, statutory authorities and other interested parties. The EIA will be undertaken in accordance with relevant legislation and guidance and will include a spatial and temporal scope for its assessment.

1.4.3. Scoping is an important part of the EIA process and determines which environmental topics are to be examined during the course of the assessment. The Scoping Report describes how the EIA will be undertaken and identifies the technical environmental disciplines that will be considered. Defining the environmental scope is one of the most critical parts of the EIA as it sets out the method for the detailed assessment.

1.4.4. An EIA Scoping Report was submitted to the Planning Inspectorate (PINS) on 6 February 2018 to inform its Scoping Opinion, a response was received on 19 March 2018. The comments will be taken into account where appropriate and used to inform the EIA.

1.4.5. The Proposed Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) under Section 14(1)(h) and Section 22 of the Planning Act 2008 (PA 2008) (as amended) by virtue of the fact that:

- It comprises the construction / alteration of a highway
- The highway to be constructed is wholly in England
- The Secretary of State will be the highway authority for the highway
- The speed limit for any class of vehicle on the highway is to be 50 miles per hour or greater, and the area of development is greater than 12.5 hectares

1.4.6. In accordance with the legislation, a DCO is therefore required to allow the construction and operation of the Proposed Scheme.

1.4.7. Following the completion of the Scoping Report, the subsequent Scoping Opinion from PINS and the EIA work undertaken to date, the EIA for a DCO is reported in 2 stages:

- The PEIR, prepared to inform the consultation with the public and other stakeholders about the Proposed Scheme
- The Environmental Statement (ES), prepared to accompany the DCO application

1.4.8. Each environmental topic chapter of this PEIR describes the local environment and any identified sensitive receptors such as Natura 2000 sites, Sites of Special Scientific Interest (SSSI) and local environment management areas such as Air Quality Management Areas (AQMA) or Noise Important Areas (NIA).

1.4.9. Environmental surveys that have been carried out for each topic are then described, along with detail of consultation with SEBs, Local Authorities and other stakeholders. Any likely impacts of the Proposed Scheme on the local environment are then described.

1.4.10. The significance of environmental effects is not addressed within the PEIR however this will be considered in the ES.

1.4.11. It should be noted there have been a few adjustments to the proposed DCO boundary in some locations. The changes between the previous DCO boundary submitted with the scoping report and the current proposals can be found in Appendix B. These have been made to allow for potential changes to walking cycling and horse riding facilities, a small degree of flexibility with regard to construction areas and drainage features and for additional signage on the A1 southbound carriageway. It is considered that the changes are unlikely to give rise to substantial changes to the scope of the assessment work. The assessment work will include and address these changes.

2. The Proposed Scheme

2.1. Overview

2.1.1. The A47 forms part of the strategic road network and provides for a variety of local, medium and long-distance trips between the A1 and the eastern coastline. The corridor connects the cities of Norwich and Peterborough, the towns of Wisbech, Kings Lynn, Dereham, Great Yarmouth and Lowestoft and a succession of villages in what is largely a rural area.

2.1.2. The existing A47 single-carriageway is to be upgraded to dual-carriageway standard. It will be constructed slightly to the north of the existing A47 from the A1/A47 junction for approximately 800m, before crossing the existing A47, where it will be constructed to the south of the existing alignment until it ties into the existing dual-carriageway at the Nene Way Roundabout (See Appendix C).

2.1.3. The existing western roundabout at the A1/A47 junction will be upgraded to incorporate additional entry and exit lanes on each arm, except the southern arm (Old North Road). The northern entry will be further amended to include a segregated left turn from the A1 northbound on to the A47 eastbound carriageway.

2.1.4. The existing section on the A1 overbridge, between the western and eastern roundabouts, will be opened to 2 lanes in each direction, as permitted within the confines of the existing bridge width.

2.1.5. The existing eastern roundabout at the A1/A47 junction will be enlarged and the part-time traffic signals removed. The roundabout will include a new link to the south for access to the water pumping station and the fuel station. A new underbridge is also to be constructed off this new link under the proposed A47, giving access to Sacrewell Farm and Country Centre.

2.1.6. The new link road, including access to the water pumping station, the fuel station and Sacrewell Farm and Country Centre, is proposed to be handed over to either Peterborough City Council or another arrangement.

2.1.7. To the west of the scheme, a new free-flow slip road is to be constructed connecting the existing A1 southbound carriageway to the new A47 eastbound carriageway. The existing diverge lane off the A1 southbound is retained as part of these arrangements to connect to the eastern roundabout at the A1/A47 junction for all other movements.

2.1.8. A new bridge will also be constructed, where the proposed A47 alignment crosses over the disused railway line to the west of Sutton Heath Road.

2.1.9. Current direct accesses to Sutton Heath Road and The Drift will be closed, with alternative arrangements proposed for both, connecting slightly further east, at the Nene Way Roundabout. The Drift is proposed to be shortened with turning arrangements to be provided.

2.1.10. The section of existing A47 between Sutton Heath Road and the Nene Way Roundabout is proposed to be de-trunked and handed over to Peterborough City Council.

2.1.11. A larger roundabout is to replace the existing Nene Way Roundabout to the east of the scheme. Here, a connection with a retained section of the existing A47 will also be added for access to Sutton Heath Road.

2.1.12. Drainage ditches and ponds are proposed along the length of the scheme. Existing culverts will also be improved.

2.1.13. Provision for walking, cycling and horse riding is proposed to connect between Wansford, Sutton and local amenities. Existing access tracks will be reinstated.

2.1.14. The layby on the A1 southbound immediately to the north of the A1/A47 junction and the layby on the A47 immediately to the west of Sutton Heath Road will be removed. Alternative provision is proposed on the new link road near the fuel station.

2.2. Lighting

A1 junction

2.2.1. The 2 existing A1 northbound and southbound roundabout junctions and associated approach and exit roads are currently lit during the hours of darkness.

2.2.2. The provision of new road lighting is proposed at the 2 A1 roundabout junctions and mainline A47. Lighting will be provided on either side of the carriageway on the mainline A47 linking the 2 roundabouts (approximately ch40-ch260).

2.2.3. Lighting will be provided adjacent to the eastbound approach to the A1 northbound (A6118 / B671) roundabout for an approximate distance of 130m. One lighting columns will be installed adjacent to the westbound exit. To the north of the roundabout lighting will be provided on the approach and exit road to the A1 northbound, lighting up to the junction with Old North Road. There are no plans to change the existing lighting on the A6118 / B671.

2.2.4. New road lighting will be provided on the westbound approach to the A1 southbound roundabout (approximately Ch.20-Ch.200) with 1 lighting column

proposed on the eastbound exit. To the north of the roundabout, new road lighting will be provided on the approach to the A1 (approximately Ch.20 to Ch.120) and the A1 exit slip road (approximately Ch.120 to Ch.240). To the south of the roundabout a new approach and exit road is proposed. New road lighting will be provided and installed adjacent to the northbound side of the carriageway providing approximately 50m of new road lighting.

Nene Way Roundabout

2.2.5. The existing Nene Way Roundabout junction and associated approach and exit roads are currently lit during the hours of darkness.

2.2.6. The provision of new road lighting is proposed at the roundabout junction and mainline A47. Lighting will be provided adjacent to the carriageway on the eastbound approach (approximately Ch.2300-Ch.2470) with 1 lighting column provided on the westbound exit. 1 proposed lighting column adjacent to both the eastbound exit and westbound approach will be provided which will link in with the existing lighting installation.

2.2.7. Lighting will be provided on the carriageway north of the roundabout and will extend to encompass the junction of the new A47 eastbound mainline slip road. 1 lighting column will be installed on the slip road at the new junction.

2.2.8. New road lighting will be provided south of the roundabout to link in with the existing lighting installation on the Old Peterborough Road.

Lighting design

2.2.9. The lighting design is ongoing, the current indications are that a range of 6m to 15m lighting column heights with LED luminaires will be used. Lighting columns will be located in verges (or at the back of footways where applicable) and oriented perpendicular to the carriageway. Luminaires will be specified that restrict all direct upward light to minimise sky glow.

2.2.10. Electrical supply to lighting columns will be connected to feeder pillars with outgoing circuits routed through ducting that is buried in verges and beneath the carriageway where applicable.

2.3. Drainage

2.3.1. The exact details for the proposed drainage strategy is currently unknown, it will be developed as the Proposed Scheme progresses and detailed fully in the Environment Statement. However, to help reduce the risk of flooding, a sustainable drainage system will be implemented. To support this, a flood risk assessment will inform the design of the surface-water drainage system. A new

crossing of Wittering Brook will be provided to accommodate the new road that links west of the dismantled railway. To prevent pollution, best practice mitigation measures will be used during construction such as the safe storage of materials away from drains and watercourses.

3. Context of the Proposed Scheme and consideration of alternatives

3.1. The need for the Proposed Scheme

3.1.1. The section of the A47 between Wansford and Sutton is currently a single-carriageway. This acts as a bottleneck, resulting in congestion, leading to longer journey times and poor safety. The Proposed Scheme will relieve congestion, reduce journey times, encourage economic growth, and improve the driver experience.

3.1.2. If nothing is done to improve capacity and connectivity, these delays are forecast to get worse in future years. In developing the Proposed Scheme Highways England aim to address these issues by a high quality dual-carriageway link which is intended to improve the traffic flow, reduce journey times on the route and increase the route safety and resilience. The Proposed Scheme is also intended to support economic growth by making journeys safer and more reliable.

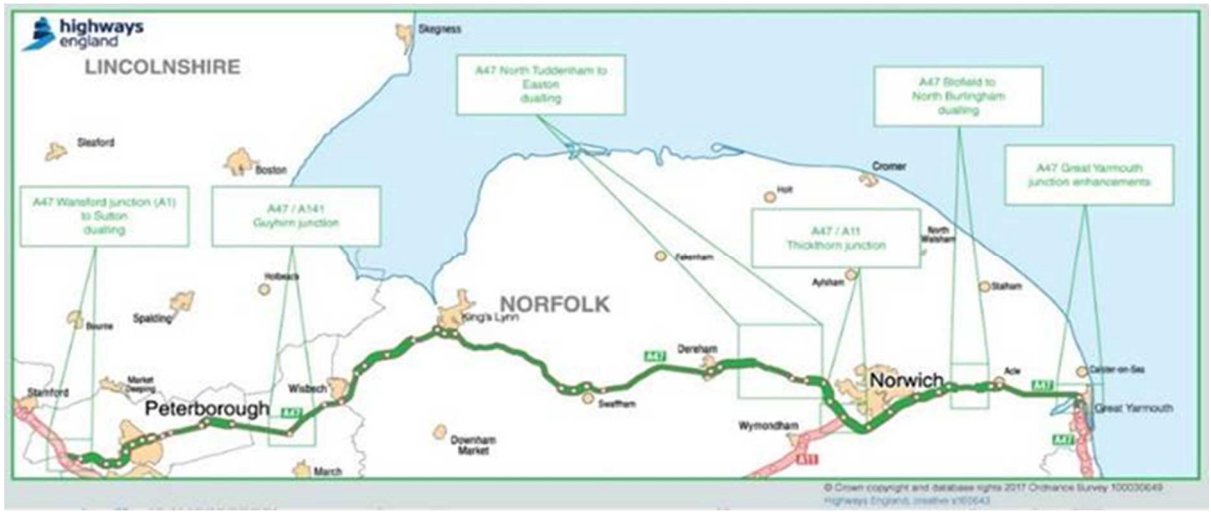
3.2. Background to the Proposed Scheme

3.2.1. The Road Investment Strategy (RIS) announced in December 2014 includes a package of 6 schemes to be developed and constructed by Highways England during Roads period 1 (2015 – 2020) and the early part of Roads Period 2 (2020 – 2025). The proposed 6 schemes are:

- A47 Wansford to Sutton
- A47 / A141 Guyhirn Junction
- A47 North Tuddenham to Easton
- A47 / A11 Thickthorn Junction
- A47 Blofield to North Burlingham
- A47 Great Yarmouth Junction

3.2.2. These schemes will improve journeys on the 115 mile section of the A47 between Peterborough and Great Yarmouth. The schemes have been branded as the A47 Improvement Programme, and together the proposals will relieve congestion and improve the reliability of journey times for drivers. The 6 schemes are illustrated in Figure 3-1.

Figure 3-1:The A47 Improvement Programme



3.3. Objectives of the Proposed Scheme

3.3.1. The objectives of the Proposed Scheme are:

Supporting economic growth

- Contributing to sustainable economic growth by supporting employment and residential development opportunities. The Proposed Scheme aims to reduce congestion-related delay, improve journey time reliability and increase the overall capacity of the A47.

A safe and serviceable network

- Improving road safety for all road users through being designed to modern highway standards appropriate for a strategic road.

A more free-flowing network

- An improved route between Wansford and Sutton would be more reliable, reduce journey times and provide capacity for future traffic growth. The resilience of the road in coping with incidents such as collisions, breakdowns, maintenance and extreme weather will be improved.

Improved environment

- Protecting the environment by minimising adverse impacts and where possible deliver multiple benefits by improving the environmental impact of transport on those living along the existing A47 and by minimising the impact of new infrastructure on the natural and built environment.

An accessible and integrated network

- Ensuring the proposals take into account local communities and access to the road network, providing a safer route between communities for cyclists, walkers, equestrians and other non-motorist groups.

Value for money

- Ensuring that the Proposed Scheme is affordable and delivers good value for money.

3.4. Alternatives considered

3.4.1. In seeking to resolve the transport problem, 9 potential options were developed and assessed to identify their performance against environmental, engineering, transportation and economic criteria so that they could be compared to allow the most appropriate options to be taken forward.

3.4.2. Three options were then selected for non-statutory public consultation and further assessment. Assessment was undertaken with regard to environmental impact and engineering suitability. The options were re-numbered for simplicity during Stage 2.

3.4.3. The 3 options are detailed below.

3.4.4. Option 1 was the online dualling of the existing A47 between Wansford and Sutton plus free-flow link to A1 southbound.

3.4.5. Option 2 was part off-line to the north, part off-line to the south plus free-flow link from A1 southbound.

3.4.6. Option 3 was off-line to the north plus free-flow from the A1 southbound.

3.4.7. Having reviewed the feedback following the consultation and the results of the further environmental, economic and technical assessment, it was identified that Option 2 solves the main traffic and safety problems along the route. Previous design and development also concluded that Option 2 would have significant advantages in terms of environmental impact when compared to Option 3, and and would have less impact during construction when compared to Option 1. Option 2 was therefore identified as the preferred route.

3.4.8. However, key concerns raised during the non-statutory consultation have influenced an amendment to the original Option 2 proposal. The new dual-carriageway would be moved as close as possible to the southern edge of the existing A47 at the eastern end of the Proposed Scheme. This would:

- Increase the distance from the new road to both the River Nene and the village of Sutton
- Reduce the amount of land-take required
- Allow for the easiest connection of existing side roads to the new A47
- Allow for most of the existing A47 to remain in place for local traffic and walkers, cyclists and horse riders

3.5. Design intervention

3.5.1. The design of the Proposed Scheme is an iterative process that evolves with technical and engineering considerations in conjunction with environmental constraints. To benefit the reader and to better describe the decision-making process, this Preliminary Environmental Information Report (PEIR) makes a distinction between mitigation and design intervention.

3.5.2. In the context of this (PEIR) and the subsequent Environmental Statement, a design intervention is defined as a change to the design of the Proposed Scheme to reduce / remove an identified environmental effect or improve / introduce an environmental benefit.

3.5.3. Mitigation is defined as an action or future intent to reduce an identified effect.

4. Consultation

4.1. Consultation undertaken to date

4.1.1. A stakeholder mapping exercise was undertaken to identify relevant stakeholders and their key interests. This list was used to inform the participants of a 6 week non-statutory public consultation, which was held between 13 March and 21 April 2017.

4.1.2. At all public information exhibition events, members of the Highways England management team, the designers and council officials were available to discuss the proposed options with stakeholders.

4.1.3. An additional static panel was set up at Peterborough Town Hall, and following the public information events the key display material was left on show at Sacrewell Farm and County Centre until the end of the consultation period. The panel provided details of the proposed non-statutory public consultation events along with details of how to access the consultation material and respond to the questionnaire. Copies of the consultation brochure and questionnaire were also made available at this event for the general public to pick up if they were unable to attend the scheduled information events.

4.1.4. The Highways England website made the non-statutory consultation documents available to stakeholders for viewing and downloading and included the facility to complete and return the questionnaire online. The website was kept up to date with information on all the non-statutory public consultation events and public information points.

4.1.5. Consultation has commenced with Peterborough City Council and the local councils.

Engagement with Statutory Environmental Bodies

4.1.6. Highways England held an initial workshop the Environment Agency, Natural England and Historic England in August 2016. Highways England did not formally engage with, Natural England or the Environment Agency during Stage 2 optioneering process or the non-statutory public consultation period in 2017 although they were asked to review and comment on the proposed options. Formal consultation with Historic England was undertaken in May 2017. However, Stage 3 formal consultation is now being undertaken with all the Statutory Environmental Bodies.

Engagement with landowners

4.1.7. As part of the consultation process, Highways England sought to discuss the proposals with parties directly impacted by the proposals, such as landowners and those with business interests or development proposals in the Proposed Scheme area.

Engagement with the community

4.1.8. The Public Information Exhibitions (PIEs) were held on 23, 24 and 25 March 2017. Details are shown in Table 4-1 below, including the number of visitors that attended. The exhibition was attended by staff from Highways England and its consulting engineers, who were available to answer questions on the proposals from members of the public.

Table 4-1: Public consultation details

Venue	Date	Opening Times	Number of Visitors
Peterborough Town Hall	14 March 2017	9am – 5pm	MPs, Councillors and stakeholder preview – numbers not recorded
Haycock Hotel Wansford	23 March 2017	3pm – 8pm	68
St. Michael and All Angels Church, Sutton	24 March 2017	10am – 5pm	70
Sacrewell Farm and Country Centre, Wansford	25 March 2017	10am – 5pm	33

4.1.9. An additional static panel was set up at Peterborough Town Hall, and following the PIE the key display material regarding the options were left on show at Sacrewell Farm and Country Centre until the end of the public consultation. The panel provided details of the proposed PIE events along with details of how to access the consultation material and respond to the questionnaire. Copies of the brochure and questionnaire were also made available at this event for the general public to pick-up.

4.2. Proposed consultation

4.2.1. A consultation strategy has been developed which outlines the organisations who will be consulted and the proposed timeline for the consultation. As well as, methods for promoting the consultation including the Primary Consultation Zone which outlines an area within which all properties will directly receive information

about the consultation and the public exhibitions. This strategy has been agreed with the relevant statutory consultees though the development of the Proposed Scheme's Statement of Community Consultation. Highways England will consult the Statutory Bodies at the same time as consulting the local community.

4.2.2. Consultation required to support individual assessments is set out within each technical chapter of this report.

Engagement with hard to reach groups

4.2.3. The Proposed Scheme's Equality Impact Assessment will identify the relevant hard to reach groups. Host local authorities will be consulted about identification of relevant groups. Categories identified and contacted include walking, cycling and horse riders (WCHR) groups, ethnic organisations, local traveller communities', disability groups and groups representing children and the elderly.

4.2.4. Proposed Scheme summary information, the Statement of Community Consultation, policy guidance documents and other relevant technical documents will be available online and at various information points stationed at local community venues. These documents will be added to throughout the course of the DCO planning application. The online project web site address is: https:/highwaysengland.citizenspace.com/he/a47-wansford-to-sutton-dualling/

Consultation events

4.2.5. Our statutory consultation will include events in the locations and dates shown in Table 4-2Table 4-2: Statutory consultation event details.

Table 4-2: Statutory consultation event details

Venue	Date	Opening Time	Closing Time
St Michaels and All Angels Church, Nene Way, Sutton, PE5 7XD	29 September 2018	11am	5pm
Haycock Hotel, Wansford, Peterborough, PE8 6JA	1 October 2018	1pm	8pm
Sacrewell Farm and Country Centre Thornhaugh, Peterborough, PE8 6HJ	4 October 2018	1pm	8pm
Mobile Visitor Centre at St John's Square, Exchange Street, Peterborough, PE1 1XB	6 October 2018	11am	5pm

4.2.6. The exhibitions will give visitors an opportunity to view the Proposed Scheme proposals, talk to the project team and provide feedbacks comments. The public will be informed of the exhibitions through channels including: advertisements in

local media, the Proposed Scheme website, direct communications and scheme updates. A similar event, held earlier on the same day and at the same venue as each of the public events, will be held for the media and key stakeholders.

4.2.7. Feedback forms will be available at the exhibition events for members of the public to record their comments and these can either be left with the project team and/or returned to the postal address. Feedback forms can also be submitted via the Proposed Scheme website, if electronic format is preferred.

4.2.8. The consultation will be advertised in the Peterborough Telegraph and the Peterborough News locally circulating newspapers. Adverts will be placed in local newspapers at the launch of the consultation and reminders will be placed ahead of the exhibition events. Press releases detailing the consultation and how the community and road users can participate will be issued. Advertisements will also be sent to local Parish Council's, to which information can be publicised in their magazines and newsletters, which are distributed to local residents freely. By working with clerks and members, information can also be made available on Parish Council websites. Properties within the Primary Consultation Zone will also receive information about the consultation and public events. The consultation will also be advertised on: Twitter: @HighwaysEAST.

4.2.9. Feedback Process Comments made during the consultation will be recorded and carefully considered by Highways England and will be taken into account when further developing the scheme proposal. An explanation of how comments have shaped and influenced our proposals will be reported in a Consultation Report prepared by Highways England which will accompany the Development Consent Order (DCO) application as required by Section 37(3) (c) of the Planning Act 2008. The Planning Inspectorate will decide whether the application meets the required standards to proceed to examination and will determine whether Highways England's pre-application consultation has been adequate.

4.2.10. Highways England needs to collect and assess all responses to the consultation before compiling the DCO application to the Planning Inspectorate. To allow time to do this, feedback must be received by 11.59 pm 29 October 2018.

5. Air quality

5.1. Introduction

5.1.1. This chapter presents the preliminary findings of the air quality assessment. This comprises a review of the existing environment and identification of potential impacts of the Proposed Scheme upon air quality. Potential impacts are discussed considering relevant policy and legislation, and in the context of existing air quality in the study area and relevant consultation.

5.2. Guidance and best practice

Legislation

5.2.1. In the UK, the presence of pollutants in ambient air is managed through legislation (including that transposed from EU Directives) and government policy. Air quality limit values and Air Quality Objectives (AQO) specify the ambient concentration of a pollutant, a time period over which that concentration is measured, and a date by which compliance with the limit value or objective should be achieved.

5.2.2. The AQO and limit values relevant to the Proposed Scheme are summarised in Table 5-1.

Table 5-1: Air quality objectives and limit values

Pollutant	Averaging Period	Air Quality Objectives and Limit Values		Attainment Date	
		Concentration	Allowance	Air Quality Objectives	EU Limit Values
Nitrogen Dioxide (NO_2)	Annual	40 µg/m^3	-	31 December 2005[a][b]	1 January 2010[c]
	1 Hour	200 µg/m^3	18	31 December 2005[a][b]	1 January 2010[c]
Nitrogen Oxides (NO_X)[d]	Annual	30 µg/m^3	-	1st January 2001[c]	
Particulate Matter (PM_{10})	Annual	40 µg/m^3	-	31 December 2004[a][b]	1 January 2005[c]
	24 Hour	50 µg/m^3	35	31 December 2004[a][b]	1 January 2005[c]

Notes:
[a] Air Quality (England) Regulations 2000 as amended in 2002 (Statutory Instrument 2002)
[b] Air Quality Strategy 2007 (Defra,2007)
[c] EU Directive 2008/50/EEC on ambient air quality and cleaner air for Europe and The Air Quality Standards Regulations 2010. Derogations (time extensions) have been agreed by the EU for meeting the NO_2 limit values in some zones/agglomerations. (European Commission, 2008)
[d] Designated for the protection of vegetation and ecosystems and referred to as the critical level for NOx.

Policy

5.2.3. The National Policy Statement for National Networks (NPSNN) notes that the applicant should undertake an assessment of the impacts of the Proposed Scheme describing:

- Existing air quality levels
- Forecasts of air quality at the time of opening, assuming that the Proposed Scheme is not built (the future baseline) and taking account the impact of the Proposed Scheme
- Any significant air quality effects, their mitigation and any residual effects, distinguish between the construction and operation stages and taking account of the impact of road traffic generated by the Proposed Scheme

Guidance

5.2.4. The air quality assessment follows the guidance provided by the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1, the Department for Environment, Food and Rural Affairs (Defra) technical guidance for undertaking air quality assessments (Local Air Quality Management – Technical Guidance (LAQM-TG) (16)) (Defra 2016), and the following Interim Advice Note (IAN) published by Highways England:

- IAN 170/12 Updated air quality advice on the assessment of Future NOx and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1, Air Quality
- IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality
- IAN 175/13 Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Proposed Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA207/07)
- IAN 185/15 Updated traffic, air quality and noise advice on the assessment of traffic data into speed-bands for users of DMRB Volume 11, Section 3 Part 1 Air Quality

5.2.5. Highways England's IAN 174/13 (Highways England, 2013) and 175/13 (Highways England, 2013) informs decision-making on the judgements of air quality impacts and determining whether the Proposed Scheme will affect the UK's reported ability to comply with the Air Quality Directive, in line with the requirements of the NPSNN.

5.3. Study area

Local assessment

5.3.1. The air quality study area is determined based on changes in traffic flows on the local road network. For the Environmental Statement (ES), the traffic data will be available and the affected road network (ARN) will be determined based on DMRB Volume 11, Section 3, Part 1 (HA 207/07). Affected roads are defined where at least 1 of the following criteria is met:

- Road alignment will change by 5m or more
- Daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) flow or more
- Large Goods Vehicle (LGV) flows will change by 200 AADT or more
- Daily average speed will change by 10kph or more
- Peak hour speed will change by 20kph or more

5.3.2. The assessment work undertaken to date comprises a qualitative review of the potential impacts on air quality at sensitive receptors based on:

- existing baseline conditions (based on publicly available information)
- the location of receptors
- changes to road layout and potential traffic changes

Regional assessment

5.3.3. The regional air quality assessment assesses the change in total emissions resulting from the Proposed Scheme. This is required as emissions not only affect local air quality, but also have an impact on a regional, national and international scale.

5.3.4. DMRB Volume 11, Section 3, Part 1 (HA 207/07), is used to determine the regional affected road network and is used to determine the changes in regional emissions. The criteria are defined as:

- A change of more than 10% in AADT
- A change of more than 10% to the number of LGVs
- A change in daily average speed of more than 20kph

5.4. Assumptions and limitations

5.4.1. Assessment work to date has been based on an understanding of the baseline conditions, location of sensitive receptors and potential changes in emissions due to the road layout and traffic flows.

5.5. Baseline

Human health

5.5.1. The receptors located closest to the alignment of the Proposed Scheme are in Black Swan Spinney to the south of the new dual-carriageway between the existing 2 roundabouts at the western extent of the Proposed Scheme. These are located approximately 20m from the A47.

5.5.2. In addition, there is a cluster of receptors located to the west of the existing A1 Great North Road to the north of the existing A1/A47 interchange. These are located approximately 50m from the A1 at their closest point.

5.5.3. There are several residential receptors located to the west of the Proposed Scheme alignment and adjacent to the A1 Great North Road to the south of the A1/A47 interchange also have the potential to be affected due to changes in traffic flows on the local road network as a result of the Proposed Scheme.

5.5.4. To the east of the existing A1 / A47 interchange along the alignment of the proposed dual-carriageway there will be 1 receptor at Old Station House, Sutton Heath Road following the removal of Deep Springs.

Designated ecological sites

5.5.5. There are no internationally or nationally designated ecological sites within 200 metres of the Proposed Scheme. There are however 5 Sites of Special Scientific Interest (SSSI) (Sutton Heath Bog (within 200m of the Proposed Scheme), Wansford Pasture, Old Sulehay Forest, West Abbots & Lounds Wood and Castor Hanglands) within approximately 1.6 Kilometres of the Proposed Scheme and therefore these may be located within 200m of the Proposed Scheme ARN once it has been defined.

Local air quality

5.5.6. There are currently no declared Air Quality Management Areas (AQMAs) for nitrogen dioxide (NO_2) or particulate matter (PM_{10}) within Peterborough City Council's (PCC) administrative area. PCC declared an AQMA in 2007 due to exceedances of the SO2 15-minute mean air quality objective associated with emissions from a brickworks in this location. The AQMA is located approximately 14.5 kilometres east of the Proposed Scheme and is for SO2 and therefore will not be affected as a result of the Proposed Scheme.

5.5.7. PCC collects monitoring data for NO_2 at 17 sites within its area. The data is collected using passive NO_2 diffusion tubes. Annual mean NO_2 concentrations at these sites have been well below the objective in recent years.

5.5.8. A 6 month air quality monitoring survey was undertaken by Highways England from January to June 2016. The results from monitoring were bias adjusted and annualised in accordance with Defra's Local Air Quality Management Technical Guidance (TG16). This monitoring survey concluded that NO_2 concentrations within the vicinity of the Proposed Scheme are well below the annual mean NO_2 air quality objective; the greatest annual mean NO_2 concentration within the vicinity of the Proposed Scheme of 28.2µg/m^3 was recorded on Black Swan Spinney. This monitoring site is representative of sensitive receptors in close proximity to the existing junction at the A47 and A1 and is therefore considered representative of a worst case concentrations.

Defra projected background concentrations

5.5.9. In addition to the data above, Defra provides estimates of background pollution concentrations for NO_X, NO_2 and PM_{10} across the UK for each 1 kilometre grid square, for every year from 2015 to 2030. Future year projections have been developed on the base year for the background maps, which is currently 2015. This data can be used to provide specific background pollutant concentrations at receptors included within the assessment and to supplement local monitoring data.

5.5.10. The maximum background concentrations for the areas covered by the Proposed Scheme alignment for the year 2015 are presented in Table 5-2 and demonstrate that background concentrations are well below the relevant objectives and expected to reduce further in future years as older vehicles are replaced with newer ones which meet more stringent standards.

Table 5-2: Defra background data

NO_x	NO_2	PM_{10}
12.4	9.3	16.8

Note: Proposed Scheme covers multiple OS grid squares. Therefore, the results presented above are taken from the grid squares which have the greatest pollutant concentrations for 2016. Grid squares used = 507500, 299500, 508500, 299500, 509500, 299500 and 510500, 299500

EU limit value compliance

5.5.11. Defra's Pollution Climate Mapping (PCM) is used to report compliance with the EU limit values and provides NO_2 concentrations for a number of roads across the UK for a selection of future years. The most up to date PCM model outputs were released in August 2017, following the release of the UK Plan for tackling nitrogen dioxide concentrations (Defra, 2017).

5.5.12. The PCM link closest to the Proposed Scheme, (on the A47) is located approximately 5.5 kilometres from the Proposed Scheme and has a reported

annual NO_2 concentration in 2017 of 38µg/m^3, which is below the annual mean limit value of 40µg/m^3 for NO_2.

5.6. Consultation

5.6.1. A Scoping Report was submitted in February 2018 to PINS. The Scoping Opinion was received from The Planning Inspectorate (PINS) in March 2018. The outcome of the scoping opinion will guide the development of the methodology and focus of the assessment to be reported in the ES.

5.6.2. Further consultation will be undertaken with PCC to discuss the choice of receptors included in the assessment, once the affected road network can be defined.

5.7. Design interventions

5.7.1. At the time of writing this report, no design interventions have been included for air quality. Any future iterative design as a result of environmental considerations will be reported in the ES.

5.8. Potential mitigation measures

Construction

5.8.1. No additional mitigation measures during the construction phase other than those in accordance with the Best Practicable Means (BPM), as described in Section 79 (9) of the Environmental Protection Act 1990 are likely to be required.

Operation

5.8.2. At the time of writing this report, no operational air quality specific mitigation measures have been designed into the Proposed Scheme. Any proposed mitigation in the future will be reported in the ES.

5.9. Potential impacts

Construction

5.9.1. An indicative construction assessment has been undertaken following best practice guidance using a risk based approach which takes into account the dust raising potential of the likely construction activities, the embedded mitigation and the location of potentially sensitive receptors. Implementation of appropriate good practice mitigation measures will reduce air quality impacts.

Operation

5.9.2. The redistribution of traffic as a result of the Proposed Scheme is likely to have an impact on air quality, depending on where the changes in flows occur.

5.9.3. The Proposed Scheme will likely increase traffic on the A47 but also reduce congestion at the existing roundabouts. This increase in flows has the potential to affect air quality at Black Swan Spinney through increase traffic and this will be assessed in the ES. The proposed alignment of the new A1/A47 interchange will move flows away from sensitive receptors close to the A1 and will likely have a positive effect on air quality. The changes in flows and speeds on the road network from the Proposed Scheme are not expected to be significant in accordance with IAN174/13 considering the exiting NO_2 concentrations.

5.9.4. Any roads that fall within the Proposed Scheme's affected road network and overlap with road links included in the PCM model will be assessed for compliance with the Air Quality Directive in accordance with IAN 175/13. Considering the location of the closest links included in the PCM model and the current reported concentrations, the Proposed Scheme is unlikely to cause a non-compliance with the Air Quality Directive.

5.10. Chapter summary

5.10.1. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated qualitative impacts upon air quality. The Proposed Scheme will impact air quality around the A47 and surrounding roads as a result of changes in the road layout and redistribution of traffic. A review of existing ambient monitoring data, and the likely changes in traffic flows as a result of the Proposed Scheme suggests that there is the potential for both positive and negative air quality impacts however, the annual mean air quality objective for NO_2 will not be exceeded.

5.10.2. Further work will be undertaken to develop design interventions to limit or reduce impacts and promote opportunities for the environment within the study area wherever possible. Design development and potential mitigation will be reported in the ES as well as further detailing of baseline conditions and likely changes during both construction and operation for all identified receptors.

6. Cultural heritage

6.1. Introduction

6.1.1. This chapter presents the preliminary findings of the cultural heritage assessment. This comprises a review of the existing environment and identification of the potential impacts of the Proposed Scheme upon surrounding cultural heritage receptors. The chapter also outlines proposed design measures to help mitigate these potential impacts and relevant consultation.

6.2. Guidance and best practice

6.2.1. The overarching legislation in relation to the historic environment in the UK is provided by:

- The Ancient Monuments and Archaeological Areas Act 1979
- The Planning (Listed Buildings and Conservation Areas) Act 1990

6.2.2. The assessment is undertaken in accordance with the published standards and guidance:

- Ministry of Housing, Communities and Local Government (MHCLG) (formerly the Department of Central and Local Government, DCLG) (2018) National Planning Policy Framework, Section 12 Conserving and enhancing the historic environment
- MHCLG (2013) National Planning Policy Guidance (NPPG)
- Department for Transport (DfT) (2007) Design Manual for Roads and Bridges DMRB), Environmental Assessment (Volume 11, Section 3, Part 2 – Cultural Heritage)
- Historic England (2008) Conservation Principles
- Historic England (2015) Historic Environment Good Practice Advice in Planning note 2 (GPA2) – Managing significance in decision taking in the historic environment
- Historic England (2017) Historic Environment Good Practice Advice in Planning Note 3 (GPA3) – The setting of heritage assets
- Chartered Institute for Archaeologists (2014) Standard and Guidance for historic environment assessment (updated 2017)
- National Policy Statement for National Networks, December 2014 Environment and Social Impacts

6.2.3. The local planning policies for the historic environment presented in the Peterborough City Council (PCC) Core Strategy Development Plan Document (DPD) adopted 2011 (PCC 2011). Policy CS17 states that the council will

protect, conserve and enhance the historic environment throughout Peterborough and that all new development should respect and enhance the historic environment.

6.2.4. Once adopted the Peterborough Local Plan 2016 to 2036 will replace the DPD. Policy LP20 Heritage Assets, is similar to the policy it will supersede, as it will protect, conserve and enhance heritage assets throughout Peterborough and 'all new development must respect and enhance the local character and distinctiveness of the area… particularly in areas of high heritage value' (PCC 2016, 49).

6.3. Study area

6.3.1. The study area comprises a 1 kilometre buffer around the Proposed Scheme boundary.

6.4. Assumptions and limitations

6.4.1. With no intrusive evaluation surveys yet completed, the archaeological potential within the Proposed Scheme Boundary cannot be considered to have been fully examined or determined.

6.4.2. The assessment is based upon Design Fix A+, prepared May 2018. As such further development of the Proposed Scheme has the potential to alter the predicted impacts of the construction and operation upon the cultural heritage resource. Any changes to the design would be reported in the Environmental Statement (ES).

6.4.3. Information provided by Historic Environment Records (HER) can be limited because it depends on available opportunities for research, fieldwork, and discovery. Where nothing of historic interest is shown in a particular area, this can be down to a lack of targeted research or investigation rather than the genuine absence of heritage assets.

6.4.4. Only non-designated buildings of local heritage interest identified within the Environmental Assessment Report (EAR) (Highways England 2017) are presented within this assessment. Further assessment would need to take into consideration any such assets.

6.4.5. Documentary sources are rare before the medieval period, and many historic documents are inherently biased. Older primary sources often fail to accurately locate sites and interpretation can be subjective.

6.4.6. Where archaeological sites have been identified solely from aerial imagery without confirmation from archaeological excavation or supporting evidence in

the form of find-spots etc., it is possible the interpretation may be revised in the light of further investigation.

6.5. Baseline

6.5.1. The information presented within this report is largely derived from the EAR (Highways England 2017).

6.5.2. Data detailing nationally designated cultural heritage assets in the UK has been obtained from Historic England's National Heritage List for England. Information concerning designated and non-designated heritage assets was obtained from the Peterborough and Cambridgeshire HER. The 2 HER duplicate records as they overlap the county boundaries, therefore only 1 HER dataset (Peterborough) is referred to in this document.

6.5.3. References used in this section refer to the National Heritage List for England list entry numbers (NHLE numbers) and Peterborough HER reference numbers (PCCHER). References for buildings of local importance are presented as Building Local Importance (BLI) numbers and are taken from Peterborough City Council's inventory.

Archaeological and historical overview

6.5.4. A previous evaluation of the HER has been undertaken for the Proposed Scheme. This identified that there is high potential for archaeological remains dating from between the prehistoric period and Roman periods in particular, within the study area.

6.5.5. References used in this section refer to the National Heritage List for England list entry numbers (NHLE numbers) and Peterborough HER reference numbers (PCC HER numbers).

Designated assets

6.5.6. There are 5 scheduled monuments within 1 kilometre of the Proposed Scheme:

- "Site revealed by aerial photography West of Sutton Heath", NHLE 1006796, situated on the northern side of the A47, to the west of Sutton Heath Road; a geophysical, magnetometer survey conducted to inform the EAR revealed a series of subterranean features; ring ditches characteristic of Bronze Age (1800-600 BC) barrows (funerary monuments)
- "Roman fort and enclosure at Sutton Cross", NHLE 1006837, 300m to the east of the new A47 Sutton junction
- "Wansford Bridge", NHLE 1006835 / NHLE 1003810, 550m south of the Wansford A1 / A47 junction

- "Wansford Roman site", NHLE 1006836, 800m to the south of the A47 / A1 junction
- "Sutton Heath, Romano-British site", NHLE 1006880, 1 kilometre to the north of the A47, situated on the eastern side of Sutton Heath Road

6.5.7. There are 85 listed buildings within 1 kilometre of the Proposed Scheme. Seven grade I listed structures as follows:

- Church of St Mary the Virgin, NHLE 1127442, 550m to the south-west of the A1 / A47 Wansford junction, in Wansford village centre
- Church of St Michael and All Angels, NHLE 1127517, 650m south of the A47, in Sutton village
- Church of St Andrew, NHLE 1225298, 640m north-east of the A1 / A47 Wansford junction, in the village of Thornhaugh
- Wansford Bridge, NHLE 1127445 and NHLE 1274654, 600m south-east of the A47 / A1 junction, in the village of Wansford (this is recorded as 2 separate assets as it covers 2 counties)
- Stibbington Hall, NHLE 1222241, 840m south of the A47 in the village of Stibbington
- Gateway and boundary wall to forecourt of Stibbington Hall, NHLE 1274861, 850m south of the A47, in the village of Stibbington

6.5.8. Seven grade II* assets as follows (1 of which appears to be a duplicated record):

- Great North Road Bridge carrying northbound carriageway over the River Nene, NHLE 1274340 and 1331276, 350m to the south of the A47 / A1 unction, in Wansford
- Sacrewell Mill and Mill House and Stables, NHLE 1127493, 550m to the north-east of the A47 / A1 junction
- The Haycock Hotel, NHLE 1237866, 680m south-west of the A47 / A1 junction in Wansford
- Parish church of St John the Baptist, NHLE 1274862, 850m to the south of the A47, in the village of Stibbington
- Manor House, NHLE 1127458, 800m north-west of the A47 / A1 junction, in the village of Thornhaugh
- The Old Rectory, NHLE 1222331, 850m to the south-west of the A47, in the village of Stibbington

6.5.9. The remaining listed buildings are all grade II and are largely situated within the centres of the surrounding villages of Thornhaugh, Wansford, Stibbington and Sutton.

6.5.10. There are 3 conservation areas within the study area, centred on the historic centres of Wansford, Sutton and Stibbington.

6.5.11. There are no registered parks and gardens, historic battlefields or World Heritage Sites within the study area.

Archaeological fieldwork

6.5.12. Geophysical magnetometer survey has been undertaken across the Proposed Scheme (Archaeological Services WYAS 2018). The results indicate 5 main areas of archaeological, and potential archaeological, activity:

6.5.13. Area 1 – Field to the east of the A1 and north of the A47, Sacrewell Farm. Potential archaeological pits and linear features within an area identified on the HER as a potential ironworking site. A walkover survey of this field identified large quantities of slag on the surface. Several of the features in the southern part of the field appear to follow the line of a former field boundary and extend to the south of the A47 on a north-east to south-west alignment.

6.5.14. Area 2 – Straddling the A47 to the east of the filling station. A cluster of potential archaeological features and a pair of parallel ditches and associated linear feature forming a potential enclosure have been interpreted as a possible Roman roadside settlement.

6.5.15. Area 3 – South of the A47 at Deep Springs cottage. A series of enclosure ditches with internal and external features.

6.5.16. Area 4 – West of The Drift. A pit alignment of probable Iron Age date, previously recorded through aerial photographs, with 2 potential ring ditches.

6.5.17. Area 5 – South of the A47, west of the Nene Way Roundabout. A cluster of linear and pit-like features of potential archaeological origin.

6.5.18. The Proposed Scheme follows the line of the A47 to the south of the scheduled monument (NHLE 1006796). A geophysical, magnetometer survey revealed a series of subterranean features; ring ditches characteristic of Bronze Age (1800-600 BC) barrows (funerary monuments) (Headland Archaeology: Land Adjacent to the A47, Wansford Peterborough Geophysical Survey June 2017).

Archaeological and historical background

6.5.19. Though a small number of prehistoric find-spots are recorded within 1 kilometre of the Proposed Scheme and date from the Mesolithic period through to the Iron Age, the study area contains a large number of prehistoric cropmarks. Many of these are ring ditches, which are likely to be barrows (funerary monuments) situated close to the River Nene. Bronze Age barrows are commonly sited in close proximity to water courses, or on high ground with inter-visibility between features. Neolithic and Bronze Age flints have been recovered over the past 40

years from the field to the south-west of Sacrewell Farm (PCCHER 01976). Bronze Age human remains in a cist were identified to the north of the Proposed Scheme, (PCCHER 00176), west of scheduled monument NHLE 1006796. No further contextual details are recorded.

6.5.20. A potential Iron Age pit alignment is recorded on aerial photographs (PCCHER 08368) and through geophysical survey (Archaeological Services WYAS 2018) on the line of the Proposed Scheme, to the west of The Drift. The alignment appears to follow a north-west to south-east course, roughly parallel to The Drift. It is uncertain what function the pit alignment would have performed; it could have formed a boundary - evidence of banks have been recorded alongside similar pit alignments, suggesting that the bank might have been the intended boundary feature, rather than a series of pits.

6.5.21. There are a number of Roman find-spots in the area. The A47 is reported to run along the alignment of a Roman road, probably Margary's route 25, the Fen Causeway (Margary 1973). The Roman road, Ermine Street, ran north-westwards to the east of the Sutton end of the Proposed Scheme. An ironworking site was recorded at Sacrewell Farm, in the line of the Proposed Scheme (PCCHER 50343). A recent walkover survey identified large quantities of slag spread across the field, within the topsoil. The site of a Roman fort is located some 300m to the east of the Proposed Scheme (scheduled monument NHLE 1006837). A Romano-British settlement site has been identified around 1 kilometre to the north of the Proposed Scheme, at Sutton Heath (NHLE 1006880).

6.5.22. Excavations to the south of Sacrewell Farm, around 10m to the east of the Proposed Scheme at the MC20 local road, recorded a Roman building with a decorative surface, suggestive of a property with some status (PCCHER 01991). The records however acknowledge that this location is uncertain, it is proposed to investigate with intrusive trial trenching any areas that could be impacted by the Proposed Scheme.

6.5.23. Early medieval and medieval records are largely confined to the villages, as are the majority of post-medieval records, indicating that the surrounding land was agricultural. Wansford is not recorded in the Domesday Survey of 1086 indicating that there was no taxable settlement present at the time. However, a wooden bridge at Wansford is recorded in the 13th century (PCC 2008). The Norman ascendancy to the throne led to a widespread construction programme which required large amounts of stone. Several quarries are recorded in the nearby area, such as Barnack Hills and Holes some 4 Kilometres to the north of the Proposed Scheme, and outside of the study area. It is probable that the river was used to access and transport the nearby resources of building stone. The

settlement at Wansford relied heavily upon the river trade and access to the Great North Road (PCC 2008).

6.5.24. Later, 19th century mapping shows that the area remained agricultural. The historic landscape was divided into smaller fields than are present today but the general layout is similar, and many of the current field boundaries are recorded on the historic maps.

6.5.25. Post-medieval drains are recorded and a World War Two Royal Observer Corps site was reputedly located within survey area Wan03 (PCCHER 50635).

6.5.26. There are 3 19th century buildings of local importance in close proximity to the Proposed Scheme:

- Station House, the former railway station building at Sutton Heath Station, dated 1867
- Heath House, dated 1867
- Railway bridge, dated 1867. The bridge takes the A47 over the former railway cutting

6.6. Consultation

6.6.1. To date a meeting with Historic England and Peterborough City Council was undertaken on 10 May 2017. Further meetings with Historic England were held on 26 February 2018 and 16 May 2018. A meeting with Peterborough City Council was held on 7 June 2018 and followed by an Environmental Liaison Group event held on the 12 June 2018. Table 6-1 shows the consultation in full detail.

Table 6-1: Consultation to date

Consultee	Comment	Date	Responses
Historic England	Consultation at Stage 2 Options	May 2017	
Historic England and Peterborough City Council	Geophysical survey of the scheduled monument required and a wider aerial photograph and LiDAR analysis should be undertaken.	10/05/17	Geophysical survey and aerial photograph and LiDAR analysis was undertaken in 2017.
Historic England	Introduction to Proposed Scheme. Impact to Scheduled Monument discussed. Impact to listed buildings raised – in particular Sacrewell Mill.	26/02/18	
Parish Councils – Wansford and Sutton, public	Suggestion to move Proposed Scheme discussed. Importance and significance of scheduled monument explained.	04/05/18	The Proposed Scheme alignment was amended
Historic England	Discussion regarding impact to scheduled monument and local proposal to route the Proposed Scheme through scheduled monument. Suggestion of updating the listing	16/05/18	Listability to be internally assessed.

Consultee	Comment	Date	Responses
	information for the scheduled monument. Suggestion of review of 3 buildings of local importance in terms of meeting the criteria for listing.		
Peterborough City Council, observed by Parish Councillors from Wansford and Sutton Parishes.	Discussed geophysical survey results and area to south of scheduled monument that was not possible to survey. Discussed proposed trenching approach.	07/06/18	Trench plan and specification to be issued..
Peterborough City Council, Anglian Water (various)	Environmental Liaison Group – introduction to Proposed Scheme, summary of environmental constraints and surveys. Discussion with PCC Conservation Officer and Historic England concerning the 3 buildings of local importance (Old Station House, Heath House and the railway bridge). Discussed impact on setting upon all 3 assets. New scheme Design Fix A+ discussed at meeting – Historic England concerned about proximity of the Proposed Scheme to scheduled monument – emphasised their position that the existing verge must be retained and not used. Impact to listed buildings raised – in particular Sacrewell Mill.	12/06/18	Trench plan to be amended. Statement of Significance to be progressed. Historic England to progress with updating the scheduling listing and assess listability of the 3 buildings of local importance.

6.7. Design interventions

6.7.1. The Proposed Scheme has been amended in response to consultation with local stakeholders and statutory stakeholders. This brings the Proposed Scheme closer to, but not within the existing verge therefore providing a buffer around the southern perimeter of the scheduled monument and resulting in less impact to the county wildlife site.

6.7.2. A number of mitigation measures have been suggested, such as screening the listed buildings from the development and sympathetic design of the road bridge adjacent to the A47 bridge, over the dismantled railway, however none have been incorporated into the design at this stage.

6.8. Potential mitigation measures

6.8.1. Construction would be carried out using industry best practice and in accordance with a Construction Environmental Management Programme (CEMP) to reduce any potential adverse impacts. Mitigation measures for the historic environment would be reported in the ES and incorporated throughout the design and construction stages.

6.8.2. In addition to the identified mitigation measures, archaeological investigation (such as excavation of buried remains) will be undertaken if required to help understand the value of assets where there is a potential loss.

6.8.3. Mitigation recommendations which have been put forward through the early design phases, are:

- Sensitive vegetation screening of the MC10 Slip Road A1 to A47 to minimise setting impact to Sacrewell Mill
- Limit impact to historic hedgerows and boundaries by restricting permanent loss to the footprint of the Proposed Scheme, with no loss for temporary purposes such as haul routes and compounds
- Limit impact to buried archaeological features across the Proposed Scheme by avoiding ground disturbance in areas of temporary use, such as haul routes and compounds, using ground protection measures
- Limit impact to buried archaeological features through minimisation of the Proposed Scheme footprint, in order to keep ground disturbance to as small an area as possible

6.9. Potential impacts

Construction

6.9.1. Construction impacts may arise as a result of the following activities:

- Temporary and permanent land-take
- Demolition and site clearance
- Excavation, ground disturbance and compaction
- Use of plant and machinery
- Building up site levels with made ground
- Construction of new infrastructure or modification of existing infrastructure
- Visual intrusion and disruption to access during construction
- Creation of increased noise / dust during construction
- Diversion / alteration of existing services or installation of new services
- Landscaping and planting

6.9.2. These activities could lead to the following effects on the historic resource:

- Loss / damage or long-term burial of archaeological remains
- Structural damage to historic buildings due to proximity of works
- Severance or loss of features such that, the physical or visual integrity of a site is compromised and the ability to understand and appreciate the remaining elements is diminished
- Temporary alteration and/or visual intrusion into the historic setting / character of a designated asset or undesignated site of national or regional significance

- Temporary impacts on the access to, and amenity of, designated sites or undesignated sites of national or regional significance

6.9.3. Cumulative effects are also a consideration and would be reported accordingly in the ES.

Sensitive receptors during construction

6.9.4. Table 6-2 sets out the key sensitive receptors that could potentially be affected by construction of the Proposed Scheme. The final ES would set out to assess the potential effects of the Proposed Scheme on the identified receptors and provide recommendations for mitigation.

Table 6-2: Sensitive receptors during construction

Receptor	Location	Description
Sacrewell Mill and Mill House and Stables, 550m to the north-east of the A47 / A1 junction. Grade II* listed building.	507889, 300062	Early 18th century mill house and water mill dated 1755. Construction of the MC10 Slip Road A1 to A47 will impact the setting of the asset. It is possible that there will be an increase in noise during construction.
Great North Road Bridge carrying northbound carriageway over the River Nene. Grade II* listed structure.	507627, 299362	Constructed 1925-1928. Construction is unlikely to significantly alter the setting of the receptor; it is not likely to be visible and will not introduce new noise impacts. However, this will be assessed in more detail for the Environment Statement.
“Site revealed by aerial photography West of Sutton Heath, scheduled monument”.	508696, 299751 (centre)	Bronze Age barrow cemetery with Roman enclosure in the north. Construction of the widened road would further separate the asset from the River Nene, which is the likely draw for the original placement of the barrow cemetery. Construction will have a visual impact to the setting of the heritage asset. There will be a temporary noise impact during construction.
“Stables coach house and cottage ranges circa 5 metres northwest of Stibbington Hall”. Grade II listed building, 770m south of the Proposed Scheme.	508926, 298763	Mid-19th century structures. Possible visual impact to their setting resulting in an adverse effect.
Stibbington Hall, 800m south of the Proposed Scheme. Grade I listed building.	508922, 298739	Dated 1624 with 17th, 18th and 20th century alterations. Possible visual impact to their setting resulting in an adverse effect.
Gateway and Boundary Wall to Forecourt of Stibbington Hall. 820m south of the Proposed Scheme. Grade I listed building.	508901, 298724	Construction date circa 1625. Possible visual impact to their setting resulting in an adverse effect.
Non-designated A47 road bridge over the dismantled railway.	508982, 299570	Construction date circa 1860. Permanent adverse impact to setting

Receptor	Location	Description
		through construction of adjacent road bridge.
Buried archaeological remains identified through aerial photography. Prehistoric to post-medieval in date, across the Proposed Scheme.	Scheme wide	Non-designated assets. Cropmarks identify funerary assets, pit alignments and field systems of prehistoric to Roman date. Construction would partially or totally destroy these assets.
Unknown buried archaeological remains. Prehistoric to post-medieval in date, across the Proposed Scheme.	Scheme wide	Non-designated assets. Construction would partially or totally destroy these assets.
Historic landscape character	Scheme wide	The historic landscape character is post-medieval enclosure with some 20th century alterations. Construction of the Proposed Scheme would require partial loss of field boundaries and, if present, historic hedgerows.

Operation

6.9.5. Impacts from the operational phase of the Proposed Scheme may arise as a result of the adverse or beneficial impacts upon the special architectural or historic interest of a designated site (or undesignated site of national importance) and its setting, character or appearance.

6.9.6. The Proposed Scheme could lead to the following impacts on the historic resource:

- Increased visual intrusion both to and from sites / buildings of national or regional importance
- Alteration to the historic setting / character of a designated site or undesignated site of national or regional significance
- Increase or decrease in noise, vibration or dust such that the amenity or physical fabric of a nationally or regionally important site is either adversely affected or improved
- Opportunities to enhance the character and setting of a designated site or undesignated site of national or regional significance
- Opportunities for heritage related education and tourism

Sensitive receptors during operation

6.9.7. Table 6-3 sets out the key sensitive receptors that could potentially be affected by the Proposed Scheme. The final ES would set out to assess the potential effects of the Proposed Scheme on the identified receptors and provide recommendations for mitigation.

Table 6-3: Sensitive receptors during operation

Receptor	Location	Description
Sacrewell Mill and Mill House and Stables, 550m to the north-east of the A47 / A1 junction. Grade II* listed building.	507889, 300062	Early 18th century mill house and water mill dated 1755. There will be a possible increase in traffic noise during operation as the new slip road will be brought closer to the receptor.

6.10. Chapter summary

6.10.1. The Proposed Scheme is situated in an area with a wealth of archaeological evidence dating from the prehistoric period onwards. In particular, many of the identified cropmarks appear to be attributable to Bronze Age funerary activity. The Proposed Scheme is situated immediately to the south of a Scheduled Monument comprising of a Bronze Age barrow cemetery with later Roman enclosures. Roman activity is associated with the road network; Roman settlements, several villas, a fort, and an ironworking site have been recorded within the area surrounding the Proposed Scheme. There are a small number of Saxon chance finds, but no settlement evidence. The landscape appears to have remained rural agricultural, with pockets of quarrying activity throughout the medieval and post-medieval periods.

6.10.2. Geophysical survey undertaken to inform the assessment of the Proposed Scheme has revealed 5 areas of activity across the Proposed Scheme, probably dating to the prehistoric, Roman, medieval and post-medieval periods.

6.10.3. Further work would be undertaken to develop design interventions to limit or reduce impacts and promote opportunities for the environment within the study area wherever possible. Design development and potential mitigation would be reported in the ES as well as further detailing of baseline conditions and likely changes during both construction and operation for identified receptors such as Sacrewell Farm and the Scheduled Monument.

7. Landscape

7.1. Introduction

7.1.1. This chapter presents the preliminary findings of the Landscape and Visual Impact Assessment (LVIA), comprising a review of the existing environment and identification of the potential impacts of the Proposed Scheme upon surrounding landscape and visual receptors. The chapter also outlines proposed design measures to help mitigate potential landscape and visual impacts.

7.2. Guidance and best practice

7.2.1. No single prescribed methodology exists for assessing landscape and visual impact; however, this assessment follows best practice guidelines as set out in:

- Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 5 Landscape Effects (Highways England, 1993)
- DMRB Interim Advice Note 135/10 (IAN 135/10) Landscape and Visual Effects Assessment (Highways England, 2010)
- Guidelines for Landscape and Visual Impact Assessment Third Edition (Landscape Institute & Institute of Environmental Management and Assessment, 2013)
- An Approach to Landscape Character Assessment (Natural England and Department for Environment, Food and Rural Affairs, 2014)

7.2.2. Information has also been gathered from the A47 Wansford to Sutton Project Control Framework (PCF) Stage 2 Environmental Assessment Report (Document Reference: A47IMPS2-AMY-WS-ZZ-DO-J0024).

7.3. Study area

7.3.1. In recognition of the guidance given in DMRB Volume 11 Section 3 Part 5 Landscape Impacts, the study area for the LVIA extends 1 Kilometre from the Proposed Scheme limits.

7.4. Assumptions and limitations

7.4.1. Visual impacts have been considered based on a site visit to publicly accessible areas.

7.4.2. The Arboricultural Impact Assessment was not available at the time of the Preliminary Environmental Information Report.

7.5. Baseline

Landscape character

7.5.1. Transport corridors form dominant features within the local environment, with the A47 running through the study area, to the north of Sutton and Stibbington, whilst the A1 runs to the east of Wansford creating a physical boundary between the village and the remainder of the study area.

7.5.2. Located to the north of the A47 is Sacrewell Farm and Country Centre, a local recreation facility. This forms part of an open and rural landscape, which comprises a mixture of irregular shaped fields of variable sizes, generally enclosed by hedgerows, with occasional blocks of woodland. It is interspersed with small-scale settlements, such as Upton and isolated groups of farmsteads and houses. The southern part of the study area is more heavily wooded, with mature and semi-mature trees, and shrubby vegetation lining the edge of the River Nene and wetland south of the river, and with vegetation along minor vehicular routes and associated with residential properties limiting views. The existing A47 is itself partially delineated by mature trees and hedgerows but also includes large sections of the route without notable vegetation cover.

7.5.3. A number of Public Rights of Way (PRoW) traverse the landscape, most notable are Hereward Way, which runs north to south of the Proposed Scheme, and Nene Way to the south of the Proposed Scheme, which links up with Hereward Way at the River Nene.

7.5.4. The study area is located on the edge of 2 National Character Areas (NCA); 89 Northamptonshire Vales and 92 Rockingham Forest.

Landscape designations

7.5.5. There are no landscape designations associated with the Proposed Scheme study area.

Visual

7.5.6. To the south-east of the study area the landscape is more open, allowing extensive views across the plateau topography. The topography of the remainder of the study area contrasts notably, with the gently undulating landscape of ridges and valleys. The extents of views to the north and south-west of the study area are further restricted by the screening effect of woodland, a strong hedgerow network and mature trees.

7.5.7. The potential for views of the Proposed Scheme most notably associate with residential properties and users of the local Public Rights of Way (PRoW)

network. The potential for views from residential properties includes the settlements of Sutton, Stibbington and small parts of Wansford. There is also the potential for views from Thornhaugh and Thackers Close to the west of the A1 and a wider, dispersed pattern of individual properties and small hamlets spread extensively across the study area. Various PRoW footpaths and bridleways coincide with the extent of the study area, most notable are Hereward Way, which runs north to south of the Proposed Scheme, and Nene Way to the south of the Proposed Scheme, which links up with Hereward Way at the River Nene.

7.5.8. Views of the Proposed Scheme would also be experienced by users of Sacrewell Farm and Country Centre, BP Petrol Filling Station A47 and road users of the A47 and various minor roads within the extent of the study area.

7.5.9. Table 7-1 below summarises the main receptors and their sensitivity to the Proposed Scheme.

Table 7-1:Visual receptor sensitivity

Receptor	Sensitivity
Residential properties on the northern edge of Sutton	High
Residential properties on the northern edge of Stibbington	High
Residential properties on the eastern edge of Wansford	High
Residential properties on the eastern edge of Thornhaugh	Low
Dispersed residential properties to the north and south of the existing A47	High
Users of PRoW including, Hereward Way and Nene Way	High
Sacrewell Farm and Country Centre	Medium
BP Petrol Filling Station A47	Low
Users of the A47 road	Low
Users of the various minor roads to the north and south of the existing A47	Low

7.6. Consultation

7.6.1. Non-statutory public consultation on the Proposed Scheme was undertaken in March and April 2017. Where relevant, points arising will be carried forward in the development of mitigation measures for the Proposed Scheme and would be reported in the Environmental Statement (ES).

7.6.2. A Scoping Report was submitted in February 2018, the outcome of which will guide the development of the methodology and focus of the assessment to be reported in the ES.

7.6.3. Representative viewpoints to inform the assessment of visual impacts are to be discussed and agreed in consultation with the Local Planning Authority and consequently reported in the ES.

7.7. Design interventions

7.7.1. The current Proposed Scheme layout does not accommodate any specific landscape and visual design interventions. The scope to incorporate design interventions will be considered as part of the ongoing design development process and will be presented in the ES. Typical landscape and visual related interventions include minor highway alignment changes to assist integration with existing features, the adaptation of earthworks to contribute to screening and input to the positioning of highway related elements such as lighting or signage to limit visual impacts.

7.8. Potential mitigation measures

7.8.1. A comprehensive environmental masterplan and subsequent detailed planting design is to be produced to develop a robust landscape mitigation strategy. Potential mitigation measures would seek to reduce impacts during both Construction and Operation phases.

7.9. Potential impacts

Construction

7.9.1. The removal of existing vegetation, earthworks and presence of construction plant, materials, machinery, construction compounds and construction lighting would potentially result in impacts on local landscape elements and character during construction, with large-scale construction works resulting in new additions within the landscape.

7.9.2. Given the sensitivity of a number of nearby receptors there are likely to be impacts upon landscape character and visual amenity during construction, whilst more distant receptors would be affected to a lesser degree. The ES chapter will address these receptors, identifying likely changes to landscape character and to views for each receptor, the magnitude of change experienced and the resulting effect during construction

Operation

7.9.3. At year 1 of operation, there would potentially be an impact on landscape character and visual amenity due to the relative prominence of Proposed Scheme infrastructure (including raised structures and overbridges) prior to the

establishment of integrating the Proposed Scheme mitigation planting. Impacts would also result from the year 1 loss of mature tree and hedgerow landscape elements relative to the existing baseline and to the localised loss of agricultural land. By year 15 of operation, the establishment of the Proposed Scheme landscape mitigation would contribute to a reduction in the extent and significance of landscape and visual impacts. There would however remain the potential for residual landscape and visual impacts as an outcome of the relative increase in road infrastructure associated with the raised road structure, overbridge and enlarged carriageway, although the extent of this would be limited due to the local topography and existing vegetation, which restricts views.

7.9.4. The detailed impacts upon visual amenity and landscape character will be described in the ES, identifying the likely change during operation for each visual receptor and landscape character area, the magnitude of that change and the resulting significance of effect.

7.9.5. There would also be potential for night-time visual impacts as a result of the influence of vehicle headlights and Proposed Scheme lighting. Night-time lighting impacts would reduce over time following establishment of screening afforded by the Proposed Scheme mitigation planting.

Chapter summary

7.9.6. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated impacts upon landscape character and visual amenity. Major adverse impacts on occupiers of residential properties and recreational users of PRoW are likely during construction and the early years of the operational phase.

7.9.7. Further work would be undertaken to develop design interventions to limit or reduce adverse impacts and promote opportunities for the environment in the study area wherever possible. Any design development and potential mitigation would be reported in the ES as well as further detailing of baseline conditions and likely changes during both construction and operation for all identified receptors.

8. Biodiversity

8.1. Introduction

8.1.1. This chapter presents the preliminary findings of the ecological impact assessment. This comprises a review of the existing environment and identification of the potential impacts of the Proposed Scheme upon surrounding ecological receptors. Consultation is identified where relevant to the content and focus of the chapter. The chapter also outlines proposed design measures to help mitigate potential ecological impacts.

8.2. Guidance and best practice

8.2.1. As is best practice, the assessments in the Biodiversity chapter of this Preliminary Environmental Information Report (PEIR) only consider those ecological receptors that are of sufficient conservation value and potentially vulnerable to impacts arising from the proposed development. These are termed Valued Ecological Receptors.

8.2.2. Surveys and assessment would be undertaken in line with guidelines set out in the following documents and sources:

Habitats

- JNCC (2011) The National Vegetation Classification (NVC) [online] http://jncc.defra.gov.uk/page-4259
- Rodwell, J.S. (1991) British Plant Communities. Volume 2: Mires and Heaths. Cambridge University Press
- Rodwell, J.S. (1992) British Plant Communities. Volume 3: Grassland and Montane Communities. Cambridge University Press
- Rodwell, J.S. (2006) National Vegetation Classification: Users' Handbook. JNCC

Aquatic Invertebrates

- C.M. Drake, D.A. Lott, K.N.A. Alexander & J. Webb (2007), Surveying terrestrial and freshwater invertebrates for conservation evaluation, Natural England
- EU-star, UK invertebrate sampling and analysis procedure for start project
- Environment Agency, Freshwater macro-invertebrate analysis of riverine samples 2012
- Environment Agency, Freshwater macro-invertebrate sampling in rivers (2012), EA

Badgers

- Harris S, Cresswell P and Jefferies D (1989) 'Surveying Badgers'
- Hancocks P et al (2013), Competencies for Species Surveys: Badger, CIEEM
- Bang, P. Dahlstrom, P. (2006). Animal Tracks and Signs. Oxford University Press
- Neal, E. & Cheeseman, C. (1996). Badgers, T&AD Poyser Ltd.
- Booty, C et al. (1994). Problems with badgers? (3rd Ed), RSPCA Publications
- Andrews, R. (2013). The Classification of badgers *Meles Meles* setts in the UK: A review and Guidance for Surveyors. In Practice, CIEEM: pp. 27 – 31

Bats

- Bat Conservation Trust 'Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition)'
- British Standards Institute 'Surveying for Bats in Trees and Woodland – Guide (BS 8596:2015) (1st edition)'
- Chartered Institute of Ecology and Environmental Management (CIEEM) 'Competencies for Species Surveys: Bats'
- Bat Conservation Trust Bats and Buildings

Birds

- Bibby, C.J. et al, (2007) Bird census techniques (2nd edition), Academic press
- Evans, J. et al, (2002) Bird monitoring methods a manual of techniques for key UK species, RSPB
- Crick, H. et al, (2013) Raptors a field guide for surveys and monitoring, 3rd edition. The stationary office

Great Crested Newts

- English Nature Great Crested Newt Mitigation Guidelines (2001)
- Biggs J et al 'Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (*Triturus cristatus)* environmental DNA
- ARG UK (2010), ARG UK Advice Note 5: Great Crested Newt Habitat Suitability Index,. Amphibian and Reptile Groups of the United Kingdom.
- Jeffcote M et al. (2000). Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal 10 (4), 143-155

Otter

- Chanin P (2003). Ecology of the European Otter (Ref 9.28)
- Findlay M and Chanin P (2013), Competencies for Species Surveys: Otter, CIEEM

Water vole

- Dean, M et al. The Water Vole Mitigation Handbook (2016)
- (The Mammal Society Guidance Series) (Ref 9.30)
- Strachan R et al. (2013), Competencies for Species Surveys: Water Vole, CIEEM

White-clawed crayfish

- Peay S (2003), Monitoring the White-clawed Crayfish, English Nature
- Peay S (2000), Guidance on works affecting white-clawed crayfish, English Nature
- Bradley P & Peay S (2013), Competencies for species surveys: White-clawed Crayfish, CIEEM
- Holdich D (2003), Ecology of the White-clawed Crayfish, English Nature
- Natural England – Standing Advice Species: White-clawed crayfish

8.3. Study area

8.3.1. The distance over which Designated Sites, and protected habitats and species could be affected by the Proposes Scheme is variable, and depends on active pathways between the Proposed Scheme and the potential receptor, and on species mobility. The study areas used for specific ecological surveys therefore differs dependant on the survey. The study area for specific surveys can be found in Table 8-1.

Table 8-1: study areas for each ecological receptor

Receptor	Study Area (including areas not surveyed)
Internationally and nationally designated sites (including Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Wetlands of International Importance (Ramsar Sites).	Dependent on pathway and to align with The Habitat
National Nature Reserves (NNRs) and Sites of Special Scientific Interest (SSSIs).	2 kilometres from the Proposed Scheme.
SACs designated for bats.	30 kilometres from the Proposed Scheme.

Receptor	Study Area (including areas not surveyed)
Statutory sites designated for birds.	10 kilometres from the Proposed Scheme.
Locally designated conservation sites (including Local Nature Reserves (LNRs), County Wildlife Sites (CWSs) Local Wildlife Sites (LWSs) and RSPB reserves).	2 kilometres from the Proposed Scheme.
Habitats.	500m from the Proposed Scheme.
Aquatic invertebrates.	500m from the Proposed Scheme.
Badgers.	50m from the Proposed Scheme.
Bats.	50m from the Proposed Scheme.
Breeding and wintering birds.	100m from the Proposed Scheme.
Great crested newts *Triturus cristatus*.	500m from the Proposed Scheme.
Water vole *Arvicola amphibius* and otter *Lutra lutra*.	250m from the Proposed Scheme.
White-clawed crayfish *Austropotamobius pallipes.*	500m from the Proposed Scheme.

8.4. Assumptions and limitations

8.4.1. It should be noted that the absence of certain protected or rare species from the Phase 1 Survey does not preclude their presence on a site. There is always the risk of protected or rare species being over-looked, either owing to the timing of the survey or the scarcity of the species within the Study Area. Therefore, ecological surveys are on-going during 2018 and will continue to be undertaken during 2019. An updated assessment will be included within the Environmental Statement (ES) once survey results have been received.

8.4.2. Field surveys are confined to locations where landowner permission has been obtained; every effort to negotiate access has been made before and during the 2018 survey season

8.4.3. During the Preliminary Roost Feature (PRF) inspection, trees covered by ivy were assessed but not climbed because it was not practical to do so (i.e. the action of climbing is likely to be damaging or destructive to the potential roost locations). Where trees were considered unsafe to climb, a conservative roost suitability or risk assessment was ascribed to them.

8.4.4. Some areas (land parcels and individual buildings) have only recently become available for survey. We have secured access in time to allow all the season's surveys requirements, but in many cases, these have not been surveyed before. This means that assessments of impacts will be based on 1 season's survey data, whereas assessments of impacts for land parcels where access has historically been available, will be based on more than 1 season of data.

8.4.5. A number of the detailed surveys were started late in the 2017 season (mid-July), meaning that only half a season of data or less is currently available. To provide robustness to these surveys, it is intended to continue early season surveys, to ensure that sufficient survey effort has been undertaken, and that surveys at the sensitive early part of the season are included for assessment.

8.4.6. No details of any additional land-take, such as for site compounds or access routes have been confirmed. Impacts described within this chapter are subject to change once additional information is received. This updated assessment would be included within the ES.

8.5. Baseline

8.5.1. A number of nationally and locally designated sites occur within the study area, which are presented in Table 8-2.

Table 8-2: Summary of existing nature conservation designated sites

Summary of Existing Baseline	
Designated Site	Distance from the Proposed Scheme
Nene Washes SPA and Ramsar	11.9 kilometres east
Sutton Bog and Heath SSSI	50m north
Wansford Pasture SSSI	0.4 kilometres south
Old Sulehay Forest SSSI	1.08 kilometres south-west
West Abbot's and Lound Woods SSSI	1.5 kilometres north-east
Castor Hanglands SSSI	1.6 kilometres north-east
Sutton Disused Railway CWS	Within Proposed Scheme Boundary
River Nene CWS	50m south
Sutton Meadows CWS	50m south
A47/A1 Interchange Road Verges CWS	Within Proposed Scheme Boundary
Stibbington Pits CWS	0.2 kilometres south
Heil Corner and Top Field Spinney CWS	0.6 kilometres south
Standens Pasture LWS (LWS)	0.6 kilometres south-west
Yarwell Gravel Pit LWS	1.8 kilometres south
Andrews Quarry LWS	2.2 kilometres south-west
Yarwell Mill Lake LWS	2.4 kilometres south

Botanical

Sutton Heath and Bog SSSI

8.5.2. An National Vegetation Classification (NVC) survey of Sutton Heath and Bog SSSI resulted in 14 NVC communities being recorded. These are associated with areas of mire and flush, swamp vegetation, open water, unimproved calcareous and neutral grasslands, willow woodland and scattered scrub. Since the last survey effort (Lambert, 1997), the site has been found to have changed from a drier more heavily grazed site to a wetter site with lower density grazing. The site supports some areas of species-rich M13 *Schoenus nigricans* - *Juncus subnodulosus* mire community and several rare and uncommon plant species, especially in the mire and calcareous grassland communities.

Other botanical habitats

8.5.3. A large proportion of land along the Proposed Scheme is arable fields planted with crop monocultures, with most field margins being of low botanical interest.

8.5.4. Grassland habitats are present between the River Nene and the A47, mainly lying within the northern extents of Sutton Meadows North CWS. At time of the survey, much of the area had been cut, however the remaining area was dominated by false oat-grass (*Arrhenatherum elatius)* being classified as poor semi-improved grassland. There is a small patch of high quality species-rich unimproved grassland that is likely to be affected by the Proposed Scheme.

8.5.5. Road verges along the A47 from the A1 roundabout to the petrol station are predominately species-poor semi-improved neutral grassland, with a small area of species-rich neutral grassland east of Sacrewell Farm entrance road. Road verges west of the Sacrewell Farm entrance contain calcareous grassland indicators but have become dominated by species-poor *Arrhenatherum* grassland. The application of grit to roads can often affect species diversity, as grit being spread onto verges by passing cars can reduce the number of salt intolerant species present.

8.5.6. The majority of the woodland areas in the Zone of Influence (ZoI) are mixed or broadleaved plantation woodlands with mature trees, these are self-sown, but with a high proportion of non-native species. Ground flora in much of the woodlands is limited due to a very closed canopy. There is 1 small area of mature semi-natural oak woodland, covered by a Tree Preservation Order (TPO) which would be affected by the Proposed Scheme. It is located south of the A47, to the east of the disused railway. (The disused railway and an adjacent block of broadleaved woodland to the south of the Proposed Scheme are also covered

by the TPO). This area has substantial amounts of standing and fallen deadwood, with some ground flora present.

8.5.7. The northernmost end of Sutton Disused Railway CWS, lying within the proposed route option and adjacent to this woodland area, is dominated by hawthorn and elder *Sambucas nigra* scrub with a limited ground flora and is of low botanical interest. The qualifying feature of the site, CG5 *Bromus erectus - Brachypodium pinnatum* grassland, is present further to the south and will not be impacted by the Proposed Scheme.

Arboriculture

8.5.8. The preliminary tree survey identified 50 individual trees of note and 44 groups of trees. Of those, 7 were categorised as high-quality trees, 56 as moderate quality trees, 29 as low-quality trees and 2 as unsuitable for retention.

8.5.9. The structural condition of the trees associated with the Proposed Scheme is generally good with individual trees mostly only containing minor defects.

Hedgerows

8.5.10. Two species-rich hedgerows within the ZoI are classified as 'important' under the wildlife and landscape criteria of the Hedgerows Regulations. The remaining hedgerows are species poor and not considered to be important, being largely hawthorn and blackthorn dominated. The Proposed Scheme will affect these 2 important.

Bats

Preliminary roost assessment

8.5.11. A total of 96 trees were inspected during the preliminary roost assessment and categorised above negligible potential. Of those, 36 were categorised as high potential for roosting bats, 42 of those were categorised as medium potential and 18 of those were categorised as low potential.

Tree aerial inspection

8.5.12. All trees which were analysed in the preliminary roost assessment were assessed for summer roost potential through aerial inspection. These trees were again surveyed to assess hibernation potential. Table 8-3 shows these results.

Table 8-3: Tree inspection results for summer and hibernation surveys. Trees categorised using Bat Conservation Trust good practice guidelines

Tree Categorisation	Summer – No. of trees	Hibernation – No. of trees
Negligible bat roost potential	37	29
Low bat roost potential	13	12
Moderate bat roost potential	24	36
High bat roost potential	10	11
Confirmed roost	1	1
Not surveyed	11	7

8.5.13. A confirmed roost was identified by the presence of droppings in a cavity. Whether bats have been using this cavity as a summer roost, hibernation roost or both is uncertain. The location of all bat roosts can be found in the Environmental Constraints Map in Appendix D.

Building emergence / re-entry surveys

2017 Surveys:

8.5.14. Of the 6 buildings in the study area, Old Station House was considered of high roost potential, Sutton Heath House and Deep Springs House was considered to be of moderate roost potential, the Pumping Station was considered to be of low roost potential and the Petrol Station and Public Toilets were considered of negligible potential.

8.5.15. Following the building scoping surveys, The Pumping Station, Old Station House, Sutton Heath House (and garage) and Deep Springs House (and garages) were selected for emergence and re-entry surveys. No surveys could be carried out at the Pumping Station due to existing on-site antisocial behaviour. Due to land access issues, no surveys were carried out at the Old Station House and associated buildings.

8.5.16. A building inspection was carried out at Old Station House prior to access being denied. Bat droppings were identified in 1 of the garages, confirming the presence of a roost but DNA analysis was not carried out, so the species within the roost are unknown.

8.5.17. A soprano pipistrelle roost was confirmed at Sutton Heath House, with 50 bats being the maximum count during the 3 surveys conducted. Survey results for Sutton Heath House will be detailed in the ES.

8.5.18. Surveys found no evidence of a roost at Deep Springs House.

2018 Surveys

8.5.19. Of the 4 buildings previously assigned bat potential in 2017, surveys have continued into 2018 with the Pumping Station, Station House, Heath House and Deep Spring all having had a dusk survey completed. Of these, Heath House was the only structure to have any species emerging, those being 1 common *pipistrelle* and 1 *soprano pipistrelle*. This is a large reduction of the number soprano pipistrelles recorded in 2017. It should be noted that this survey result may be anomalous if the roost was disturbed earlier in the evening, which we believe to be the case. Two more surveys are scheduled for Heath House so a more certain estimate of roost size should be attained by the end of the season.

8.5.20. Due to the evolution of the Proposed Scheme, the barn complex at Sacrewell Farm now falls within 50m of the Development Consent Order (DCO) red line boundary. Building inspections found no evidence of bats (droppings, feeding remains etc), however the complex shows to have a high potential for bats so 3 surveys have been scheduled for the season.

Activity surveys – transects

2017 Surveys:

8.5.21. Across all the transect surveys, 861 bat passes were recorded from a minimum of 5 bat species across the 4 transects which were sampled. These species include common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), noctule (*Nyctalus noctula*), Leisler's bat (*Nyctalus leisleri*) and *Myotis*.

8.5.22. The most frequently used area studied was around Stibbington Pits, with large numbers of soprano pipistrelle passes being recorded as they fed over the lakes and river. There was also a substantial number of common pipistrelles using the fields and wooded areas around Sacrewell Farm.

8.5.23. *2018 Surveys:*

8.5.24. Two transects have been undertaken in May and June, the first transects which run north of the existing A47 and the second which run south. In addition to the 5 species which were recorded during the 2017 surveys, activity surveys have also shown the presence of brown long eared bats (*Plecotus auritus*) and barbastelle bats (*Barbastella barbastellus*). Surveyors have also been able to distinguish 2 *Myotis* species, those being Natterer's Bat (*Myotis nattereri*) and Daubenton's Bat (*Myotis daubentonii*).

Dawn return tree surveys

2017 Surveys:

8.5.25. One dawn survey was carried out across 9 trees varying between medium and high potential. No bats were recorded entering these trees.

8.5.26. As surveys to date have focused largely on activity surveys (transects and static monitoring), there was a need to conduct a substantial number of emergence and re-entry surveys for trees with potential roost features to identify all roosts in the study area.

2018 Surveys:

8.5.27. Approximately 120 surveys have been scheduled across 70 trees throughout the study area with roughly a third having been completed. At present, 2 additional trees have been found to hold roosting bats. The first tree is T24 located near Heath House, where surveys so far have found 1 Myotis to be using the ivy in the tree. The second is W1T9 located in the TPO woodland, bordering the A47 and the disused railway. One common pipistrelle was observed using the ivy in the tree. See Appendix D Environmental Constraints Map for roost locations.

Static monitoring

2017 Surveys:

8.5.28. During the static monitoring, 29,185 passes were recorded across the 8 static bat detectors deployed. At least 5 bat species were recorded which included soprano pipistrelle, common pipistrelle, noctule, Leisler's and Myotis species.

8.5.29. As with the transect surveys, the static monitoring suggests that the Stibbington Pits and Sacrewell Farm areas are the most species rich areas and more likely used by greater quantities of bats. There was also a relatively high quantity of passes recorded on the border of the woodland north of the A47, encompassing the disused railway. This supports the likelihood that the disused railway is being used as flight route / corridor.

2018 Surveys:

8.5.30. Static monitoring is on-going with results being concluded at the end of the season; limited analysis of recordings has taken place at this stage.

Badger

8.5.31. Six badger setts, of varying degrees of activity, were identified during Stage 2 surveys. These included main setts, outliers and annex setts, and disused setts.

8.5.32. During the 2018 surveys, 2 of the above setts remain in the study area; 1 additional potential sett has also been identified, giving a total of 3 within the Stage 3 survey area. Of these 3 setts, just 1 is currently active.

Birds

Breeding birds

8.5.33. In 2017, a total of 45 bird species were recorded across 2 transects. These included 5 Birds of Conservation Concern (BoCC) Red listed species, and 12 Amber BoCC listed species. 7 of these species recorded are listed as priority species under the Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006, and 1 species is listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

8.5.34. Of the 5 red listed species recorded during the survey, numbers were relatively low. Skylark (*Alauda arvensis*) were recorded on both transects with numbers concentrated in the north. Yellowhammer (*Emberiza citronella*) numbers were low throughout the study area. No breeding evidence was recorded for linnet (*Carduelis cannabina*) or house sparrow (*Passer domesticus*) and records for both species were limited to individuals flying over the Proposed Scheme or birds seen in hedgerows.

8.5.35. Red kite (Milvus milvus) was the only Schedule 1 bird recorded and is common in the area.

8.5.36. Breeding bird surveys for 2018 are currently ongoing. Survey results are similar to those of 2017, in terms of species identified, distribution, densities etc, although full analysis has yet to take place.

Autumn passage birds

8.5.37. A total of 15 notable bird species that are considered under the BoCC (Eaton et al, 2015), Schedule 1 Birds of the Wildlife & Countryside Act (1981) and the Natural Environment & Rural Communities (NERC) Act species lists were recorded during the survey effort.

8.5.38. These include 1 species listed under Schedule 1, 6 species protected under the NERC act, 6 species which are listed on the BoCC (2009) Red List, 8 species which are listed on the BoCC (2009) Amber List and 7 UK Biodiversity Action Plan (BAP) species.

8.5.39. The 6 BoCC (2009) Red List species recorded during the autumn passage are as follows; linnet, skylark, yellowhammer, song thrush (*Turdus philomelos*), starling (*Sturnus vulgaris*), herring gull (*Larus argentatus*) and house sparrow. All

were recorded in flight over arable fields, with the exception of linnet and yellowhammer, which were feeding within arable fields.

8.5.40. As with the breeding bird surveys, red kite was the only Schedule 1 species recorded during the survey.

Overwintering birds

8.5.41. A total of 62 species were recorded during the overwintering bird surveys. Of these, there were 5 species which are designated under Schedule 1 of the Wildlife and Countryside Act (1981), 12 species which are designated under the NERC act, 12 BoCC (2009) red listed species, 15 BoCC (2009) amber listed species and 35 BoCC (2009) green listed species.

Reptiles

8.5.42. In 2017, reptile surveys identified 1 adult male common lizard (Zootoca vivipara) on Sutton Meadows CWS, 20m east of the fuelling station.

8.5.43. In 2018, surveys were repeated showing relatively similar results. Across the 7 surveys, 6 common lizards were identified in total, 1 being found approximately 20m east of the pumping station and the remaining being found in a similar location north of the existing A47. Results suggest a small localised population of common lizards in the area.

Water vole and Otter

8.5.44. Surveys identified suitable habitat for water voles along the River Nene but neither Stage 2 or Stage 3 surveys found any field signs. Water voles are therefore presumed to be absent from within the ZoI.

8.5.45. A number of otter field signs have been found during Stage 2 and Stage 3 surveys along the River Nene and within the Wittering Brook which runs into the Nene, including feeding remains and multiple occurrences of spraint. Stage 3 surveys suggest that otters infrequently use of the watercourse which passes underneath the existing A47.

8.5.46. 2018 surveys have confirmed the continued use of Wittering Brook by otters with spraint and footprints found along the watercourse on either side of the existing A47.

Fungi

8.5.47. The 2017 survey consisted of a walked transect adjacent to the A47 and within the land-take of the proposed works. Survey effort was increased (e.g. increased

ground coverage) in areas where species were considered more cryptic (i.e. woodland). The fungi survey identified a total of 11 species, all of which are considered common UK species. Of these species, 3 were recorded growing in woodland, 1 within an arable field, 4 beneath hedgerows and 2 within an area of improved grassland near Sacrewell Farm.

8.5.48. No surveys have taken place during 2018.

Invertebrates

Terrestrial

8.5.49. During the 2017 surveys a total of 81 species were collected and identified. Of these, 9 were of conservation concern, 2 species were designated as Near Threatened (NT), 2 species were listed on schedule 41 of the NERC Act, 2 species as designated as Nationally Notable and 5 species were assessed as having a restricted range nationally and therefore are potentially of local importance.

Aquatic

8.5.50. The 2017 aquatic invertebrate survey undertaken along the River Nene identified at least 64 taxa of aquatic invertebrates; of which, 49 were identified to species. The overall species richness of aquatic invertebrates varied from a minimum of 9 taxa to a maximum of 23 taxa in a sample. Areas of high overall species richness were predominantly found at the eastern end of the survey area, corresponding with a generally improved water quality. Sample sites with lower diversity and reduced water quality were observed at the western end of the survey area. One RDB3-listed species and 1 Regionally Notable species were found in total during the survey.

8.5.51. Samples from 2018 aquatic invertebrate surveys along the River Nene and Wittering Brook are currently undergoing laboratory analysis.

Invasive species

8.5.52. Two stands of Himalayan balsam (*Impatiens glandulifera*) were identified along 2 watercourses within the Proposed Scheme boundary. 1 stand north of the A47 is unlikely to be affected by the Proposed Scheme, but the stand south of the A47 is likely to be affected. This stand is located next to the Wittering Brook.

White-clawed crayfish

8.5.53. All areas of suitable habitat were assessed in Stage 2 and Stage 3 surveys but no white-clawed crayfish were identified. A detailed habitat assessment

generally found the water courses within the Proposed Scheme area to be suboptimal due to largely silty beds.

Valuation of ecological receptors

8.5.54. A summary of the valuation of ecological receptors relevant to the Proposed Scheme is provided in Table 8-4.

Table 8-4:Summary of valuation of ecological receptors

Ecological receptor	Valuation
Nene Washes SPA and Ramsar	Very High
Sutton Heath and Bog SSSI, Wansford Pasture SSSI, Old Sulehay Forest SSSI, West Abbot's and Lound Woods SSSI and Castor Hanglands SSSI	High
Sutton Disused Railway CWS, River Nene CWS, Sutton Meadows CWS, A47 / A1 Interchange Road Verges CWS, Stibbington Pits CWS, Heil Corner and Top Field Spinney CWS	Medium
Natural Environment and Rural Communities Act 2006 Section 41 Habitats of Principal Importance – Floodplain grazing marsh, good quality semi-improved grassland, lowland calcareous grassland, lowland meadows, lowland fens, ancient woodland, deciduous woodland, important hedgerows within 2 kilometres of Proposed Scheme Boundary.	Medium
Important Hedgerows	Medium
Introduced shrub - within and adjacent to Proposed Scheme Boundary	Low
Ephemeral/short perennial - within and adjacent to Proposed Scheme Boundary.	Low
Scrub - within and adjacent to Proposed Scheme Boundary.	Low
Scattered trees – within and adjacent to Proposed Scheme Boundary.	Low
Grasslands (improved, marshy) – within and adjacent Proposed Scheme Boundary.	Low
Tall ruderal – within and adjacent to Proposed Scheme Boundary.	Low
Running water - within and adjacent to Proposed Scheme Boundary.	Low
Hedgerows - sp. poor within and adjacent to Proposed Scheme Boundary.	Low
Plantation woodland – broadleaved, coniferous, within and adjacent to Proposed Scheme Boundary.	Low
Bats (and their roosts) (all species) – within and adjacent to Proposed Scheme Boundary.	High
Birds (Schedule 1 species, Species of Conservation Concern, RSPB Red/Amber List List) – within and adjacent to Proposed Scheme Boundary.	High/Medium
Birds (other species) – within and adjacent to Proposed Scheme Boundary.	Low
Badgers (and their setts) – within and adjacent to Proposed Scheme Boundary.	High
Otters (and their holts, couches, laying up sites etc)- within and adjacent to Proposed Scheme Boundary.	High
Aquatic Invertebrate species of conservation concern, near threatened, nationally notable etc - within and adjacent to Proposed Scheme Boundary.	High
Aquatic invertebrates (other species) - within and adjacent to Proposed Scheme Boundary.	Low

Ecological receptor	Valuation
Nene Washes SPA and Ramsar	Very High
Terrestrial invertebrate species of conservation concern, near threatened, nationally notable etc - within and adjacent to DCO Site Boundary.	High
Terrestrial invertebrates (other species) - within and adjacent to Proposed Scheme Boundary.	Low
Reptiles - within and adjacent Proposed Scheme Boundary.	Medium
Fungi - within and adjacent to Proposed Scheme Boundary.	Local

8.6. Consultation

8.6.1. A Scoping Report was submitted in February 2018, the outcome of which will guide the development of the methodology and focus of the assessment to be reported in the ES.

8.6.2. Consultation has also taken place with the site officer responsible for Stibbington Pits. Stibbington Pits are owned by The Wildlife Trust of Bedfordshire, Cambridgeshire and Northamptonshire.

8.6.3. Detailed consultations have yet to be undertaken with various statutory bodies including Natural England, Environment Agency, Norfolk Council, Norfolk Wildlife Trust and the RSPB. These organisations will need to be consulted fully during the environmental impact assessment and their responses will be included in the associated reporting.

8.6.4. Consultation with the following groups would also need to be updated prior to works to fully develop robust mitigation measures:

- Cambridgeshire Biodiversity Information Service (NBIS)
- Cambridgeshire local bat recorder
- Cambridgeshire local badger recorder
- Cambridgeshire Amphibian and Reptile Group
- Local Mammal Group
- RSPB Norfolk Local Group
- Bird Trust for Ornithology
- Cambridgeshire Ornithologists Association
- Raptor Trust
- Cambridgeshire Biodiversity Partnership
- Cambridgeshire Amateur Entomologists society
- Cambridgeshire Moths
- Cambridgeshire Flora Group
- Cambridgeshire County Council
- The Barn Owl Trust

8.6.5. Consultation will be undertaken with Natural England to discuss the findings of the Habitats Regulations Assessment Screening report that is to be updated in 2018. This consultation would discuss the impact to ecological receptors included in the Biodiversity Chapter of the ES.

8.7. Design interventions

8.7.1. Recommendations have been made to guide the design process to avoid the loss of biodiversity wherever possible. As the process is still undergoing, it is anticipated that additional design interventions may be added or current design interventions reviewed, during the completion of the survey and design work. This will be reported in the ES.

8.7.2. The design and construction of the proposed bridge over the disused railway will be at a height that will allow mammals, birds and reptiles etc. to safely pass underneath the A47 unharmed. It is important that the dimensions of the bridge are of a sufficient size so that no bat species using the disused railway are deterred from using the new structure. If this was to happen, it could force individuals previously passing under the existing A47 to fly over it, causing mortalities which could be detrimental to local populations.

8.7.3. There is evidence that suggests that the existing culvert is being used by otters and other mammals. Impacts here should be minimised by keeping the water course alignment as close to the previous watercourse route as possible. Mammal ledges should be incorporated into the culvert design.

8.7.4. The route alignment has been chosen to allow a considerable buffer between the new alignment and Sutton Heath and Bog SSSI. This will avoid direct impacts due to land-take and habitat loss, fragmentation etc, and should help to minimise adverse impacts due to pollution and any potential changes to drainage on the site, as such changes would be detrimental to the important assemblages of plant species on site.

8.7.5. The design of the garage slip road will be positioned / aligned to avoid any impact on the bat tree roost located next to the existing A47. This will also minimise impacts on the existing badger sett in this area.

8.7.6. Earthwork slopes will be kept as tight as possible, given the slope stability properties of the earthworks, where the new road would come closest to the river. This will help to preserve the riparian habitat of the River Nene by minimising the Proposed Scheme's footprint in the area.

8.8. Potential mitigation measures

Habitat creation

8.8.1. Landscaping will take place along the length of the Proposed Scheme. This will be designed as habitat creation to mitigate for those habitats lost to the Proposed Scheme, particularly the A47 / A1 Interchange Road Verges North County Wildlife Site (CWS), the Sutton Meadows North CWS, the Sutton Disused Railway CWS. Habitat replacement may be required for all CWS sites that the Proposed Scheme impact.

8.8.2. Newly created habitats will use native species, mimicking those semi-natural habitats already within the ZoI. They are likely to consist of a mosaic of grassland, scrub, woodland, hedgerows and ponds (drainage lagoons).

Bats

8.8.3. Bat mitigation may be required to support a European Protected Species (EPS) Licence if any roosts are to be disturbed or removed. Other mitigation proposed within the ES may include bat boxes, bat bricks and the creation or improvement of foraging areas and flight corridors. Where bat flight routes are affected, planting will include a proportion of more established trees (2 to 4 metres in height) among the whips that are likely to make up the majority of the landscaping, this will provide a physical structure along which the bats can echo-locate.

Birds

8.8.4. To avoid impacts on breeding birds, habitat clearance should take place over winter, as far as is possible. Any habitat that needs to be cleared outside of the winter season should be subject to a watching brief by a suitably qualified ecologist.

8.8.5. If nesting birds are found, then habitat clearance will be paused, and a suitable exclusion zone established, the size of which will depend on the species and the specific location and circumstance.

8.8.6. Important habitats for both breeding and overwintering birds highlighted in the bird reports should be retained where possible. Mitigation may include the replacement of woodland, hedgerows etc. taken by the Proposed Scheme.

Badgers

8.8.7. Dependent upon the findings of 2018 badger surveys and the design, a maximum of 2 badger setts may have to be translocated due to the Proposed

Scheme. If this is needed, care will be taken so that setts are moved to an ecologically appropriate location.

8.8.8. Badger fencing will be erected along the southern edge of the Proposed Scheme where the road would border Sutton Meadows CWS. The Stage 3 badger survey reported dead badgers on the highway, fencing would deter further badgers crossing.

Otters

8.8.9. The installation of mammal ledges on the culverts in the Proposed Scheme is important as otters have been reported using the stream. The restoration and improvements of any habitats lost to the Proposed Scheme may be needed. This could include the construction of artificial holts. Pollution prevention and sediment control will be essential and no night working will be undertaken in sensitive areas.

Other

8.8.10. A comprehensive Construction Environmental Management Plan (CEMP) would be in place before any works began. The CEMP would include all best practice environmental mitigation measures required during construction. It will also include sediment drift fencing along all appropriate site boundaries to avoid sediment run-off during construction.

8.8.11. As the design process is still undergoing and ecological surveys are not yet complete, it is anticipated that additional mitigation measures may be added or current mitigation measures reviewed. A complete list of mitigation measures will be reported in the ES.

8.9. Potential impacts

Construction

8.9.1. During the construction phase, the following impacts are likely to be felt:

- Temporary and permanent loss of habitats
- Disturbance to habitats
- Potential for disturbance to badgers, including impacts on an existing sett, and loss of foraging habitat
- Potential for disturbance to otters, due to the alteration to the existing Wittering Brook culvert
- Disturbance or destruction of bat roosts
- Loss of bat foraging habitat with loss of arable land / light disturbance

- Disturbance of farmland birds and their habitat
- Loss of habitat causing fragmentation and loss of connectivity for some species e.g. bats, birds, badgers, otters etc
- Change in hydrology
- Potential for increased traffic collision mortality for mammals and birds due to the widening of the road

8.9.2. No direct impacts are anticipated on any statutory designated sites. Careful management of construction dust, including effective dust suppression, use of low-dust equipment and methods, monitoring of ongoing weather conditions, wind direction etc will ensure that there will be no impacts on the Sutton Heath and Bog SSSI, a site of high ecological value.

8.9.3. Similarly, the Nene Washes SPA and Ramsar will be protected from impacts by the careful management of the Proposed Scheme construction. Careful site layout, including features like haul roads and site compounds, the use of silt fencing, strict pollution control processes and a thorough site environmental audit process will ensure that there are no impacts on this site, of very high ecological value.

8.9.4. Land-take is anticipated upon A47 / A1 Interchange Road Verges CWS, Sutton Meadows CWS and Sutton Disused Railway CWS. This will result in the loss of various habitats including an area of high quality unimproved grassland, semi-improved neutral grassland and woodland dominated by hawthorn and elder. These sites are of medium biodiversity value.

8.9.5. The works for the Proposed Scheme would result in the permanent loss of an area of semi-natural oak woodland (protected by Tree Preservation Order) of medium biodiversity importance, mixed and broadleaved plantation woodlands of low biodiversity importance, various grasslands of low and medium importance and arable land of low importance.

8.9.6. The Proposed Scheme will impact on 2 important hedgerows at the south-western section of the Proposed Scheme, as the northernmost ends of each would be removed.

8.9.7. The Proposed Scheme is likely to impact on a known bat foraging / commuting route, along the disused railway. The habitat clearance and construction of the Proposed Scheme will result in the potential severance of this route during construction. The proposed overbridge will be of sufficient height to allow bats to fly underneath, allowing the severance / fragmentation to be mitigated, once the bats become habituated to the new feature in the landscape. All bats are of a high biodiversity value.

8.9.8. The Proposed Scheme may result in the removal or disturbance of a bat tree roost located east of the fuelling station, and in the north-western corner of the TPO woodland. Before any action is taken the appropriate EPS mitigation licence will need to be in place.

8.9.9. It should also be noted that there are a substantial number of trees which will be affected by the Proposed Scheme with either high or medium potential for bat roost suitability, for which surveys are ongoing. EPS mitigation licences will need to be obtained before the disturbance of any roosts if discovered in the future.

8.9.10. The Proposed Scheme is likely to impact on a number of bird species, due to loss of feeding habitat, shelter and breeding locations. These impacts should be limited, due to the disturbance that the existing road already has on these species.

8.9.11. Habitat clearance for the Proposed Scheme is also likely to impact on bird species moving north / south in the survey area. Although bird species will be habituated to the existing road, the Proposed Scheme will be wider than the existing road, so the number of individuals and number of species impacted by this increased fragmentation is likely to increase.

8.9.12. The relocation of at least 1 badger set is likely to be required under the Proposed Scheme. Appropriate mitigation in the form of a new sett and the correct licence will need to be obtained before any setts are disturbed. Badgers are of a medium biodiversity importance.

8.9.13. The alteration of the culvert under the A47, and the general loss of connectivity due to habitat clearance, are likely to result in short term impacts on otters locally, by temporarily severing this known commuting route.

Operation

8.9.14. During the operational phase, many of the impacts experienced during the construction phase will remain, and a number of new impacts will be felt due to increased traffic volumes:

- Continued disturbance to habitats and species, due to traffic noise and vibration
- Continued, but lessening fragmentation and loss of connectivity for some species e.g. bats, birds, badgers, otters etc
- Potential for direct mortality of bats, birds, badgers, otters etc

8.9.15. The habitat creation included as part of the Proposed Scheme will be of limited biodiversity value in the opening year. The value of the habitats will increase as they become established. Grassland habitats will become fully established at a

faster rate than woodlands so will provide greater value at a faster rate. The severance of habitats and commuting routes for species, as described in the construction phase, will remain at the opening year, however as habitats become more established, these impacts will lessen.

8.9.16. It is predicted that the impact on bats using the disused railway will lessen during operation, as the bats become habituated to the new underpass. Similarly, impacts on otters using the Wittering Brook will lessen as otters become more familiar and comfortable with the new culvert and the associated watercourse and landscaping.

8.9.17. Vehicle collision mortality should decrease as roadside habitats (hedges, tree-lines etc) become established and grow taller, as they will have the effect of ensuring that birds and bats fly higher across the road than when they are lower in height.

8.10. Chapter summary

8.10.1. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated impacts upon ecological receptors. There are valuable habitats and species present of nature conservation importance which could be impacted by the Proposed Scheme. The environmental constraints for the Proposed Scheme can be found in Appendix D. The on-going ecological surveys will help identify mitigation measures to reduce the magnitude of impacts through sensitive design and construction methodologies, with a view to safeguard the conservation status of populations through both the construction and operational phases.

8.10.2. Mitigation in the form of pollution prevention, Ecological Clerk of Works (ECoW) presence during vegetation clearance and habitats created for multiple benefits is recommended to reduce such impacts once the Proposed Scheme becomes operational. Specific mitigation measures for protected species will be finalised within the Biodiversity Chapter of the ES following the proposed protected species surveys.

8.10.3. A number of measures have been recommended initially to guide the design process and identify mitigation requirements. However, these measures are not an exhaustive list and are likely to require a review and additional measures following completion of the survey and design work.

9. Geology & soils

9.1. Introduction

9.1.1. This chapter presents the preliminary findings of the geology and soils assessment. This comprises a review of the existing environment and identification of potential impacts of the Proposed Scheme upon surrounding land. The chapter also outlines proposed design measures to help mitigate these potential impacts and relevant consultation.

9.2. Guidance and best practice

9.2.1. The main legislative framework regarding geology and soils (including contaminated land, agricultural viability, farm severance and soils as a national resource) includes the following legislation, guidance and best practice:

- The Contaminated Land (England) (Amendment) Regulations 2012
- The Environmental Damage (Prevention and Remediation) (England) Regulations 2015
- The Environmental Permitting (England and Wales) Regulations 2016
- The Environmental Permitting (England and Wales) (Amendment) Regulations 2018
- The Environmental Protection Act 1990 (as amended by the Environment Act 1995)
- The Water Resources Act 1991 (England and Wales) (Amendment) Regulations 2009
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Design Manual for Roads and Bridges (DMRB) Volume 11 Section 2 Part 5 Assessment and Management of Environmental Effects, Chapter 2 (Highways Agency, 2008)
- Code of Practice for the Sustainable Use of Soils on Construction Sites, Defra 2009
- Contaminated Land Risk Assessment – A Guide to Good Practice C552 (CIRIA, 2001)
- CLR 11: Model procedures for the management of land contamination. Environment Agency / Defra, 2004
- Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. Environment Agency, 2001
- DMRB Volume 11, Section 3, Part 6 (Land Use) (DMRB 2001)

9.2.2. The sensitivity of geology and soils has been based on Table 2.1 of DMRB Volume 11 Section 2 Part 5 Assessment and Management of Environmental Effects, Chapter 2 - HA 205/08 (Highways Agency, 2008) in conjunction with professional judgement.

9.2.3. The assessment of geo-environmental risks follows the Environment Agency / Department for Environment, Food and Rural Activities (Defra) methodology.

9.3. Study area

9.3.1. The following study areas were used for the Proposed Scheme, based on professional judgement and the distance over which potential impacts could occur in relation to geology and ground conditions:

- 2 kilometres buffer either side of the proposed road alignment was used to identify any designated sites of geological interest
- 300m buffer either side of the proposed road alignment was used to identify bedrock, superficial deposits and soils types, and to identify any potentially contaminated land in the vicinity

9.3.2. Design Manual for Roads and Bridges (DMRB) guidance does not provide a set definition of the study area for assessing the impacts on Agriculture and Farm Viability. Therefore, the study area has been based on professional judgement and includes all farms, farm access routes, important agricultural infrastructure and agricultural land that have the potential to be impacted by the Proposed Scheme.

9.4. Assumptions and limitations

9.4.1. With regards to land quality and contaminated land, it should be noted that there are uncertainties and data limitations concerning geochemical makeup, and the characteristics of surface water and groundwater etc.

9.5. Baseline

Determining baseline conditions

9.5.1. A desktop review of available geological, soils, historical Ordnance Survey and agricultural maps along with previously published reports and ground investigations were reviewed along with previous site walkover information. This includes evaluation of information from Highways Agency Geotechnical Data Management System (HADGMS) and an Envirocheck desk study report (Landmark Information group, 2017).

9.5.2. A site walkover survey was undertaken on Wednesday 7th February 2018 to determine the accuracy of desk study information, and also to identify any sites worthy of further investigation.

9.5.3. Statutory and non-statutory bodies have been consulted to obtain available information.

Designated sites

9.5.4. There are no designated sites, for example Sites of Special Scientific Interest or Geological Conservation Review Sites, within the study area that are designated for their geological or geomorphological importance.

Artificial ground

9.5.5. The term Artificial Ground describes variously:

- Made ground – land or ground created by filling in a low area with waste or natural fill material also known as infilled ground
- worked ground (areas where the ground has been cut away – quarries, road cuttings, sand and gravel pits), infilled and disturbed ground.

9.5.6. Artificial ground can be unsuitable for building without modification and requires testing for properties. Artificial ground is likely to exist in the vicinity of the old railway around Ch1325 - Ch1375. The composition of the material is likely to be a variable and feature old railway sidings, ash and granular and cohesive materials with poor engineering properties. There will also be made ground presents at the points where the Proposed Scheme intersects with the existing A47.

Superficial deposits

9.5.7. The anticipated superficial geology underlying the Proposed Scheme is River Terrace Deposits likely to consist of slight silty fine to medium sand over fine to medium sands and sub-round gravels and Alluvium, likely to consist of very clayey sands. Head deposits are noted near the planned free-flow slip road, running east-west across the planned route, in the base of an un-named valley. These are expected to comprise of clay, silt, sand and gravel with occasional peat inclusions (British Geological Society (BGS), 2017).

Bedrock geology

9.5.8. The bedrock of the local area is generally flat lying with a shallow dip towards the south-east. The units present are recorded as Rutland Formation, Upper and Lower Lincolnshire Limestone, Grantham formation and Whitby Mudstone

Formation. The underlying units are generally seen only in the valleys of the primary watercourses.

Soil conditions

9.5.9. The European Soils Bureau (UK Soil Observatory, 2017) indicates that the soils comprise of Shallow lime-rich soils over chalk or limestone (associated with bedrock exposure). Freely draining slightly acidic but base-rich soils (associated with the River Terrace Deposits). Loamy and clayey floodplain soils with naturally high groundwater (associated with Alluvium deposits). The Cranfield Soil and Agrifood Institute (2017) online map indicates the soils in the study area to be grade 2, grade 3 and grade 4.

Mineral resource

9.5.10. There are no active mines or quarries within the study area. A review of historical maps has shown the presence of disused sand pits and gravel quarries (BGS, 2017).

Agricultural viability

9.5.11. Land use within the study area to the north and south of the A47 is predominantly agricultural and much of this is used for arable production. Smaller, parcels of land are believed to be used as permanent pasture, parkland and woodland which indicate little agricultural viability.

9.5.12. The quality of the agricultural land is yet to be determined as no detailed Agricultural Land Classification (ALC) surveys have been undertaken to date. There have been 2 ALC investigations into sites surrounding the Proposed Scheme which can be used as a proxy to inform the baseline assessment. The ALC of the agricultural land may have changed since these surveys were undertaken, however it is possible to correlate any information with Natural England's 1:250,000 ALC map for the eastern region.

9.5.13. The reports and maps of these surveys have been published by Natural England and results outlined below:

- Castor, situated 740m east of Nene Way Roundabout, a total area of 101.33ha of agricultural land was surveyed with grade 2 agricultural land, grade 3a agricultural land, grade 3b agricultural land and non-agricultural land concluded to be at the site (Natural England, 2016a).
- Wansford (March, 1997), situated 1,140m west of the Wansford junction off the A1, a total area of 65.5ha of land was surveyed with grade 3a agricultural

land, grade 3b agricultural land and grade 4 agricultural land and non-agricultural land concluded to be at the site (Natural England, 2016b).

9.5.14. These investigation indicate that the baseline land classifications within the study area are likely to be Grades 2, 3a and 3b. Natural England's (2010) 1:250,000 ALC map for the eastern region indicates grade 2 land in the area, therefore confirming the observations outlined above.

9.5.15. Grades 2 and 3a agricultural land is classified as 'best and most versatile' (BMV) land by Department for environment, farming and rural activities (Defra) standards and is considered a national resource. The exact area of land-take for each grade is yet to be determined, however, there is potential for loss of over 20ha of BMV land.

Farm severance

9.5.16. Privately owned parcels of agricultural land (small fields to large multi-field farm estates) are located within the study area. Access tracks to these fields are also present, and are predominately located off side roads. The identification of these features indicates that there is the potential for major impacts from the Proposed Scheme, should access routes be severed or the viability of farm holdings reduced.

Contamination and contaminated land

9.5.17. The assessment of contaminated land-takes account of the 'source-pathway receptor' (S-P-R) approach which seeks to establish the potential for a link between a source of contamination and a receptor which may constitute a risk.

Potential contamination sources

9.5.18. Potential contamination sources, pathways and receptors (S-P-R linkages) are listed in Table 9-1 below.

Table 9-1: Summary of the potential S-P-R linkages within the study area

Source	Receptor	Pathway	Comments
On-site S1: Agricultural Land – potentially pesticides, fertilisers and slurry applied to the land within the Proposed Scheme Boundary. S2: Agricultural Land – potential fuel spillages from agricultural machinery.	R1: Groundwater	P1: Horizontal and vertical migration of leachate through potentially permeable soils and geological formations.	Principal and Secondary aquifers underlie the route. The risk to groundwater is considered to be MODERATE / LOW.
	R2: Surface water bodies	P1: Horizontal and vertical migration of leachate through potentially permeable soils and geological formations.	There are multiple surface water features, ponds, watercourses on and in proximity to the Proposed Scheme. Due to the distance of potential receptors the risk to surface water is considered MODERATE.

Source	Receptor	Pathway	Comments
S3: Existing A47 – vehicle fuels, oils, brake fluid. S4: The disused railway line – potential hydrocarbons and heavy metals. S5: The potential made ground within carriageway foundations – potential contamination. Off-site S6: The fuel station approximately Ch.600 – potential hydrocarbons, airborne particulates and possibility of future spillage S7: Potential made ground in the foundations of existing buildings – potential contamination. S8: The Wansford Pumping Station and associated tunnels located at approximate Ch.400, potential chemicals associated with water purification and made ground. S9: Traffic using the A1 west of the Proposed Scheme – potential hydrocarbons and airborne particulates S10: The disused railway line – potential hydrocarbons. S11: The Electricity substation and mast – potential heavy metals and PCB's. S12: Historical sand and gravel pits. S13: A sewage pumping station west of the A1 at Ch.100.	R3: Subsurface structures	P1: Horizontal and vertical migration of leachate through potentially permeable soils and geological formations. P2: Migration of contaminants along engineered preferential pathways, e.g. underground services, pipes, tunnels and drainage pathways both surface and culverted. P6: Vertical and lateral migration of volatile vapours and ground gases.	Risk to buried concrete is considered to be LOW.
	R4: Flora and fauna	P1: Horizontal and vertical migration of leachate through potentially permeable soils and geological formations. P2: Migration of contaminants along engineered preferential pathways, e.g. Underground services, pipes, tunnels and drainage pathways both surface and culverted. P3: Surface run-off along roads, pavements, cutting faces etc. P4: Root uptake. P5: Human uptake pathways. P6: Vertical and lateral migration of volatile vapours and ground gases.	The risk to flora and fauna is considered to be LOW.
	R5: Construction and maintenance workers	P5: Human uptake pathways. P6: Vertical and lateral migration of volatile vapours and ground gases.	It is standard practice for all members of the construction and maintenance teams to wear suitable Personal Protective Equipment (PPE). The risk is considered to be LOW.
	R6: Road users	P5: Human uptake pathways. P6: Vertical and lateral migration of volatile vapours and ground gases.	Following development, end users are unlikely to come into contact with the soils at site. The risks to the road users is considered to be VERY LOW.

9.5.19. Soil and groundwater sampling and chemical analysis would be completed as part of the proposed ground investigation. The results would be assessed in line with good practice guidance to produce a revised conceptual site model. The initial S-P-R linkages would be updated based on the data obtained, and a remediation options appraisal are then completed if appropriate. This identifies the requirement for any remediation / mitigation works to mitigate any potential risks identified by the process.

9.6. Consultation

9.6.1. The proposed works are not considered to warrant specific consultation in respect of land quality issues i.e. potential sterilisation of mineral reserves and contaminated land risks. The former is unlikely to be a material consideration owing to the depth of rockhead, and the alignment does not impinge upon significant expanses of surface sand and gravel deposits. The latter will be addressed as part of routine investigation and assessment procedures which do not require a specific permit.

9.6.2. Confidential questionnaires would be issued to landowners and tenant farmers in relation to their agricultural land and farm status. Discussion with the local Planning and Economic Development Officers and key stakeholders (landowners and property agents) will also take place. Natural England will be consulted with regard to potential loss of soils.

9.7. Design interventions

9.7.1. A design intervention is a recommended mitigation from the environment team that will be imbedded into the design.

9.7.2. No design interventions are proposed at this stage of the design pending review based on the ground investigation data. The outcomes of which would be reported in the ES.

9.7.3. The most applicable mitigation for Agricultural Viability, and Farm Severance is through effective design.

9.7.4. The first principle of the Proposed Scheme is to ensure that the footprint of the Proposed Scheme is reduced as much as practicable, without adversely affecting the design. This minimises the total area of agricultural land affected. It also minimises the number of incidents of farm access and irrigation severance.

9.8. Potential mitigation measures

9.8.1. The construction phase would be carried out in accordance with a Construction Environmental Management Plan (CEMP).

9.8.2. The CEMP also would contain a Materials Management Plan / Soil Resource Plan which would outline areas of soil to be protected from earthworks and construction activities; the areas and types of topsoil and subsoil to be stripped, haul routes, stockpile locations; the methods for stripping, stockpiling, respreading and ameliorating landscape soils, and a cut and fill balance to ensure as much material as possible is re-used within the Proposed Scheme. An earthworks specification would also be produced, which would provide

geotechnical and chemical acceptability criteria to which site-won and imported materials should comply before being used during construction.

9.8.3. Dust from construction activities would be suppressed using best practice methods such as the use of netting, dust dampening, wheel washing facilities and road sweeping vehicles to prevent the spread of potentially contaminated windblown material.

9.8.4. Mobilisation of contaminants, either from existing sources or from spillages during works, would be mitigated by the implementation of best practice measures set out in the CEMP. Hazardous substances such as any excavated contaminated land, fuels, chemicals, waste and construction materials would be stored, handled, transported and disposed of in accordance with the CEMP. This should also outline emergency procedures to respond to potential accidental spillages and leaks. To mitigate short-term (acute) risks appropriate construction methods would be adopted to minimise exposure to potentially harmful substances, and suitable Personal Protective Equipment employed.

9.8.5. Where open excavations are anticipated in any areas of potential contaminated ground, excavations should be lined in order to inhibit water percolation and subsequent leachate generation. Where piling or penetrative ground improvement is required through potentially contaminated ground, the works should be carried out in accordance with published Environment Agency guidance, and a foundation works risk assessment may need to be undertaken.

9.8.6. Clean drilling methods are specified for drilling boreholes which form part of the ground investigation in consideration of the of the aquifers beneath the Proposed Scheme.

9.8.7. Drainage measures would be put in place to prevent runoff into surface waters during any investigative ground works.

9.9. Potential impacts

Construction

9.9.1. There would be a loss of grade 2 and grade 3 agricultural land associated with the road construction. There may also be deterioration and compaction of adjacent existing soil resource, due to storage and handling or due to vehicle movements during construction and loading in proximity to the new road construction.

9.9.2. The Proposed Scheme may result in impacts on farm businesses during construction, due to potential severance, loss of access and disruption to drainage and irrigation, together with impacts resulting from the reduction in farm

size and / or manageability and / or income because of temporary land-take or severance.

9.9.3. Other impacts arising from construction will be managed through the CEMP.

Operation

9.9.4. In general, geology and soils impacts from road schemes primarily tend to be limited to the construction phase. The newly constructed hardstanding cover has the potential to lead to increased surface water run-off during operation. Uncontrolled run-off onto adjacent agricultural land may give rise to erosion of soil. Potential contamination may arise from fuel spills associated with use of the new road. These are not considered to represent a net change over baseline conditions.

9.9.5. The Proposed Scheme will result in permanent impacts on agricultural land including soils as a national resource as well as farming businesses because of land-take and the severance and loss of access, disruption to drainage, irrigation and impacts resulting from reductions in farm size and / or manageability and / or income because of land-take, severance or loss of buildings.

9.10. Chapter summary

9.10.1. This chapter has identified various potential impacts on geology and soil related receptors that could result from the Proposed Scheme. However, appropriate mitigation measures to limit or potentially completely remove these impacts have been outlined, and these would be refined and reported in the Environmental Statement (ES). The significance of the effects would be determined using the guidance set out in the DMRB Volume 11 Section 2 Part 5 - HA 205/08 (Assessment and Management of Environmental Effects). All identified effects would be reduced as far as is reasonably practicable in accordance with the applicable legislation.

10. Materials

10.1. Introduction

10.1.1. This chapter presents the preliminary findings of the assessment on material assets and waste. This comprises a review of the existing environment and identification of the potential impacts of the Proposed Scheme upon material assets and waste. Consultation is identified where relevant to the content and focus of the chapter. The chapter also outlines proposed design measures to help mitigate potential impacts.

10.1.2. For the purposes of the assessment, materials assets and waste are defined as comprising:

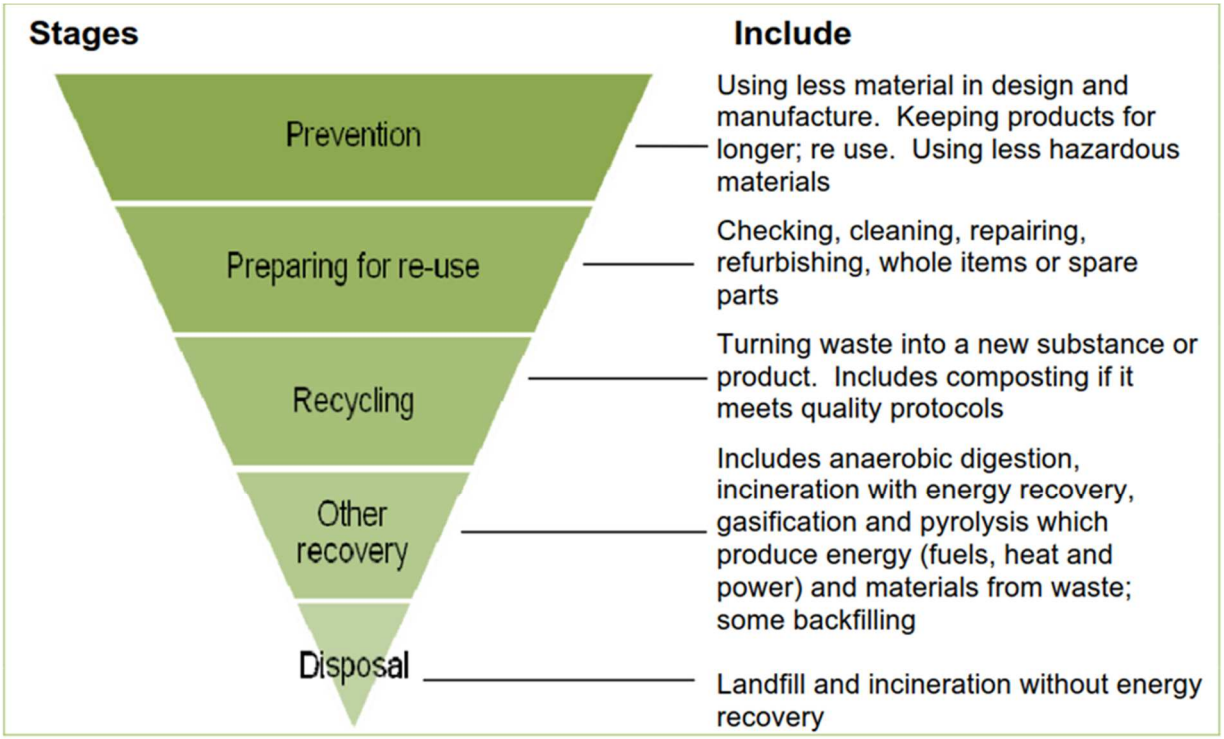
- The provision and use of material resources, including primary, secondary, recycled and manufactured materials
- The generation and management of waste

10.2. Guidance and best practice

10.2.1. The following legislation, standards and best practice guidelines are considered to be relevant to the Proposed Scheme, which regulate the management of m EU Waste Framework Directive 2008/98/EC Materials and waste:

- Waste (England and Wales) Regulations 2011, as amended.
- Environmental Protection Act 1990
- Landfill (England and Wales) Regulations 2002, as amended
- The Waste Prevention Programme for England 2013
- National Policy Statement for National Networks (NPSNN) 2014
- National Planning Policy for Waste 2014
- The Waste Management Plan for England 2013
- DMRB Volume 11 Section 2 Part 5 ‘Assessment and Management of Environmental Effects’
- Interim Advice Note (IAN) 153/11 ‘Guidance on the Environmental Assessment of Material Resources’

Figure 10-1: Waste hierarchy



10.2.2. The Waste (England and Wales) Regulations 2011, implement parts of the revised Waste Framework Directive 2008, particularly the principles of Waste Hierarchy.

10.3. Assumptions and limitations

10.3.1. Quantities of material resources required and the waste anticipated to be generated during the construction of the Proposed Scheme are not available at this stage, as the design has not yet been finalised. Therefore, only a qualitative assessment has been carried out at this stage, limited to identifying activities that are likely to require significant quantities of materials, or are likely to generate significant quantities of waste.

10.3.2. Conclusions and recommendations may be revised within the ES, based on updated information following further design detail, research, survey and investigation.

10.4. Baseline

Material resources

10.4.1. Information on the demand for key construction materials within the second study area (Cambridgeshire) has been used to provide the baseline for material resources. In addition, information for the UK has also been provided as a

national comparison. This information has been determined through a desk-study using a number of readily available resources, in particular from the Minerals Products Association, International Steel Statistics Bureau, and Cambridgeshire County Council and Peterborough City Council.

10.4.2. Table 10-1 outlines the demand, in terms of sales, of minerals and mineral products in the UK in 2015.

Table 10-1: UK sales of minerals and mineral products in 2015

Material	UK demand
Aggregates *Of which:* • *Crushed rock* • *Sand and gravel – land won* • *Sand and gravel – marine won* • *Recycled and secondary*	225 million tonnes • *104 million tonnes* • *46 million tonnes* • *12 million tonnes* • *63 million tonnes*
Cementitious (including imports) *Of which:* • *Cement (including imports)* • *Other cementitious materials (Fly ash, GCBs)*	13 million tonnes • *11 million tonnes* • *2 million tonnes*
Ready-mixed concrete	54 million tonnes
Concrete products	27 million tonnes
Asphalt	24 million tonnes
Dimension stone	1 million tonnes

Source: The Minerals Products Industry at a Glance (Minerals Products Association, 2016)

10.4.3. In regard to steel, which is another key construction material, the demand for steel in the UK in 2016 was 10.90 million tonnes (International Steel Statistics Bureau, 2017).

10.4.4. At a regional level, Table 10-2 outlines aggregate sales and reserves in Cambridgeshire and Peterborough for 2016. The Cambridgeshire and Peterborough Local Aggregate Assessment, notes that the steady and adequate supply of sand and gravel is maintained, however, the supply of limestone is reducing as only 2 sites remain. Limestone is restricted to a small area to the west of Peterborough; and no new locations for limestone extraction have been proven acceptable.

10.4.5. The Cambridgeshire and Peterborough Local Aggregate Assessment outlines that there is no direct apportionment for recycled / secondary aggregates at a regional level.

Table 10-2: Aggregate sales and reserves in Cambridgeshire and Peterborough for 2016

Aggregate	Sales (million tonnes)	Average (10 year) sales (million tonnes)	Average (3 year) sales (million tonnes)	LAA rate* (million tonnes)	Reserves (million tonnes)	Land-bank (million tonnes)
Sand and gravel	2.56	2.91	2.56	3.0	43.92	15.09
Crushed rock (limestone)	0.34	0.29	0.41	0.3	2.83	9.7
Recycled / secondary	0.5	0.6	0.5	-	-	-

Source: Cambridgeshire and Peterborough Minerals and Waste Development Plan: Local Aggregate Assessment (Cambridgeshire County Council and Peterborough City Council, 2017)

*Note: *Local Aggregate Assessment (LAA) rate is the planned level of provision in the adopted Core Strategy i.e. 3.0 / 0.3 million tonnes per year*

Generation and Management of Waste

10.4.6. The most recent information available relating to current waste generation and operational waste facilities in the county of Cambridgeshire has been gathered to provide the baseline for this assessment. As stated above, information for the UK has also been provided as a national comparison. Information on the current waste arisings, and the capacity of waste management facilities have been determined through a desk-top study, using a number of readily available resources, in particular data from the Environment Agency, Defra, Cambridgeshire County Council and Peterborough City Council.

Waste Generation

The latest data from the Environment Agency indicated that Cambridgeshire produced over 5.6 million tonnes of waste in 2016 (Table 10-3), which was managed in 6,382 permitted waste facilities (Environment Agency, 2017).

Table 10-3: Waste managed in 2016

Waste Management Method	Cambridgeshire* (tonnes)	England (tonnes)
Landfill	2,269,000	44,715,000
Transfer	947,000	46,684,000
Treatment	1,830,000	72,419,000
Metal Recycling	247,000	13,767,000
Incineration	85,000	11,639,000
Use of Waste**	0	1,628,000
Land Disposal***	294,000	12,174,000
Total	**5,672,000**	**203,026,000**

Source: Environment Agency (2017) Waste Management for England

*Notes: *Former planning sub-region*

***Use of waste includes the use in construction, in reclamation and to manufacture timber*

****Land disposal includes waste deposited in landfill for recovery / benefit and borehole and lagoon inputs*

10.4.7. With respect to construction and demolition waste, the Environment Agency recorded that 1,540,000 tonnes of inert / construction and demolition waste was deposited in landfilled in Cambridgeshire in 2016. There are no figures available showing how much construction and demolition waste was recycled or recovered in 2016. However, the ENV23 – Statistics on Waste (Defra, 2016) outlines that of the 49,000 tonnes of non-hazardous construction and demolition waste generated in England in 2014, 44,900 tonnes were recovered (which 91.4% of the total generated).

10.4.8. It was also recorded by the Environment Agency no waste was re-used in construction in Cambridgeshire. However, 252,000 tonnes were used in construction in England (Environment Agency, 2017).

10.4.9. Regarding hazardous waste, Table 10-4 below, outlines the quantities managed and deposited in Cambridgeshire and England in 2016. Of the 69,652 tonnes managed in Cambridgeshire, 11,487 tonnes were specified as construction and demolition waste and asbestos, and of the 150,944 tonnes deposited in Cambridgeshire, 106,226 tonnes were specified as construction and demolition waste and asbestos.

Table 10-4: Hazardous waste managed and deposited in 2016

Hazardous Waste	Cambridgeshire (tonnes)	England (tonnes)
Managed	69,652	4,558,077
Deposited	150,944	4,925,309

Source: Environment Agency (2017) Waste Management for England 2016

Potential hazardous waste arisings

10.4.10. Sources of contamination have been considered within the first study area (within the red line boundary of the Proposed Scheme). There are no authorised or historic landfills within the study area. However, as outlined in Chapter 9 Geology and Soils, there may also be other potential contamination risks from agricultural land use, existing highway use, a disused railway line, and made-ground. For more information on the potential contamination risks, see Chapter 9 Geology and Soils.

Waste management facilities

10.4.11. The Waste Management for England 2016 (Environment Agency, 2017) provides the most up to date (2016) information on the remaining capacity of landfill in Cambridgeshire, see Table 10-5 below.

Table 10-5: Landfill capacity in 2016 in Cambridgeshire

Landfill type	Cambridgeshire (m^3)
Hazardous Merchant	-
Hazardous Restricted	-
Non-Hazardous with SNRHW* cell	2,201,000
Non-Hazardous	9,033,000
Non-Hazardous Restricted	-
Inert	2,365,000
Total	**13,599,000**

Source: Environment Agency (2017) Waste Management for England 2016
*Notes: *Stable Non-Reactive Hazardous Waste (SNRHW)*

10.4.12. The most recent data from Cambridgeshire County Council on the capacity of their waste management facilities is from 2009 and is outlined in the Cambridgeshire and Peterborough Minerals and Waste Core Strategy Development Plan Document (Cambridgeshire County Council and Peterborough City Council, 2011). This document is currently under review and a new Minerals and Waste Local Plan will be produced.

10.4.13. Table 10-6 below outlines data from 2009 on the remaining landfill capacity within Cambridgeshire, and Table 10-7 outlines the operating capacities for recycling and recovery facilities in 2009.

Table 10-6: Remaining landfill void space within Cambridgeshire in 2009

Waste Type	Remaining void (m^3) in 2009
Inert	2,232,000
Non-hazardous	15,736,000
Hazardous	600,000

Source: Cambridgeshire and Peterborough Minerals and Waste Local Plan 2011

Table 10-7: Cambridgeshire operating capacities for recycling and recovery facilities in 2009

Type	Facility Type	Operating Capacity in 2009 (tonnes per year)
Inert	Recycling	1,129,000
Non-hazardous	Recycling	492,000
	Composting	97,000
	Treatment	27,800
Hazardous	Treatment	34,000

Source: Cambridgeshire and Peterborough Minerals and Waste Local Plan 2011

10.4.14. Despite the capacity for recycling and recovery, and taking into account future planned capacity for recycling and recovery, a shortfall in inert waste processing capacity within the plan period (until 2026) has been identified (Cambridgeshire County Council and Peterborough City Council, 2011). This is outlined in Table 10-8. It was also outlined that although the data shows a surplus of around 2 million cubic metres of void space in non-hazardous landfill in 2026 (Table 10-8), if recycling and recovery facilities do not come on stream, as soon as possible, then this may result in a shortfall of non-hazardous landfill at the end of the plan period (Cambridgeshire County Council and Peterborough City Council, 2011).

Table 10-8: Remaining / deficit landfill void space

Year	Inert (m^3)	Non-Hazardous (m^3)
2011	-2,770,000	9,173,000
2016	-6,040,000	6,251,000
2021	-9,000,000	4,192,000
2026	-12,090,000	2,124,000

Source: Cambridgeshire and Peterborough Minerals and Waste Local Plan 2011

10.4.15. The Cambridgeshire and Peterborough Minerals and Waste Local Plan (2011) outline that by 2026, the Waste Planning Authorities in the area will make a provision for a minimum of:

- 627,000 tonners per annum of new recycling capacity (materials recycling facilities / mixed recycling)
- 1.86 million tonnes per annum of inert waste recycling capacity
- 12.09 million cubic tonnes of inert landfill void space over the plan period
- 14,000 cubic metres per annum of stable non-reactive hazardous waste landfill void space

10.4.16. In regard to hazardous waste, there is no general hazardous waste landfill capable of accepting a wide range of waste in Cambridgeshire. However, there is a landfill site which accepts a wide range of hazardous waste at King's Cliffe in Northamptonshire (immediately outside of the plan area), which has capacity to accept the small amount of hazardous waste arising within Cambridgeshire if required (Cambridgeshire County Council and Peterborough City Council, 2011).

10.5. Consultation

10.5.1. No consultation regarding the material assets and waste assessment has been undertaken with consultation bodies to date. In addition, no consultation specifically regarding the materials assessment is required with statutory environmental bodies to support the ES.

10.6. Design interventions

10.6.1. The principles of value engineering have been adopted by the Design Team to optimise the alignment and reduce costs, where appropriate. This would subsequently enable material savings, which would directly reduce the effects from the use of material resources. Changes to the Proposed Scheme design from value engineering, which enables materials savings, will be outlined in the ES.

10.7. Potential mitigation measures

10.7.1. Measures would be implemented to reduce the effects from the use of material resources and the generation and management of waste by the Proposed Scheme during the construction phase. There is substantial overlap in the mitigation for both aspects (material resource use and waste generation), due to the synergy between the re-use of materials and the avoidance of waste generation.

10.7.2. A Construction Environmental Management Plan (CEMP) would be produced for the Proposed Scheme which would detail mitigation measures that would be implemented on-site to ensure efficient use of material resources and reduction of waste arisings, and to reduce the potential impact identified in Section 12.9 below. Mitigation may include (but not limited to) the following measures:

- Materials would be delivered on an ‘as required’ basis to avoid damage or contamination, and therefore limit the likelihood of waste
- All suitable excavated material would be re-used in the construction of the Proposed Scheme and in landscaping features to reduce the requirements to import materials for construction and reduce the need to remove surplus materials from site
- Where site-won material is not available or suitable for re-use, secondary or recycled materials would be procured where available and practicable
- Temporary stockpiling of fill materials, prior to incorporation in the Proposed Scheme, would be avoided where possible. This ensures double handling and damage is minimised and therefore, avoids the generation of waste
- Locally sourced materials and suppliers would be identified and used, where practicable
- Pre-cast elements would be used, where practicable, to ensure efficient use of materials and avoid the generation of waste arisings from cut offs
- The waste hierarchy (refer to Section 12.2 above) would be implemented throughout the construction to minimise disposal and maximise re-use and recycling of waste arisings. Opportunities for re-use and recycling of waste include (but are not limited to):

  - Re-using excavated soils on-site in the landscaping features of the Proposed Scheme
  - Chipping green waste on-site for use in the landscaping for the Proposed Scheme
  - Composting of green waste
  - Recycling of inert material by crushing, blending and subsequent re-use, as an aggregate
  - Re-using waste on other nearby schemes
  - Re-using waste for uses with clear benefits to the environment, for example in the remodelling of agricultural land or in the restoration of nearby quarries or other excavation sites
- Facilities would be provided on-site to segregate waste, for example, for recycling

10.7.3. A site waste management plan would be produced for the Proposed Scheme, which would ensure that waste is managed in accordance with the waste hierarchy and other relevant legislative requirements, and would detail information on the waste carriers and waste management facilities that would be used.

10.7.4. Where waste must be taken to a recycling or disposal site, the contractor must ensure that the sites have the appropriate permits to ensure that environmental risks are reduced, such as damage to hydrological systems. In addition, the suitable facility would be located as close to the works as possible to minimise the impacts of transportation, in particular the release of carbon emissions. The appointed Contractor would identify the closest and relevant treatment and disposal sites.

10.7.5. An MMP would also be produced by the contractor for the earthworks, if appropriate. This would identify ways to re-use site-won or excavated materials within the construction of the Proposed Scheme provided it meets the requirements for the CL:AIRE Definition of Waste Code of Practice.

10.8. Potential impacts

Construction

Use of material resources

10.8.1. The Proposed Scheme is likely to require large quantities of material resources for construction purposes. The receptors likely to be subject to impacts, as a result of material resource use, include quarries and other sources of minerals, and other finite raw material resources. The potential impacts associated with the use of material resources on these receptors include:

- The availability of material resources and the subsequent impact on the demand for materials
- The depletion of non-renewable resources

10.8.2. It is outside of the scope of the assessment to assess the environmental effects associated with the raw materials extraction, and processing and manufacturing of products, as these are likely to be subject to separate environmental assessments. The use of material resources would also be likely to generate adverse environmental effects through the transportation of materials (for use on-site), however the effects of this are more logically dealt with within chapter 5 Air quality and chapter 11 Noise and vibration, and will therefore not be included within the scope of the materials assessment.

10.8.3. Quantities of materials required for the construction of the Proposed Scheme have not been calculated at this stage, however the materials likely to be required for the construction are detailed in Table 10-9.

Table 10-9: 9 Summary of material resources likely to be required for construction

Activity	Materials resources likely to be required for construction
Site remediation / preparation / earthworks	Fill materials for earthworks Timber (e.g. for temporary use for shuttering)
Demolition	No material resources would be required for demolition.
Site construction	Road sub-base and surface materials Concrete, steel and other structural materials Pre-cast and prefabricated products (e.g. kerbs, gullies, barriers, manholes, drainage) Signage, lighting columns and markings Timber (e.g. for temporary use for shuttering) Topsoil

Source: Table adapted from Table A in Annex 1 of IAN 153/11

Generation and management of waste

10.8.4. The generation and management of waste, from the construction of the Proposed Scheme, may result in adverse environmental impacts including the temporary occupation of waste management facility space (from treatment of waste) and the permanent reduction to landfill capacity (from disposal of waste). However, the Proposed Scheme would aim to minimise the generation of waste wherever practicable, through the implementation of the waste hierarchy (see section 10.2 above). The generation and management of waste would require transport off-site, however, as per paragraph 10.8.1, this is more logically dealt with in chapter 5 Air quality and chapter 11 Noise and vibration and is, therefore, considered within the construction phase assessment for these topics.

10.8.5. Quantities of waste likely to be generated by the construction of the Proposed Scheme have not been quantified at this stage. However, the likely waste streams have been identified and outlined in Table 10-10.

Table 10-10: Summary of waste arisings likely to be generated by construction

Activity	Waste arisings likely to be generated by construction
Site remediation / preparation / earthworks	Surplus / unsuitable material (topsoil / subsoil / substrata) arising from earthworks Invasive plant species (e.g. Japanese knotweed) and injurious weeds Hazardous or contaminated soils encountered on-site Vegetation and other above ground materials produced by site clearance (e.g. litter, fly tipped waste)
Demolition	Demolition waste from removal 1 residential property
Site construction	Surplus, damaged and 'cut-off' construction materials

Source: Table adapted from Table B in Annex 1 of IAN 153/11

10.9. Chapter summary

10.9.1. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated impacts upon material assets and waste. There is the potential for adverse impacts during construction, due to the anticipated use of materials and generation of waste typical for a road infrastructure scheme of this size.

10.9.2. The impacts on material assets and waste resulting from the operation of the Proposed Scheme was scoped out of further assessment in the EIA Scoping Report (Highways England, 2018). It is anticipated that there would be minimal requirement for material resources and minimal waste generation during operation. Therefore, no operational stage assessment has been presented within this chapter.

11. Noise & vibration

11.1. Introduction

11.1.1. This chapter presents the preliminary findings of the noise and vibration assessment. This comprises a review of the existing environment and identification of the potential impacts of the Proposed Scheme in the context of noise and vibration. Consultation is identified where relevant to the content and focus of the chapter. This chapter also outlines proposed design measures to help mitigate potential noise and vibration impacts.

11.2. Guidance and best practice

11.2.1. The following legislation, standards and best practice guidelines are considered to be relevant to the Proposed Scheme.

- The National Planning Policy Framework 2018
- The Noise Policy Statement for England 2010
- Planning Practice Guidance (noise) 2014
- The Draft National Policy Statement for National Networks 2013
- The Land Compensation Act 1973 Part 1
- The Noise Insulation Regulations 1975 (amended 1988)
- Sections 60 and 61 of The Control of Pollution Act 1974
- British Standard (BS) 5228-1:2009+A1:2014, Code of practice for noise and vibration control on construction and open sites – Part 1: Noise
- BS5228-2:2009+A1:2014, Code of construction practice for noise and vibration control on construction and open sites - Part 2: Vibration
- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7, Noise and Vibration, (HD213/11 – Revision 1) 2011
- Calculation of Road Traffic Noise (CRTN) 1988
- Guidelines for Noise Impact Assessment, Institute of Environmental Management & Assessment, 2014
- World Health Organization (WHO), Night Noise Guidelines for Europe

11.3. Study area

11.3.1. The study area for operational noise is defined in accordance with DMRB Volume 11, Section 3, Part 7 and predominantly involves:

- calculation of the noise levels at up to 600 m from the new carriageway edge
- consideration of any other affected routes (where there is a change of 1dB in the short-term or 3dB in the long-term)

11.3.2. Typically, for construction activity, noise would be calculated at distances up to 500m and vibration at distances up to 50m from the Proposed Scheme footprint depending on the noise and vibration characteristics of the plant that are used.

11.3.3. The impact of construction traffic on the local network would also be considered.

11.4. Assumptions and limitations

11.4.1. This chapter is based on a desk-top study and is qualitative. However, it is informed by noise measurements undertaken in May and June 2018 and the Defra Noise map which is a product of the strategic noise mapping exercise undertaken by Defra in 2012 to meet the requirements of the Environmental Noise Directive (Directive 2002/49/EC) and the Environmental Noise (England) Regulations 2006 (as amended).

11.4.2. The variable nature of construction noise is such that it is difficult to accurately predict the noise impacts at given receptors over the period of the construction phase until plant details become available.

11.5. Baseline

11.5.1. The Proposed Scheme will potentially affect noise levels in the communities of Sutton and Wansford together with some receptors between them including some isolated dwellings, a petrol station, Sacrewell farm and Country Centre, a picnic area and some public footpaths.

11.5.2. The predominant noise sources in the area are the A1 and A47 and this would continue to be the case with the Proposed Scheme. Modelled noise data (Defra, 2012) shows that some receptors in Wansford and on Sutton Heath Road close to the A47 are close to the 55dB L_{night}, contour: an L_{night} of 55dB is the WHO recommended (WHO, 2009) Interim Target (IT) Level for night-time noise where the Night Noise Guideline value of 40dB cannot be achieved in the short-term and where policy makers choose to adopt a step-wise approach to reduce night-time noise. All other receptors are likely be exposed to noise levels below the IT level.

11.5.3. There are 2 SSSI's located in the operational noise study area, the Wansford Pasture to the south of Old Leicester Road and Sutton Heath and Bog (north of the A47 and west of Sutton Heath Road). There are also 2 Scheduled Monuments, 1 on Old North Road and 1 in the land north of the A47 and west of the Sutton Heath and Bog SSSI. There are no other ecological sites (SPA or SAC), Area of Outstanding Natural Beauty, or National Parks. Several public rights of way are located in the study area, mainly along the River Nene.

11.5.4. A noise survey was carried out in May and June 2018 including 7 long-term locations (approximately 1-week) and a further set of 6 short-term measurements (lasting for 15-minutes each and repeated at different times of the day). The survey measured the LA_{10}, 18h index that is used in the UK to characterise day-time road traffic noise. The survey showed that, in general; both the existing A47 and A1 dominate the noise environment within the measurement locations, with the A1 being more dominant where measurements were close to both measurement locations nearest A1 experienced the greatest noise levels. Locations on the A1 were consistently in the daily range of 82 to 83dB LA_{10}, 18h. Short-term locations near the A1 ranged from 75 to 77dB LA_{10}, 15min at a position to the north of the 2 roundabouts (joined the A1 and A47) and 67dB LA_{10}, 15min at a position to the south of the 2 roundabouts Measurement locations along the A47 were in the range of 66 to 68dB LA_{10}, 18h.

11.5.5. Measurement locations further away from the A47 (and also away from the A1) experience lower noise levels of around 50 to 53dB LA_{10}, 18h (for example, on the perpendicular road The Drift). However, road traffic noise likely to be from the A47 was audible. Furthermore, short-term locations further away from the A47 were between 50 to 60dB LA_{10}, 15min.

11.5.6. To set these numbers into context, the 'specified level' in the Noise Insulation Regulations, 1975 (amended 1988) is a L_{10},18h of 68dB façade level corresponding approximately to a free-field level (as reported for the noise survey) of approximately 65dB and is the level, subject to additional criteria, associated with grants in respect of the carrying out insulation work. A Noise Important Area (NIA) is defined as an area or noise 'hotspot' where the 1% of the population are located that are affected by the highest noise levels from major roads according to the results of the first round of strategic noise mapping (Defra, 2012). There are 3 such NIAs within the operational noise study area and it is particularly important to avoid increasing noise in these areas (see Table 11-1).

Table 11-1: Noise important areas

ID	Location
5305	On the A1 north of Wansford
5303	On the A1 at Wansford
5304	On the A47 at Sutton Heath Road

11.6. Consultation

11.6.1. Non-statutory public consultation on the Proposed Scheme was undertaken between 13 March and 21 April 2017. Where relevant, points arising are carried

forward in the development of mitigation measures for the Proposed Scheme and would be reported in the ES.

11.6.2. A Scoping Report was submitted in February 2018, the outcome of which will guide the development of the methodology and focus of the assessment to be reported in the ES.

11.6.3. There has been no consultation with statutory consultees on noise and vibration aspects to date.

11.6.4. The scope and methodology will be discussed with the local authority as the Proposed Scheme progresses and specifically the need to produce a Construction Environmental Management Plan (CEMP) and Section 61 Certificate (Control of Pollution Act, 1974) will be discussed.

11.7. Design interventions

11.7.1. A low noise running surface would be used within the design; this is estimated to reduce noise by ~3dB at typical highway speeds in comparison with conventional hot rolled asphalt.

11.7.2. Where new roads or changed alignment causes a heavily trafficked route to pass close to residential receptors, bunding or noise fences are often used to control noise reducing noise exposures.

11.7.3. Potential Mitigation Measures

11.7.4. Potential adverse noise impacts during construction would be mitigated through measures included within the CEMP, which would be prepared alongside the ES. These would include measures for both noise, vibration, and construction traffic.

11.7.5. Acoustic barriers can be effective at reducing noise for receptors close to the source, during both construction and operation, and will be considered in the ES for sensitive receptors that may be affected by the Proposed Scheme.

11.7.6. Low noise surfacing will be used for the Proposed Scheme, as would acoustic bunds, if required.

11.8. Potential impacts

Construction

11.8.1. The main activities during the construction phase which would generate noise and vibration are:

- Demolition of existing structures and carriageway
- Excavation, compaction and foundations works
- Construction of bridges, retaining structures, services, drainage and the new carriageway
- Surfacing
- Installation of noise barriers, signage, gantries and road markings

11.8.2. Vehicles accessing the site and compounds for the delivery of materials and equipment, carrying muck away, attendance of site personnel etc. would also generate noise.

11.8.3. Noise impacts due to the construction of the Proposed Scheme are expected to be perceptible at nearby sensitive receptors particularly in Wansford, Sutton and on Sutton Heath Road

11.8.4. The variable nature of construction noise is such that it is difficult to accurately predict the noise impacts at given receptors over the period of the construction phase. However, given the proximity of some residential receptors to the existing A1 and A47 routes, the understanding of the noise environment and the possibility that some phases of work would require night work, there is potential for impacts without careful management. Vibration impacts may also arise during any construction activities, such as demolition of existing structures, piling and surfacing if vibratory rollers are used.

Operation

11.8.5. Operational impacts from noise and vibration could arise from changes in traffic composition and flow (volume and speed), new carriageways, access and slip roads and re-alignment of existing carriageways. Road traffic may generate ground-borne or air borne impacts associated with vibration. All newly-constructed carriageways would comply with current specifications, therefore ground-borne vibration from the Proposed Scheme are unlikely to generate of perceptible levels of vibration. Relatively high levels of noise are required to cause perceptible levels of airborne vibration and therefore noise-induced vibration is only likely to occur at properties close to heavily-trafficked road links.

11.8.6. While increases in traffic volume and speed tend to increase noise, in the absence of traffic data it is not possible to state if there would be any net beneficial or adverse impacts due to the Proposed Scheme. The alignment changes may also have a positive impact (when traffic is moved further from receptors) and when any potentially negative impacts may be mitigated by the introduction of bunds or barriers.

11.8.7. The predominant potential operational adverse noise impact will be for the change in horizontal and vertical alignment of the A47 and any increase in speed as a result of dualling. It may be possible to partially mitigate this with a combination of noise barriers and vertical alignment. Changes in traffic flow may also result in noise increases for receptors within the study area and noise barriers or bunds may be able to offset these.

11.9. Chapter summary

11.9.1. This chapter has identified noise and vibration impacts of the Proposed Scheme, both short-term temporary impacts associated with construction activities and long-term permanent impacts due to road traffic noise.

11.9.2. Sensitive receptors in proximity to the Proposed Scheme have been identified. Receptors that are close to the A1 and A47 are already exposed to relatively high noise due to road traffic.

11.9.3. Noise impacts due to the construction of the Proposed Scheme are likely at nearby sensitive receptors; particularly in Wansford, Sutton and on Sutton Heath Road, and would be controlled by a CEMP.

11.9.4. Any change in road traffic noise due to the introduction of the new access and slip roads, changes in alignment, changes in traffic mix and speed, road surface and any barriers or bunds would be calculated and assessed in detail for the ES and mitigation measures would be introduced to avoid or reduce impacts where possible.

12. People & communities – all travellers

12.1. Introduction

12.1.1. This chapter presents the preliminary findings of assessment relevant to Travellers, both walkers, cyclists and horse riders, (WCHR), motorised travellers (MT) and including public transport. This chapter comprises a review of the existing environment and identification of potential impacts of the Proposed Scheme. Potential impacts are discussed, considering relevant policy and legislation and in the context of non-motorised users and vehicle travellers.

12.2. Guidance and best practice

12.2.1. People and Communities is identified as a Design Manual for Roads and Bridges (DMRB) topic within Interim Advice Note (IAN) 125/15 (Highways England, 2015) and DMRB Vol 5, Sec 2, Part 5 HD 42/17 Walking, Cycling & Horse-Riding Assessment and Review. However, the guidance contained within the DMRB Volume 11 Section 3 has not yet been updated. As a result, and pending new guidance, the assessment of People and Communities for this report has been split into 2 chapters, Chapter 13 People and communities - social presents the assessment of the social elements of people, communities, local economy and agriculture and this chapter presents the assessment for the 'travellers' elements of people and communities.

12.3. Study area

12.3.1. No study areas for the assessment of WCHRs, amenity, MTs driver stress and MTs views from the road are specified in the DMRB Volume 11 Section 2 Part 4 and the DMRB Volume 11 Section 3 Parts 8 and 9. Therefore, the study areas used in the assessment have been defined through professional judgement, based on the type and scale of the Proposed Scheme and the context of the surrounding area. These study areas are considered more than sufficient in terms of identifying the significance of effects in full.

12.3.2. The study areas used for this assessment are as follows:

- WCHRs: all WCHR facilities including public rights of way (PRoW), permissive WCHR routes, footways, long distance walks and cycle routes identified within 250m from the land within the Proposed Scheme boundary
- Amenity: all WCHR facilities including PRoWs, permissive WCHR routes, footways, long distance walks and cycle routes identified within 250m of the Proposed Scheme
- MTs driver stress: comprises all roads and connecting roads within 250m of the Proposed Scheme

- MTs view from the road: considers views from the proposed route alignment in operation only

12.4. Assumptions and limitations

12.4.1. This assessment relies on desk-based studies, using publicly available information where available. This information includes strategic documents, Geographical Information Science (GIS) software and previous assessments undertaken.

12.4.2. Traffic data has not been used to support the assessments for amenity and driver stress. Therefore, the assessments are qualitative in nature and will be considered in further detail in the Environmental Statement (ES).

12.5. Baseline

Walking Cycling and Horse Riders

12.5.1. Table 12-1 below provides a summary of routes used by walkers, cyclists and horse riders within the study area. There is also potential for local side roads to be used by WCHRs.

Table 12-1: WCHR facilities within the study area

WCHR facility type	WCHR route name	WCHR facility ID.
Permissive - Footpath	Wansford Hereward Way Permissive	Wansford Hereward Way Permissive 2 Section 1 Hereward Way (ID: 786)
Permissive - Footpath		Wansford Hereward Way Permissive 3 Section 1 Hereward Way (ID: 787)
Permissive - Footpath	Wansford Nene Way Permissive	Wansford Nene Way Permissive 1 Section 1 Nene Way (ID: 574)
Permissive - Footpath		Wansford Nene Way Permissive 4 Section 1 Nene Way (ID: 784)
Permissive - Footpath		Wansford Annual Maintenance 113 Section 1 Annual Maintenance (ID: 460)
Permissive - Footpath		Wansford Annual Maintenance 113 Section 2 Annual Maintenance (ID: 785)
PRoW - Footpath		Sutton 1 Section 1 (ID: 392)
PRoW - Footpath	Wansford	Wansford 4 Section 1 (ID: 459)
Undesignated cycle route	N/A	At the roundabouts of the A1 / A47 junction dumbbell roundabouts

12.5.2. Two WCHR surveys have been conducted at 1 location within the study area which was representative of the Wansford Hereward Way Permissive, Wansford

Nene Way Permissive and also the Wansford PRoW, as there is potential for the routes to experience some degree of severance as a result of the Proposed Scheme. Three adults were observed using the Wansford Nene Way Permissive route during the afternoon survey walking in a western direction towards Wansford. No other WCHRs were observed using the Wansford Hereward Way Permissive and Wansford PRoW during the surveys.

Amenity

12.5.3. Table 12-2 below provides a summary of the existing amenity levels likely to be experienced using the key WCHR routes within the study area, which could be affected by the Proposed Scheme.

12.5.4. For WCHR routes, a common theme in the assessment is the extent to which users are separated from traffic, which contributes to amenity levels.

Table 12-2: Baseline amenity for WCHR Routes

Route name	Description of route
Wansford Hereward Way Permissive	This route comprises a paved road leading from the A47 towards Sacrewell Farm, providing access to the farmstead and the visitor centre. Users are surrounded on all sides by arable fields, bound by well-established hedgerows, which interrupt long-distance views. Users come across farm vehicles and private cars along this road and are exposed to road noise and traffic on this PRoW.
Wansford Nene Way Permissive	This route is well-established and requires users to follow the truck layby, across the faintly worn track through long grass north of the River Nene between Wansford and Sutton. Views from this section of the route are toward the countryside alongside the River Nene, with mature trees and some views of traffic on the A47. With the exception of the noise from the A47, users are isolated from traffic.
Wansford PRoW	This is a short PRoW which allows users to move between a road layby along the A47 to the River Nene through a field typically used for grazing. This has views of the A47 to the north and the River Nene to the south. Users are exposed to noise from the A47.
Undesignated cycle paths at A1 / A47 junction dumbbell roundabouts	These routes comprise paved cycleways separated from traffic at the A1 / A47 junction dumbbell roundabouts, with uncontrolled crossings of the slips. Views from this section are towards the River Nene to the south with intermittent views of the countryside to the north. Users are exposed to road traffic noise and traffic.

Motorised traveller's driver stress

12.5.5. The A47 section between Wansford and Sutton is an extremely busy single-carriageway road with a speed limit of 60mph. This acts as a bottleneck, resulting in congestion, leading to longer journey times and a poor safety record, which leads to driver stress. Given the surrounding land use, and the fact that the road is a key link between major conurbations, HGVs and large agricultural vehicles are common. The prevalence of these slow-moving vehicles leads to driver frustration, in turn leading at times, to unsafe overtaking manoeuvres. This takes place in the context of a flat landscape which substantially reduces clear sight lines.

12.5.6. Fast-moving traffic, in significant volumes along the A47 makes emerging from junctions very difficult; leading to driver frustration. Visibility is restricted on many roads within the study area as a result of high verges and roads often being in cutting. Relatively frequent interactions with WCHRs exacerbate the perceived danger on using side roads, leading to the fear of potential accidents. Driver stress is therefore considered to be High along the A47.

Motorised travellers view from the road

12.5.7. Within the study area, views from the A47 are generally intermittent, predominantly due to mature vegetation in the highways verge. Where gaps in this vegetation do allow drivers to see beyond the highway boundary, views generally extend further to the north than the south as a result of the gently sloping topography of the area. Such views are predominantly of the surrounding arable agricultural land, interspersed with frequent wooded areas.

12.6. Consultation

12.6.1. Initial consultation has been progressed with Sustrans and the Peterborough Cycling Forum regarding the walking cycling and horse riding assessment & Review (WCHAR) and with the Peterborough City Council PRoW officer regarding the status of Permissive Paths in the study area.

12.7. Design interventions

12.7.1. No design interventions are recommended at this stage. Provisions for WCHRs are being considered at appropriate locations along the route and will be considered in further detail within the ES.

12.8. Potential mitigation measures

Construction

12.8.1. At this stage, the following best practice measures are anticipated to be of relevance for the Proposed Scheme during construction:

- A Construction Environmental Management Plan (CEMP) would be prepared by the appointed Contractor and implemented during the construction period. The CEMP would ensure that the construction of the Proposed Scheme is undertaken in as sensitive a manner as possible, with regards to people within the local community.
- A Traffic Management Plan (TMP) would be implemented during the construction phase of the Proposed Scheme. The TMP would ensure that access is maintained and disruption is minimised as far as possible wherever

practicable, and would include measures to minimise severance by ensuring diversions for pedestrians are well signed, alternative access arrangements are made, and access to properties are retained.

- Impacts upon WCHRs would be minimised through ensuring that all temporary diversions for users of WCHR amenities around the work site are clearly signed, with alternative access arrangements maintained through the full construction period, as required.

Operation

12.8.2. At this early stage of design, proposals for changes to WCHR facilities are still to be confirmed. Provisions for WCHRs will be considered in further detail in the ES, as will landscape design mitigation.

12.9. Potential impacts

Construction

Waling cycling and horse riders

12.9.1. The Proposed Scheme would have a direct impact on all of the WCHR routes outlined in Table 12-1, as well as the undesignated cycle paths on the east roundabout of the A1 / A47 Junction. It may therefore be necessary to temporarily close these amenities to facilitate construction works. This may result in temporary increases in journey times and lengths for WCHRs. It is worth noting however, that WCHR surveys indicated that routes were generally not well used within the study area, with only 3 WCHRs identified as using the Wansford Nene Way Permissive route. At this early stage in design, it is considered that appropriate mitigation could be applied, such as the provision of adequate diversions and signage, to ensure these temporary imapcts would not be major, especially as the WCHR surveys have revealed a low usage of these WCHR routes.

12.9.2. With the implementation of best practice measures as described in Section 16.7, a slight adverse impact is anticipated during construction.

Amenity

12.9.3. Amenity is likely to be temporarily impacted for users of WCHR facilities during construction through the presence of construction plant, machinery, materials, construction compounds and construction lighting, and diversion routes, whilst there is also potential for barriers and traffic flows to change. In addition, construction activities may cause indirect imapcts for WCHRs, due to noise, dust and the presence of construction plant, materials, compounds sites and

machinery for a temporary period. The effects of such activities are discussed further in Chapter 5 Air quality, Chapter 7 Landscape and visual impacts and Chapter 11 Noise and vibration.

12.9.4. With the implementation of best practice measures as described in Section 16.7, a slight adverse impact is anticipated during construction.

Motorised travellers: driver stress

12.9.5. During construction, traffic management would be likely to result in temporary reduced speeds and lane closures, which would increase congestion and therefore journey times and driver frustration. This could temporarily increase driver stress for MTs. However, this would be managed through the implementation of a TMP and therefore impacts are unlikely to be major. However, further assessment is required to confirm this.

12.9.6. With the implementation of best practice measures as described in Section 16.7, a slight adverse impact is anticipated during construction.

Operation

Walking cycling and horse riders

12.9.7. WCHR routes comprising Wansford Hereward Way Permissive, Wansford Nene Way Permissive, Wansford PRoW and undesignated cycle routes at the A1 / A47 Junction dumbbell roundabouts are likely to be permanently affected by the Proposed Scheme. It is worth noting that WCHR surveys indicated that routes were generally not well used, with only 3 WCHRs identified using the Wansford Nene Way Permissive route. It is anticipated that appropriate mitigation would be provided for WCHRs, which would minimise adverse impacts in terms of changes to journey lengths and times and also provide new and improved facilities for WCHRs. However, at this early design stage it is not currently known where new WCHR facilities will be provided.

Amenity

12.9.8. The Proposed Scheme is anticipated to permanently affect approximately 4 WCHR routes which may result in a change in the pleasantness in journeys experienced by walkers, cyclists and equestrian users, subsequently affecting amenity. There is potential for existing barriers between WCHRs and traffic to change, as well as change to traffic flows on roads in the scheme locality. It is anticipated that appropriate mitigation would be provided for WCHRs which would minimise impacts on amenity. However, at this early design stage it is not currently known where new WCHR facilities will be provided, and traffic flows

have not been used to inform this chapter. Mitigation provision and traffic flows will be considered in further detail within the ES.

Motorised travellers: driver stress

12.9.9. It is anticipated that driver stress on the A47 would be reduced as a result of the Proposed Scheme upgrading this section of the route to a dual-carriageway. Congestion would be relieved, allowing for a more free-flowing network, reduced journey times and safer overtaking of slower vehicles. This would all contribute towards reducing driver stress. It is anticipated that appropriate mitigation would be provided for WCHRs, which would improve the fear of potential accidents, whilst a new safety barrier is also likely to be provided. Route uncertainty has not been considered at this stage, although it is anticipated that this would generally improve through the provision of new signage and gantries designed to align with current standards and methodology (i.e. reduced clutter, clear messages and informed travellers).

12.9.10. A Slight Beneficial impact is anticipated once in operation for driver stress.

Motorised travellers: views from the road

12.9.11. Views from the road are likely to change slightly as the new carriageway would be a dual-carriageway and would be constructed slightly off-line to the north and south of the existing A47 carriageway. This opens up the potential for new views for MTs. Landscape mitigation measures, such as tree planting are likely to shield views from the road for MTs, although it is likely to take some time for planting to establish. However, in the absence of a landscape design at this stage, it is not possible to confirm this conclusion. Further assessment will be required to assess the change in the view from the road for MTs. Dazzle fencing will be installed between the new A47 carriageway and the previous A47 carriageway west of Sutton Heath Road.

12.10. Chapter summary

12.10.1. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated impacts upon Travellers.

12.10.2. Journey length and time are predicted to temporarily increase for users of a number of WCHR facilities during construction. Amenity is also likely to be adversely impacted at the construction phase. Impacts on WCHR facilities and amenity during operation cannot be deduced at this stage due to a lack of design information but it is likely that the Proposed Scheme would result in changes to barriers between people and traffic, traffic flows and new facilities for WCHRs.

12.10.3. Construction works could temporarily increase stress for MT and cause disruption for local communities. This would be managed through the implementation of a TMP. During operation, driver stress would likely be reduced as a result of improved journey times and journey reliability.

12.10.4. Views from the road are likely to change from the baseline during operation with the new carriageway constructed off-line to the north and south of the existing A47. Impacts on views from the road during operation cannot be deduced at this stage in the absence of a landscape design.

12.10.5. Further work would be undertaken to develop design interventions to limit or reduce impacts and promote opportunities for the environment within the study area wherever possible. Design development and potential mitigation would be reported in the ES as well as further detailing of baseline conditions and likely changes during both construction and operation for all identified receptors.

13. Population & health – social

13.1. Introduction

13.1.1. This chapter sets out the baseline and assesses the preliminary impacts on 'Population and health – social' as arising from the A47 Wansford to Sutton Proposed Scheme.

13.1.2. Population and health is a broad topic and therefore, for ease of assessment and review, it has been split into 2 chapters. Chapter 12 Population and health – travellers presents the assessment of the Proposed Scheme on the 'travellers' element (pedestrians, cyclists, equestrians, community severance and vehicle travellers). This chapter presents assessment of the social elements of the population, communities, health and the local economy, and outlines proposed design measures to help mitigate potential impacts and relevant consultation.

13.2. Guidance and best practice

13.2.1. The Population and health chapter is a Design Manual for Road and Bridges (DMRB) topic.

13.2.2. The assessment has been undertaken in accordance with the relevant sections of DMRB Volume 11, Section 3, Part 6 (Land Use) (DMRB 2001) and Part 8 (Pedestrians, Cyclists, Equestrians & Community Effects) (DMRB 1993) which provide guidance on the sub-topics for population and health – social:

- Private property and land-take
- Community land and community facilities
- Development land
- Local economy
- Human health

13.2.3. There is currently no DMRB guidance on the assessment of local and wider economic impacts. Potential local economy impacts, including economic development impacts as a result of the Proposed Scheme, have been considered using a process based on HM Treasury Green Book principles (HM Treasury 2013). Local economy is a sub-topic considered in this chapter in addition to those detailed in the DMRB guidance.

13.2.4. The sub-topics form the foundation of the structure of this chapter. Due to each sub-topic having different requirements (such as different specialist inputs, study areas, and assumptions and limitations), the headings in this chapter are sub-divided and grouped, where relevant, to benefit the reader.

13.3. Study area

13.3.1. The area within 250m of the Proposed Scheme is referred to as the local impact area (LIA) and is the primary study area for this topic. This LIA is used to assess: private property and land-take; impacts on community land and community facilities; impacts on development land.

13.3.2. The assessment of impacts on the local economy will focus on the wider impact assessment (WIA) which in this case will be Peterborough.

13.3.3. The study area for human health is defined by the impacts being experienced. Impacts associated with population and health are assessed within the LIA and WIA. Health impacts associated with noise and air quality are assessed within the study area set out in the Air quality and Noise and vibration chapters.

13.3.4. As the Proposed Scheme is 1 of 6 along the A47, the cumulative impacts may be felt more widely than both the LIA and WIA and as such, the county of Norfolk is also considered.

13.3.5. These study areas are summarised in Table 13-1 along with the other defined study areas.

Table 13-1: Population and health – social study areas per sub-topic

Sub topic	Study area	Referred to as
Private property and land-take	The Proposed Scheme Boundary	n/a
Community land and community facilities Businesses Development land	250m from the Proposed Scheme boundary	LIA
Local economy Human health	Peterborough	WIA

13.4. Assumptions and limitations

13.4.1. To prevent double-counting of impacts, those impacts relating to other environmental topics (such as noise and air quality) are not considered in detail as part of the assessment.

13.4.2. The LIA is based on a 250m boundary from the Proposed Scheme, and not on distances via particular modes (such as walk times), by particular routes, or taking into account man-made and natural barriers (such as major roads, railway lines or water courses).

13.4.3. Potential impacts on human health from independent topics such as noise and air quality are considered within own chapters. Any potential impacts arising for human health in relation to the Population and health – social chapter are set out in the potential impacts section below.

13.4.4. Data used to define the baseline social and community conditions has been compiled from existing published sources. Assessments are based on the most recent data available for the LIA and WIA. The currency of data varies between the datasets depending on how frequently information is collected. Dates for each dataset are noted in the baseline section where available.

13.4.5. The construction strategy for the Proposed Scheme has not yet been developed; the extent of required construction works and the location of construction compounds are currently not finalised. The assessment is based on Design Fix A (the previous design fix) and does not distinguish between permanent and temporary or construction and operational boundaries. Therefore, the exact extent of temporary and permanent land-take cannot be confirmed at this stage. A figure will be available as the design progresses.

13.5. Baseline

Private property and land-take

13.5.1. Within the LIA, residential properties are largely located in the villages of Wansford and Sutton. There is 1 residential property accessed directly from the A47. This property is located approximately 13m to the south of the existing A47. A collection of residential properties is also located on Old North Road and Thackers Close (accessed via the A6118 / B671 off the A47).

13.5.2. There are several businesses located in the LIA. These are:

- Goldrush clothes and fabric wholesaler
- Arthurs traditional fish and chips
- Ducati Peterborough motorbike dealer
- Harris McCormack Architects
- The Old Rectory hotel
- The Chimes hotel
- Ace School of Motoring
- Motor Hog motor vehicle dealer
- BP petrol station
- Rontec Wansford petrol station

Community land and community facilities

13.5.3. A small number of community facilities are located within the LIA. These include: Wansford picnic area (including a public convenience), a play area in Wansford (positioned between Nene Close and Peterborough Road), Wansford Cricket Club and Wansford community hall.

13.5.4. There are no other community facilities located in the LIA, however community facilities are found in Wansford, Sutton and Stibbington, between 250m and 1 kilometre from the Proposed Scheme. In Wansford, these include the Parish Church of Saint Mary the Virgin, Wansford Post Office, Wansford Pasture and Standen's Pasture and Christie Village Hall. In Sutton there is St Michael and All Angels Church. In Stibbington there is the Church of St. John the Baptist and Cambridgeshire Environmental Education Service Stibbington day centre. Sacrewell agricultural education farm is also located to the north of the existing A47, as is The Parish Church of Saint Andrew.

Development land

13.5.5. The Peterborough Local Plan states that the former Wansford to Stamford railway line is safeguarded land for future key infrastructure. The land is planned to accommodate walking and cycling infrastructure (PCC 2016). The railway line is currently disused, and the A47 cuts across its path.

13.5.6. A list of development sites in the wider area is in the Stage 2 Environmental Assessment Report. These have been included in Table 13-2, along with further development plans that have been made available for public viewing since the report was published in November 2017.

Table 13-2: Extant planning applications for new developments

Map area	Application number and details	Date application received	Application type	Status
1	16/02375/FUL: Demolition of existing dwelling and erection of 4 semi-detached dwellings and associated outbuildings and parking	Tue 03 Jan 2017	Full	Awaiting decision
2	16/02387/NONMAT: Non-material amendment: surfacing of access road, surfacing of hardstandings, external lighting, garages, house elevations and bat and bird boxes pursuant to 15/01119/REM Application for Reserved Matters (Appearance, Landscaping, Layout and Scale) for the construction of 9, 2 storey dwellings with single storey garages and associated access road/infrastructure pursuant to planning permission 14/00643/OUT	Thu 22 Dec 2016	Full	Decided
3	16/00637/FUL:	Tue 05 Apr 2016	Full	Decided

Map area	Application number and details	Date application received	Application type	Status
	Construction of 5 flats (resubmission) | Land Off Peterborough Road Peterborough Road Wansford Peterborough			
4	16/00349/FUL : Land to the East Of Manor Farm, Nene Way Sutton, Peterborough	Proposed demolition of farm buildings and construction of 2 dwellings together with associated works	Full	Permitted
-	17/01958/FUL: Land to the north of 15 Nene Close Wansford Peterborough. Construction of 2 dwellings.	Mon 09 Oct 2017	Full	Permitted
-	17/01765/FUL: Land to the east of Manor Farm Nene Way Sutton Peterborough. Demolition of farm buildings and erection of single dwelling and detached garage outbuilding with associated parking and amenity space.	Fri 22 Sep 2017	Full	Permitted

13.5.7. There has been the potential for the creation of up to 4 villages in the vicinity of the Proposed Scheme, on land owned by the Homes and Communities Agency now known as Homes England, these have now been removed from the Local Plan.

Human health

13.5.8. Table 13-3 provides an overview of the health of the population in the WIA. This is provided at district level from Office of National Statistics (ONS) Census data and Public Health England (PHE) data. Consideration has been given to conditions and impairments that may be made worse by the Proposed Scheme due to an increase in air pollution or loss of public open space.

13.5.9. As shown in the table, the under 75 mortality rate due to cardiovascular disease is higher in Peterborough compared to both the regional and national averages. The percentage of physically active adults aged 19 and over is lower in Peterborough (61%) than the regional (67%) and national (67%) averages. Levels of obese children and excess weight in adults aged 18 and over are also higher in Peterborough compared to the East of England and nationally.

Table 13-3: Human health by location

Health profile category	Peterborough	Peterborough (%)	East of England	East of England (%)	England	England (%)
Under 75 mortality rate per 100,000 (cardiovascular)	79.7	n/a	64.7	n/a	73.5	n/a

Health profile category	Peterborough	Peterborough (%)	East of England	East of England (%)	England	England (%)
Percentage of physically active adults (aged 19+)	n/a	61	n/a	67	n/a	66
Obese children (aged 10-11)	n/a	23	n/a	18	n/a	20
Excess weight in adults (aged 18+)	n/a	63	n/a	62	n/a	61

Source: Public Health England (2017) Health profiles.

13.5.10. There are no healthcare facilities located within the LIA. Wansford surgery, Wansford pharmacy and Wansford Smile Studio Dental Practice are all located approximately 550m south of the Proposed Scheme on Yarwell Road.

13.5.11. The below table provides an overview of income deprivation at LIA, district, regional and national level. Income deprivation concerns those on low incomes who are in receipt of benefits and tax credits (Department for Communities and Local Government, 2015). The population is divided into 5 quintiles, with 1 being the most deprived and 5 being the least deprived.

13.5.12. Table 13-4 shows that the proportion of population that fall into the most deprived quintile in Peterborough (37%) is significantly higher when compared to the East of England (10%) and nationally (20%). In terms of the least deprived quintile, Peterborough has a significantly lower proportion of its population in this quintile (7%) compared to both the regional and national averages; 25% and 19% respectively.

Table 13-4: Population by income deprivation quintiles

Area	Most deprived quintile	Second most deprived quintile	Third most deprived quintile	Fourth most deprived quintile	Least deprived quintile
Peterborough	37%	24%	17%	15%	7%
East of England	10%	18%	24%	23%	25%
England	20%	21%	20%	20%	19%

Source: DCLG (2015) Indices of Deprivation, and (ONS) 2016 Mid-year population estimate

Local economy

13.5.13. Peterborough Unitary Authority has a population of 197,100, of whom 124,200 (63%) are of working age (16-64 years old). Children (aged under 16 years) make up 23% of the population, which is considerably higher than the national

average of 19%. Older people (over 65 years) comprise 14% of the general population, which is considerably lower than the national average of 18%.

13.5.14. Table 13-5 outlines the economically active population and, amongst them, those who are in employment and those who are unemployed. Both the economically active population and those in employment are lower in Peterborough compared to both the East of England and nationally. The unemployed population in Peterborough (6%) is largely in line with the East of England (4%) and nationally (5%).

Table 13-5: Employment and unemployment (Jan 2017 - Mar 2017)

All people	Peterborough Unitary Authority*	Peterborough Unitary Authority (%)**	East of England	East of England (%)	England (%)
Economically active	95,300	77	3,033,400	81	79
In employment	89,500	7272	2,919,800	78	75
Unemployed	5,800	6	113,600	4	5

Source: ONS annual population survey, Jan – Dec 2017.
Note: * numbers are for those aged 16 and over. ** % are for those aged 16-64

13.5.15. The English Indices of Deprivation 2015 are commonly used for the measurement and comparison of deprivation between neighbourhoods in England. In terms of deprivation, the neighbourhood that includes Wansford is ranked 23,406 out of 32,844 Lower Super Output Areas (LSOA) in England, with 1 being the most deprived LSOA. Sutton is located in the neighbourhood ranked 22,325. This indicates that Wansford is within the 30% least deprived neighbourhoods in England, and Sutton is within the 40% least deprived neighbourhoods. A further analysis of deprivation data at a district, regional and national level can be found below in Table 13-6.

Table 13-6: Population by deprivation quintile

Area	Most deprived quintile	Second most deprived quintile	Third most deprived quintile	Fourth most deprived quintile	Least deprived quintile
Peterborough	37%	24%	17%	15%	7%
East of England	10%	18%	24%	23%	25%
England	20%	20%	20%	20%	20%

Source: DCLG (2015) Indices of Deprivation, and ONS (2016) Mid-year population estimate

13.6. Consultation

13.6.1. No topic specific consultation has been undertaken at this stage. However, a public consultation process was undertaken from 13 March to 21 April 2017.

Refer to Chapter 4 – Consultation for further details of the public consultation. The outcomes of the consultation will be used as appropriate to inform any further assessment.

13.6.2. As outlined in section 13.3.9, confidential questionnaires will be issued to landowners and tenant farmers in relation to their agricultural land and farm status. Discussion with the local planning and economic development officers and key stakeholders (landowners and property agents) will also take place.

13.7. Design interventions

13.7.1. The most applicable mitigation for loss of private property community land, community facilities and development land is through effective design.

13.7.2. It should be ensured that the footprint of the Proposed Scheme is reduced as much as practicable, without adversely affecting the design. This minimises the total area of private property, community land, and development land affected. It also minimises: residential properties and businesses directly affected; and the number of community facilities directly affected.

13.7.3. It is likely that 1 private property will be demolished for the Proposed Scheme and permanent and temporary land-take will be required.

13.8. Potential mitigation measures

13.8.1. During construction, a Construction Environmental Management Plan (CEMP) will be prepared by the appointed contractor and implemented during construction. This will ensure construction is undertaken in as sensitive a manner as possible with regards to population and health receptors. The CEMP should incorporate:

- A Community Relations Strategy, managing communication with both the general public and local businesses prior to and during all construction works
- The Considerate Construction Scheme, informing local residents, businesses and other sections of the community about the Proposed Scheme
- A Traffic Management Plan (TMP), to manage all temporary diversions

Compensation

13.8.2. Third parties with an interest in land associated with the Proposed Scheme are defined under section 44 of the Planning Act (PA) 2008 and include:

- Owners, tenants, lessees or occupiers of the land
- People with an interest in the land or with the power to sell, convey or release the land

- People who would or might be entitled to make a relevant claim for compensation as a result of the development going ahead

13.8.3. Matters taken into account in determining compensation for land acquisition include, but are not limited to:

- Loss of land
- Loss of Income through activity (such loss of ability to use the land for a given purpose such as renting, shopping or leisure)
- Severance of services such as water supplies and other public or private utilities
- Severance of and injurious affection to the value of retained land
- Reasonable fees incurred in dealing with the claim for compensation

13.9. Potential impacts

Construction

Demolition of private property and associated land-take

13.9.1. One residential property located to the east of the disused railway line would be demolished for the Preferred Scheme. The property is located approximately 13 meters south of the A47, which provides sole access to the property. The demolition would result in approximately 1,850m^2 of permanent land- take from the private property and would cause major adverse impacts on residents.

13.9.2. Temporary land-take would be required to accommodate a construction compound for the Proposed Scheme. This construction compound, would be located to the north-west of Wansford picnic area and south of the existing A47. Access to the compound is planned to be 'left in / left out' and from the westbound carriageway of the A47. The amount of temporary land-take required for this compound is currently unknown.

Community land and community facilities

13.9.3. There would be approximately 820m^2 of land-take in the Wansford picnic area. As the access road to the public convenience would be cut off by the new MC20 Local Road, this facility may need to be demolished. This is likely to cause an adverse, but not major impact on users of both the picnic area.

Development land

13.9.4. There would be no impacts on development land throughout construction of the Proposed Scheme.

Human health

13.9.5. Several WCHR routes would be impacted both temporarily and permanently by the Proposed Scheme during the construction period. The Proposed Scheme is anticipated to have a direct but temporary impact on all WCHR routes outlined in Table 12-1, Chapter 12. Impacts are likely to relate to the temporary closure of routes for works to take place, and a possible increase in journey length and time. As well as this, the Proposed Scheme is likely to permanently impact approximately 4 WCHR routes during the construction stage (see Chapter 12).

13.9.6. Research suggests that access to green space (such as WCHR routes) can benefit an individual's health. For example, the proportion of green space is linked to self-reported levels of mental health for all ages and all socio-economic groups. Access to such space can help to improve companionship, a sense of belonging and identity, and overall levels of happiness. In terms of physical health, evidence shows that access to green space is associated with higher levels of physical activity, contributing to a reduction in long term conditions such as heart disease, cancer and musculoskeletal conditions. Access to green space is also particularly important to children. Not only is green space linked to reduced levels of obesity in children, it can also contribute towards their positive mental health and wellbeing because it encourages play.

13.9.7. Overall, should any impacts (both temporary and permanent) result in people being unable to access WCHR routes for physical activity and recreational purposes, there is potential for adverse impacts on the health of those who currently use these spaces.

Local economy

13.9.8. The Proposed Scheme will require a construction workforce to deliver it. At present, a construction strategy for the Proposed Scheme is not available and there is no information on whether workers will be new or existing employees of the designated contractor (who is yet to be appointed). There is also no information available on the skill levels likely to be required for delivery, and whether those workers can and will be drawn from the LIA or WIA. If the Proposed Scheme results in new employment in the area, this could have an impact on employment rates, resulting in a beneficial though not major impact.

13.9.9. For the duration of the construction phase, approximately 18 months, there would be construction workers on-site. It is anticipated that there would be a slight and indirect temporary beneficial impact on the local economy as a result of these workers using local hospitality and catering establishments, for example around mealtimes. This impact is also unlikely to be major as any uplift would be minor for a scheme of this size.

Operation

Private property and land-take

13.9.10. At this stage of assessment, there are not anticipated to be any operational impacts on private property and associated land-take.

Community land and community facilities

13.9.11. At this stage of assessment, there is not anticipated to be any impacts on community land and community facilities throughout operation.

Development land

13.9.12. It is possible that the implementation of the Proposed Scheme may affect proposed future housing developments on adjacent land.

13.9.13. It is possible that safeguarded land for future key walking and cycling infrastructure will be affected by the Proposed Scheme. Should such development plans still go ahead, there will need to be adequate infrastructure for pedestrians and cyclists to cross the A47. These effects will be considered in full as part of the assessment.

Human health

13.9.14. No human health impacts are expected to arise during operation. Operational impacts of noise and air quality are assessed in Chapter 5 Air quality and Chapter 11 Noise and vibration.

Local economy

13.9.15. Direct operational employment is not expected to be created as a result of the Proposed Scheme. However, there are likely to be increased indirect employment opportunities related to reduced congestion and improved journey times. Alone these are likely to be minor, but may be major when viewed cumulatively alongside other Proposed Schemes being undertaken on the A47. These are likely to be felt throughout Norfolk and will be assessed in full during the assessment.

13.10. Chapter summary

13.10.1. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated impacts associated with People and communities – social. Impacts are likely during the construction phase as result of land-take, human health impacts associated with severance of WCHR routes

and temporary employment generation. During the operational phase, there are likely to be impacts on development land and the economy.

13.10.2. Further work will be undertaken to develop design interventions to limit or reduce adverse impacts and promote opportunities for the environment in the study area wherever possible. Any design development and potential mitigation will would be reported in the ES as well as further detailing of baseline conditions and likely changes during both construction and operation for all identified receptors.

14. Road drainage and the water environment

14.1. Introduction

14.1.1. This chapter presents the preliminary findings of the road drainage and water environment assessment. This comprises a review of the existing environmental baseline information and identification of the potential impacts of the Proposed Scheme upon the water environment. The chapter also outlines proposed design measures to help mitigate potential impacts on the water environment and relevant consultation.

14.2. Guidance and best practice

14.2.1. The following legislation, standard and best practice guidelines are relevant to the Proposed Scheme:

- National Planning Policy Framework and its associated Technical Guidance
- Highways Act (1980)
- Highways (Environmental Impact Assessment) Regulations 2007 (EIA Highways Regulations 2007)
- Highways England's Design Manual for Roads and Bridges (DMRB) Section 2: General Principles of Environmental Assessment (Highways England, 2008)
- Highways England's DMRB Volume 11, Part 10 (HD 45/09) Road Drainage and Water Environment (Highways England, 2009)
- Directive 1991/676/EEC, more commonly known as the Nitrates Directive (1991)
- Directive 2000/60/EC, more commonly known as the Water Framework Directive (2000)
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- The Groundwater (WFD) (England) Direction 2016
- The Environment Agency's approach to groundwater protection (Environment Agency, 2017a)
- Best practice guidelines and procedures for pollution prevention and water management in construction as set out in the Construction Industry Research and Information Association (CIRIA) guidelines; CIRIA C532 (2002), CIRIA C648 (2006) and CIRIA C741 (2015).
- The Environmental Permitting (England and Wales) Regulations (2010) which replaces the Water Resources Act (1991) as the key legislation for water pollution in the UK.
- Infrastructure Planning EIA Regulations 2017

- Environment Agency's environmental permitting guidance (Environment Agency, 2018c)
- Planning Inspectorate Advice Note 18: The Water Framework Directive (PINS, 2017)
- Land Drainage Act 1991 and 1994
- Flood and Water Management Act (2010)
- The Environment Act (1995)
- The Water Act (2014)
- Peterborough New Local Plan 2016 – 2036 Policy LP33 Flood and Water Management
- Peterborough Local Development Framework Supplementary Document: Flood and Water Management adopted 2012
- Peterborough Core Strategy CS22 Flood Risk

14.3. Study area

14.3.1. The study area is inclusive of a 1 kilometre buffer around the Proposed Scheme. This is considered to be a reasonable screening buffer beyond which, any impacts on surface water or groundwater are unlikely to be discernible. The study area would be extended to include downstream water environment features beyond 1 kilometre if additional information suggests that they may be at risk from either the construction activities or during the operation phase. The full extent of the study area will be confirmed as part of the Environmental Statement (ES) when further design details are available.

14.4. Assumptions and limitations

14.4.1. This report has been prepared using publicly available information, with reference to previous reports carried out at Highways England's Project Control Framework Stages 1 – 3 and Highways England's Drainage Data Management System (HADDMS). The assessment presented is based on a desk-based study and an initial site visit has been undertaken. Considering the nature of the Proposed Scheme, it is not considered that the data limitations introduce any uncertainties with respect to surface water, groundwater, and flood risk. A site visit will be carried out as part of the ES.

14.4.2. The assessment of the Proposed Scheme drainage will be reported in the ES.

14.4.3. Construction methods are currently unknown and so the assumption has been made that construction will follow current best practice and guidelines.

14.5. Baseline

Surface water

14.5.1. The Proposed Scheme is situated adjacent to the northern bank of a meander in the River Nene, which flows in an easterly direction. Several large, off-line lakes and channels are present to the south of the main river channel.

14.5.2. The Wittering Brook flows through the Proposed Scheme area in a southerly direction, passing beneath the A47 in a 1.83m semi-circular culvert, before discharging into the River Nene.

14.5.3. The Mill stream flows in an easterly direction, approximately 330m north of the A47. It passes beneath the A1 within the Proposed Scheme boundary, before flowing, via a large mill pond at Sacrewell Farm, into the Wittering Brook, 500m north of the Proposed Scheme boundary.

14.5.4. There are various un-named water features located within the vicinity of the Proposed Scheme, including 29 small lakes and ponds in the neighbouring fields and 10 drainage channels. There are 3 southward flowing drainage channels located to the north of the A47, east of The Drift. Two of these are culverted beneath the A47 and the easternmost flows into a pond, which lies within the footprint of the Proposed Scheme.

14.5.5. The Proposed Scheme is situated wholly within a Surface Water Nitrate Vulnerable Zone (NVZ) and a Drinking Water Protected Area (DWPA) and, partially (at the western end) within a Drinking Water Safeguard Zone (DWSZ The River Nene is a significant water resource, with a low flow Q95 estimate of 112 Ml/d at Wansford. There are 2 surface water abstractions located on the Mill Stream, north of the A47, and a third located on the River Nene at Wansford Pumping Station (operated by Anglian Water). River water is pumped to Rutland Water (located approximately 20 kilometres to the north-west) through pipes set in a concrete duct below the A47. Rutland Water is a public water supply reservoir, DWPA, Sites of Special Scientific interest (SSSI), Special Protection Area (SPA) and Ramsar site.

Groundwater

14.5.6.

14.5.7. Environment Agency aquifer designations for the geological units underlying the Proposed Scheme are given in Table 14-1below.

Table 14-1: aquifer designations for the geological units underlying the Proposed Scheme

Aquifer class	Formation	Aquifer description
Principal	Blisworth Limestone, Lincolnshire Limestone	Permeable deposits with high intergranular and/or fracture permeability; usually provide a high level of water storage; may support water supply and/or river base flow on a strategic scale.
Secondary A	Alluvium	Permeable deposits capable of supporting water supplies at a local rather than strategic scale; may be an important source of base flow to rivers.
Secondary B	Rutland	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary Undifferentiated	River Terrace Deposits	Permeable deposits with variable characteristics so cannot be categorised A or B; assumed for groundwater protection purposes to have similar resource value to Secondary A Aquifers.
Unproductive	Lias Clay	Deposits with low permeability that have negligible significance for water supply or river base flow.

14.5.8. A groundwater Source Protection Zone (SPZ) 3 (Outer Zone) is present approximately 1.4 Kilometre north of the A47, cutting across the Sutton Heath Road.

14.5.9. There is 1 licensed groundwater abstraction from the glacial sands and gravel, located approximately 800m south of the Proposed Scheme boundary (eastern end). There are 2 registered private supply wells located on the Principal Aquifer, approximately 700m west and 1 kilometre south-west of the Proposed Scheme. A de-regulated (formerly licensed) abstraction that has not been registered with the local authority but may still be in use, is located at Sacrewell Lodge, approximately 400m north of the Proposed Scheme. British Geological Survey (BGS) records indicate a further 6 historical wells may have been present within approximately 1 kilometre of the Proposed Scheme.

14.5.10. Regionally, groundwater flow is eastwards, towards the coast. Locally, groundwater flow is likely to be primarily towards the Wittering Brook and River Nene. Groundwater levels are likely to be shallow, particularly in the vicinity of the River Nene in the central section of the route.

14.5.11. There is a residential property named ‘Deep Springs’ located to the east of the dismantled railway and south of the A47, suggesting that springs may be present nearby, there is a disused well located at this property. Ordnance Survey mapping shows springs feeding the Mill Stream 2-3 kilometres upstream of the Proposed Scheme boundary and it is likely that the watercourse is fed by groundwater throughout its length.

14.5.12. Soils in the area have a high leaching potential, meaning that they are able to transmit a wide range of pollutants to the underlying groundwater table.

14.5.13. The western half of the Proposed Scheme lies within a Groundwater Nitrate Vulnerable Zone (NVZ).

Water framework directive

14.5.14. The Proposed Scheme lies within the Anglian River Basin District. The Water Framework Directive (WFD) classifications (2016 - Cycle 2) for the River Nene and Wittering Brook (including the Mill Stream) surface water bodies are summarised in Table 14-2. Classifications for the 3 WFD groundwater bodies underlying the Proposed Scheme are summarised in Table 14-2.

Table 14-2: WFD surface water bodies

Water Body Name:	River Nene (Islip to Tidal)	Wittering Brook
Water Body ID	GB105032050381	GB105032050350
Hydromorphological designation	Heavily modified	Not artificial or heavily modified
Overall Ecological Status / Potential	Moderate	Moderate
Overall Chemical Class	Good	Good
Reasons for deterioration / not achieving Good	Physical modification, diffuse agricultural pollution (phosphate) and sewage discharge (phosphate)	Diffuse agricultural pollution (phosphate) and sewage discharge (phosphate)

Table 14-3: WFD groundwater bodies

Water Body Name:	Welland Limestone Unit A	Northampton Sands	Nene Mid Lower Jurassic Unit
Water Body ID	GB40501G445900	GB40501G445500	GB40502G402400
Location	Western and eastern extents of the study area (Wansford, Yarwel and between Sutton and Castor)	Eastern extents of the study area (north of Sutton)	Central section of the study area, (between Wansford and Sutton)
Overall status	Poor	Good	Good
Quantitative Status	Poor	Good	Good
Chemical Status	Poor	Good	Good
Reasons for deterioration / not achieving Good	Landfill leaching and groundwater abstraction	None	None

Flood risk

14.5.15. The Mill Stream and Wittering Brook are Ordinary Watercourses, maintained by Peterborough City Council. The River Nene is a Main river, maintained by the Environment Agency. The Proposed Scheme does not fall within the area of responsibility for any internal drainage board: (https://www.ada.org.uk/member_type/idbs/).

14.5.16. The embankment of the proposed road abuts a section of the north bank of the River Nene at a large meander, flowing west to east (Appendix C). At the closest point the road embankment is 13m from the river bank.

14.5.17. The land immediately surrounding the River Nene and Wittering Brook watercourses is located within Flood Zones 2 and 3 for fluvial flooding, these are predicted flood levels and historical incidents are recorded on the HADDMS database. Flood Zone 2 has an annual expected probability (AEP) of flooding of 1.0-0.1%. Flood Zone 3 has an AEP of >1%. Land outside these areas lies within Flood Zone 1 and has an AEP of <0.1% AEP.

14.5.18. The risk of surface water flooding is medium to high within the immediate vicinity of the River Nene and Wittering Brook (and their tributaries) and notably, upstream of the Wittering Brook A47 culvert. The existing A47 route is largely unaffected by surface water flooding, with the exception of the crossing of Wittering Brook which is expected to experience flooding during a 1-in-30 year flood, a 1-in-100 year flood and a 1-in-1,000 year flood.

14.5.19. The HADDMS holds records of low severity flooding in October 2009 along the existing A47 route approximately 120m and 180m east of the A47 Great North Road slip road 2009 and medium severity flooding in March 2016 along the A47 route approximately 115m west of the Nene Way Roundabout.

14.5.20. The study area is potentially at risk from groundwater flooding. HADDMS records indicate that the superficial deposits in the western and northern extents of the study area have a groundwater flood risk greater than or equal to 25% and less than 50% and the superficial deposits in the centre of the study area have a flood risk greater than or equal to 75%. The A47 route is considered to have a low to high risk of groundwater flooding (Highways England, 2016c).

14.5.21. Groundwater flooding could occur as a result of high groundwater levels within the limestone or in association with high surface water levels in the River Nene. Permeable superficial deposits (such as the River Terrace Deposits) could provide a pathway to the Proposed Scheme from either of these sources. Potentially susceptible areas are considered to be the low ground alongside the Wittering Brook and Sacrewell stream. Both watercourses are fed by groundwater springs and may have some interaction with groundwater along their lengths.

14.5.22. The Proposed Scheme has the potential to increase the risk of groundwater flooding if any sub-structures (e.g. embankment footings, sheet piles, retaining walls, ground improvement measures, etc.) obstruct groundwater flow within the permeable superficial deposits. This could result in the emergence of groundwater on the up-gradient side of the structure.

Drainage

14.5.23. HADDMS indicates that the A1 discharges to the Mill Stream, on the upstream side of the culvert. HADDMS does not show any outfalls to the Wittering Brook or River Nene therefore it is assumed that drainage for the A47 currently discharges on to the surrounding land or via soakaways (HADDMS indicates that several are present).

Aquatic ecology

14.5.24. Otter, water vole and white-clawed crayfish have been identified within the vicinity of the Proposed Scheme. Please refer to Chapter 8 Biodiversity for further details.

Conservation sites

14.5.25. There are several water dependent designated conservation sites within the vicinity of the Proposed Scheme, as follows (note that all distances are approximate from Proposed Scheme boundary).

14.5.26. The Sutton Heath and Bog SSSI lies adjacent to the northern boundary of the Proposed Scheme, on the eastern bank of the Wittering Brook. The site is partially designated for base-poor marshland species that are dependent on springs emanating from the base of the Lincolnshire Limestone Formation and/or Grantham Formation and is thought to be fed by recharge to the eastern half of the site (Environment Agency, 2018e). The Environment Agency's detailed river network map (HADDMS) indicates that by there are 5 sources within the SSSI boundary 2 culverted streams flowing into the SSSI.

14.5.27. Stibbington Pits is a County Wildlife Site comprising the off-line lakes located on the south side of the River Nene, 53m from the Proposed Scheme.

14.5.28. Wansford Pasture SSSI, located 280m south-west of the Proposed Scheme, is designated for spring-supported limestone grassland.

14.5.29. Castor Flood Meadows SSSI is present on both sides of the River Nene, downstream of the Proposed Scheme, 2.2 kilometres to the south-east. Designated species are dependent on the soil water content and the River Nene. The River Nene flows into the Nene Washes (SSSI / Special area of Conversation (SAC) / SPA / Ramsar), located 9.5 kilometres east of the Proposed Scheme. This is a washland habitat (where water levels are controlled to manage floodwater) that supports water fowl and wetland plants. Wansford Pasture (SSSI) is located upstream, 450m to the south-west, and fed by springs flowing from the limestone bedrock.

14.5.30. River water abstracted at Wansford pumping station is transferred directly to Rutland Water, located approximately 20 kilometres to the north-west. Rutland Water is a public water supply reservoir, DWPA, SSSI, SPA and Ramsar site.

Water Resources and Drainage Assets

14.5.31. An Environment Agency river level monitoring station is located on the River Nene, within the current Proposed Scheme boundary.

14.5.32. Anglian Water operates Wansford Pumping Station, which is located outside of the Proposed Scheme boundary, between the existing A47 and the river. The river intake is located within the Proposed Scheme boundary, immediately downstream of the gauging station. Raw water mains run north from the pumping station, below the existing A47, to Rutland Water.

14.5.33. Anglian water is also responsible for foul and surface water sewers in the area. Peterborough City Council is responsible for existing highway drainage.

14.6. Consultation

14.6.1. An initial consultation meeting was held with the Environment Agency on 24 May 2018 (at the Kettering office) to present the Proposed Scheme and discuss issues relating to this chapter of the assessment. Outcomes from the meeting are detailed in their letter dated 05 June 2018 (Environment Agency, 2018e), presented in Appendix D.

14.6.2. The following organisations with interest in road drainage and the water environment will also be consulted during the statutory consultation period for the Proposed Scheme:

- Peterborough City Council as Lead Local Flood Authority, in relation to surface water flooding and the Wittering Brook / Mill Stream ordinary watercourses
- Anglian Water, in relation to the protection of raw water mains and any proposed connection to, or impact on sewerage systems

14.7. Design interventions

14.7.1. The Proposed Scheme would include areas of new carriageway and hardstanding. These areas would drain, via new infrastructure, to the Wittering Brook, River Nene and groundwater. There would be new soakaways and balancing ponds to receive and treat highway drainage from the A47, using appropriate Sustainable Drainage System (SuDS) treatment methods.

14.7.2. Areas of the existing A47 that are not retained for access would be removed and landscaped, to offset the increase in impermeable area as a result of the Proposed Scheme. The remaining areas of existing hardstanding would continue to discharge at reduced rates, to existing drainage networks and subsequent outfalls to the River Nene and the Wittering Brook.

14.7.3. The net increase in volume of surface run-off will be infiltrated where possible or attenuated prior to discharge at pre-development (greenfield) rates, to ensure there is no impact fluvial and surface water flood risk.

14.7.4. All new drainage associated with the Proposed Scheme would comprise SuDS, where appropriate and subject to suitable ground conditions. Permanent SuDS features would be designed in accordance to the relevant Design Manual for Road and Bridges (DMRB) Standards (Highways England, 2016a; 2016b) and the SuDS Manual (CIRIA, 2007). Bypass interceptor drains may be used upstream of soakaways where required, to reduce the impact on groundwater quality from routine run-off and accidental spillages at the western roundabouts. SuDS measures will be used, where appropriate, to mitigate the impact of routine run-off on the water quality.

14.7.5. The proposed new culvert extensions and any diversions to the Mill Stream and Wittering Brook would be designed to minimise impacts, and where possible to provide a beneficial impact on flood risk, water quality, aquatic and riparian habitats, and geomorphology. At present there is no proposed change to the capacity of these culverts although consultation may determine capacity should be increased.

14.7.6. The proposed embankment will encroach into Flood Zones 2 and 3, reducing flood plain storage and increasing upstream flood risk. This will be mitigated through the provision of compensation storage (on a level for level, volume for volume basis) elsewhere within the Proposed Scheme.

14.7.7. Further design interventions may be required and identified during the design process and preparation of the ES when further details on the Proposed Scheme drainage are available.

14.8. Potential mitigation measures

Construction

14.8.1. During construction, best practice guidelines and procedures for pollution prevention and water management would be included as part of the overall Construction Environment Management Plan (CEMP). The CEMP will incorporate best practice as set out in Construction Industry Research and Information Association (CIRIA) guidelines CIRIA C532, (CIRIA, 2002); CIRIA

C648, (CIRIA, 2006); and CIRIA C741, (CIRIA, 2015a) and Environment Agency Pollution Prevention Guidelines (Environment Agency, 2014); and the Environment Agency's approach to Groundwater Protection (Environment Agency, 2017a). Prior to the construction works adjacent to the River Nene a detailed construction mitigation plan will be developed in conjunction with the Environment Agency (EA) and any permits will be in place.

14.8.2. The potential for impacts to occur as a result of storage of materials would be minimised by locating compounds for the storage of construction materials or temporary stockpiling of excavation materials away from the surface watercourses and drains. Drums and barrels would be properly labelled and fitted with flow control taps and stored in a designated, bund safe area within the site compound.

14.8.3. Before any discharge of water is made from the site, appropriate settlement techniques would be used. All roads and hardstanding would be kept clean and tidy to prevent the build-up of pollutants, although the use of water sprays for reducing dust or washing construction areas would be carefully managed in order to avoid washing substantial quantities of silt (etc.) into surface water receptors. Where appropriate, watercourses would be shielded by bunds to prevent contamination from surface water run-off.

14.8.4. The potential for impacts to occur as a result of contamination from accidental spillage would be minimised by the inclusion of emergency response procedures in the CEMP to handle any leakage or spillage of potentially contaminating substances. Spill kits would be located on-site near to watercourses and within the works compounds and staff would be trained in their use.

14.8.5. It is assumed that temporary watercourse crossings during construction would be required as part of the Proposed Scheme. These would be designed to minimise impact on flood risk and water quality.

14.8.6. Further mitigation measures may be required and identified during the preparation of the ES when further details on the Proposed Scheme drainage are available.

Operation

14.8.7. The potential impacts of the Proposed Scheme during the operation phase include:

- The River Nene is a sensitive watercourse due to the presence of the raw water transfer abstraction to Rutland Water and downstream national and international conservation sites. There is also a SSSI located immediately upstream of the Proposed Scheme on the Wittering Brook and sensitive

aquatic ecology has been identified locally. As recommended by PINS (Environment Agency 2018e), spillage containment will be incorporated into the Proposed Scheme design. The level of risk and (if required) containment volume will be assessed using the Highways Agency Water Risk Assessment Tool (HAWRAT) spillage risk assessment tool.

- The Mill Stream and Wittering Brook culverts would be designed to allow for current flood flows plus climate change, so would not impact on flood risk. A flood risk assessment (FRA) will be undertaken to evaluate the impacts of these impacts, determine the necessary storage volumes and appropriate SuDS components, so that these can be allowed for in the Proposed Scheme design.
- Climate change allowances will be based on the latest published guidance and agreed in consultation with the Environment Agency and Lead Local Flood Authority, who will be consulted regarding both the scope and findings of the FRA.
- The ecological sensitivity of watercourses directly impacted by culvert modification will be confirmed by a site inspection to ensure that any necessary mitigation can be incorporated into the design.
- There is potential to impact locally on shallow groundwater levels on the upgradient (north) side of the embankment, with potential impacts on the ecology of Sutton Heath Bog SSSI. The embankment will be designed to replicate the existing ground conditions and ensure that groundwater levels within the SSSI are unaffected.

14.8.8. Further potential operational impacts may be identified during the preparation of the ES when further details on the Proposed Scheme drainage are available.

14.9. Potential impacts

Construction

14.9.1. The potential impacts of the Proposed Scheme during construction include the following:

- The Sacrewell Farm overbridge will require demolition of the existing structure and embankment construction to provide ramps up to the structure. Access to the flood gauging station, pumping station, telecoms mast and other infrastructure situated at this location may be impacted by construction access requirements and the permanent works embankment.
- Works undertaken within the flood plain may impact temporarily on flood risk by reducing floodplain storage.

- Due to the proximity of surface water resources, there is the potential for direct impacts on surface water quality and flow characteristics during the construction of the Proposed Scheme.
- The A1 off-slip and the dualling of the A47 are likely to require the widening of the existing (A1) culverts located on Mill stream and, the construction of a new (A47) culvert on Wittering Brook. This work has the potential to temporarily impact surface water flow and fish / eel passage (if present) within these watercourse, as well as channel morphology and the identified crawfish. A culvert extension and new settlement pond will also be needed on the drain passing through the Proposed Scheme footprint west of Nene Way however this ditch is likely to be of low sensitivity therefore impacts would be limited.
- There is the potential for mobilisation of sediment and contaminants from road runoff to the watercourses as a consequence of construction works, particularly at site access points and the locations of major earthworks associated with the proposed embankments and bridges.
- Construction activities could temporarily increase the risk of a pollution incident at the site of works, associated with contaminated land or spills/leaks of chemicals. This could adversely impact on water quality at the nearby conservation sites. However, with appropriate mitigation measures and best practice (such as Environment Agency Pollution Prevention Guidance (PPG)) in place, the risk is considered to be minimal. Any construction activities on or near a Main River would require an Environmental Permit from the Environment Agency. Any works on or to a public sewer would require consent from the sewerage undertaker.
- Any piling or excavation could adversely impact water quality in the superficial and bedrock aquifers with potential impacts on spring flow, groundwater quality and surface water quality. Piling is not proposed currently but cannot be excluded as a possible requirement as the design progresses. The potential risk from contaminated land would be assessed through a land quality risk assessment (see Chapter 9, Geology and soils) and the works themselves would be subject to a foundation works risk assessment to determine the most appropriate methods of construction and mitigation.
- There are several known licenced and private groundwater abstractions within the study area but all are located up-gradient of the works so are unlikely to be impacted. There is 1 historical, de-regulated abstraction located at Sacrewell Farm which, if still in use, could be impacted by turbidity or any pollution as a result of piling or ground disturbance.

Operation

14.9.2. There is the potential for direct impacts during the operation of the Proposed Scheme on surface water quality. There is potential for an increase in routine pollutant inputs to surface water and flow characteristics (groundwater flows, surface water runoff flows and flood risk. The drainage strategy will mitigate for these adverse impacts.

14.9.3. There is potential for an increase in routine pollutant inputs to surface water and groundwater from road drainage or spillage risk, should the overall volume of traffic movements increase. Traffic modelling will be undertaken during the assessment and will be used to inform a Highways Agency Water Risk Assessment Tool (HAWRAT).

14.9.4. Water quality impacts will be mitigated through the use of SuDS drainage and spillage containment, as described in design interventions. Therefore, no major impacts on water quality is anticipated.

14.9.5. The increase in impermeable surface area due to the Proposed Scheme will increase the volume of surface runoff and therefore impact upon fluvial and surface water flood risk. The Proposed Scheme footprint will encroach into Flood Zones 2 and 3, reducing flood plain storage and increasing upstream flood risk. Flood risk impacts will be mitigated through the attenuation and infiltration of runoff to agreed rates and the provision of flood plain compensation storage, therefore no major impact is anticipated.

14.9.6. There is the potential for impacts on ecological sensitivity of watercourses directly impacted by culvert modification. Removal of the redundant weir on Wittering Brook, upstream of the existing A47 culvert, will have a beneficial impact on the flow regime and ecology of the watercourse.

14.10. Chapter summary

14.10.1. This chapter has summarised the current understanding of the baseline conditions, mitigation and likely anticipated impacts upon road drainage and water environment. Impacts may occur during the construction and operation phases, and impact on surface water and groundwater receptors. Stream, ponds and water features within the study area, and any associated abstractions

14.10.2. Impacts during construction would associate with accidental spillage of construction materials, earthworks, dewatering, piling and foundation construction, and changes to the River Nene floodplain and surface water courses.

14.10.3. Impacts during operation would associate with road drainage discharges of routine road run-off and accidental spillages to both ground and surface water receptors, culverting and diversion of the Wittering Brook and the Mill Stream, changes to the River Nene floodplain and land drainage, and road foundations and piling.

14.10.4. Further work would be undertaken to develop design interventions to limit or reduce adverse impacts and promote opportunities for the environment in the study area wherever possible. Design development and potential mitigation would be reported in the ES as well as further detailing of baseline conditions and likely changes during both construction and operation for all identified receptors.

15. Climate

15.1. Introduction

15.1.1. This chapter presents the preliminary findings of the Climate assessment. This comprises a review of the existing environment and identification of the potential impacts of the Proposed Scheme in the context of climate. The chapter also outlines proposed design measures to help mitigate potential landscape and visual impacts and relevant consultation.

15.1.2. This chapter outlines potential impacts relevant to climate that are anticipated from preliminary studies in relation to the Proposed Scheme.

15.2. Guidance and best practice

15.2.1. The Climate Change Act (2008) sets legally binding targets for reducing the UK's carbon emissions by 80% by 2050, relative to a 1990 baseline. The Environmental Impact Assessment (EIA) Directive (2014/52/EU) and subsequent updates to UK EIA regulations also now include a requirement to assess the impacts of projects on climate and their vulnerability to climate change.

15.2.2. To align with the requirements of the Infrastructure Planning EIA Regulations 2017 and the National Policy Statement for National Networks (NNNPS) 2014, the chapter covers 2 separate aspects:

- Effects on climate – i.e. effects on climate from carbon emissions arising from the Proposed Scheme, including how the project may affect the ability of the UK Government to meet its carbon reduction targets (in accordance with NNNPS paragraph 5.17)
- Vulnerability of the Proposed Scheme to climate change – i.e. the resilience of the Proposed Scheme to climate change impacts, including how the Proposed Scheme will take account of the projected impacts of climate change (in accordance with NNNPS paragraph 4.40 and the infrastructure planning EIA Regulations 2017)

15.2.3. For the purposes of this report, the term 'carbon' will be used as shorthand to refer to all relevant Greenhouse Gas (GHG) emissions.

15.2.4. The following guidance documents have also been used to inform the assessment:

- Highways England Major Projects' Instructions 'Environmental Impact Assessment: Implementing the Requirements of 2011/92/EU as amended by 2014/52/EU (EIA Directive)'

- Climate Adaptation Risk Assessment Progress Update (Highways England, 2016)
- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment guide to Climate Change Resilience and Adaptation (IEMA, 2015)
- IEMA's Guidance on Assessing the GHG Emissions and Evaluating their Significance (IEMA, 2017)
- Transport Analysis Guidance (TAG) Unit A3 Environmental Impact Appraisal (DfT, 2015) Chapter 4 Greenhouse Gases
- Publicly Available Specification (PAS) 2080:2016 Carbon Management in Infrastructure (British Standards Institution, 2016)

15.3. Study area

Effects on climate

15.3.1. The effects on climate assessment considers the carbon emission potential of the Proposed Scheme for both construction and operation (for this assessment the operation is considered to be the design life of the Proposed Scheme).

15.3.2. In the subsequent Environmental Statement (ES), embodied carbon emissions associated with the Proposed Scheme construction would encompass sourcing, manufacturing and transport of materials where practicable, as well as fuel associated with construction plant.

15.3.3. Operational carbon emissions associated with end-users of the Proposed Scheme (i.e. vehicle tailpipe emissions) will be assessed and reported in line with Design Manuel for Roads and Bridge (DMRB) Volume 11 Section 3 Part 1 (HA 207/07).

15.3.4. In accordance with Highways England Major Projects' Instructions, emissions associated with the end of life stage (i.e. decommissioning) will not be reported due to the uncertainty associated with the length of operation (use stage).

Vulnerability of the Proposed Scheme to climate change

15.3.5. For the purposes of the vulnerability assessment, the study area has been defined as follows in accordance with Highways England Major Projects' Instructions:

- the area of temporary and completed works within the Proposed Scheme boundary

- affected receptors identified within other environmental factors scoped into the assessment (reported within the relevant topic text within the Cumulative Assessment, where applicable)

15.3.6. The vulnerability of the Proposed Scheme to climate change during both construction and operation are considered, the latter of which is informed by the design life of the Proposed Scheme and the availability of UK Climate Projections.

15.3.7. For the purposes of assessing the climate baseline and future climate projections, data used is from the Met Office (2016). The Met Office uses regional climate data with the Proposed Scheme falling in the Eastern England region. This includes the counties of Bedfordshire, Cambridgeshire, Norfolk, Suffolk, Lincolnshire, the East Riding of Yorkshire and parts of Essex and Hertfordshire.

15.4. Assumptions and limitations

15.4.1. Data pertaining to the climate baseline and future projections are based on available information from third parties, including the historical meteorological variables recorded by the Met Office and the UK Climate Projections (UKCP09) developed by the Met Office.

15.4.2. Uncertainty is inherently associated with climate change projections, as they are complex in nature and based upon various assumptions including future global emissions trajectories. The level of uncertainty associated with projections also varies between climate variables. For example, projections related to wind and extreme weather events are considered more uncertain than those pertaining to temperature and precipitation. Similarly, the degree of uncertainty associated with all climate change projections increases with time.

15.4.3. The Mott MacDonald Sweco Joint Venture have not independently verified the climate projections. Issued reports are relevant to the Proposed Scheme information provided and are not intended to address changes in project configuration or modifications which occur over time.

15.4.4. Accordingly, any further research, analysis or decision-making should take account of the nature of the data sources and climate projections and should consider the range of literature, additional observational data, evidence and research available, and any recent developments in these.

15.4.5. There is currently no preferred methodology for the assessment of climate change (mitigation or adaptation) within EIA. Therefore, a qualitative methodology for assessing the vulnerability of the Proposed Scheme to climate

change has been used in line with DMRB Volume 11 Section 2 Part 5 and reported within the ES.

15.5. Baseline

Effects on climate

15.5.1. The carbon baseline has been taken as the current situation in which no proposed infrastructure is built, this includes existing travel and traffic patterns.

15.5.2. The availability of carbon baseline data specific to the study area is currently limited, therefore, existing carbon emissions have been considered from a variety of sources (e.g. published local authority data) in the proximity of the Proposed Scheme, including those from transport infrastructure.

15.5.3. Peterborough County Council greenhouse gas emissions in 2015 were 1,048.4kt of CO_2.

15.5.4. From a UK perspective, national greenhouse gas emissions in 2016 decreased by 41% from 1990. In 2016, UK net CO_2e emissions were estimated at 468 million tonnes, a decrease of 5% in comparison to 2015 levels (Department for Business, Energy and Industrial Strategy, 2018). In 2016, 26% of UK greenhouse gas emissions were from the transport sector with emissions of 125 $MtCO_2e$ in 2016 (National statistics, 2016).

15.5.5. The transport sector emissions specifically in Peterborough in 2015 were 436.8kt CO_2 which is a 4.6% reduction since 2005. Specifically, for A-roads in 2015, 253.8kt CO_2 were emitted in Peterborough, which is a 5.9% reduction since 2005.

Vulnerability of the Proposed Scheme to Climate Change

15.5.6. A current climate baseline for the wider region has been compiled using Met Office (2016) regional climate data for the Eastern England region. High-level climate observations for the region over a 30-year averaging period (1981-2010) are presented in Table 15-1.

Table 15-1: Historic climate baseline for Eastern England (for the period 1981-2010)

Climate Variables	Climate Observations
Temperature	Mean daily minimum temperatures can range from 0°C to 2°C in winter, whilst summer daily maximum temperatures are in the region of 22°C.
Rainfall	Eastern England includes some of the driest areas in the country, with the majority of the region receiving less than 700mm of rainfall annually, distributed fairly evenly throughout the year. On average, the region experiences approximately 30 rain days during the winter months (December – February) and under 25 days during the summer period (June – August). Despite generally low levels of precipitation, the area has encountered a number of

Climate Variables	Climate Observations
	severe storms which can contribute significantly to total annual rainfall and may also result in the occurrence of hail.
Wind	Eastern England is 1 of the more sheltered parts of the UK, however the winter months are when the strongest winds are experienced. Wind direction is fairly consistent across the region; speeds are generally greater in coastal locations than inland, and gusts exceeding 167km/h have been recorded in East Anglia. The frequency of tornadoes is greatest in eastern England relative to other parts of the UK, nevertheless, the intensity of these events remains minor.
Sunshine	Average annual sunshine in the wider region ranges from approximately 1,450 hours over Lincolnshire and East Yorkshire, to over 1,600 hours in east Norfolk, Suffolk and Essex.
Air Frost	The average number of days with air frost ranges from less than 30 (coastal) to 55 (inland) per year.

Source: Met Office (2016) Regional Climate Data

15.5.7. The UK Climate Projections (UKCP09) provide regional climate projection information, for which the Proposed Scheme is included within the East of England Administrative Region. The East of England region is predicted to experience changes in temperature, rainfall, and frequency of extreme weather events as a consequence of climate change. These changes are predicted to occur under all 3 carbon emissions scenarios (i.e. low, medium and high), which are incorporated into the climate change models prepared by the Met Office Hadley Centre. The general trend for the region is warmer, drier summers and warmer, wetter winters.

15.5.8. Under the high emissions scenario (50th percentile) for the 2080s, projected changes in climatic conditions are as outlined in Table 15-2.

Table 15-2: Future climate projections for Eastern England (2080s, under high emissions scenario)

Climate Variables	Climate Observations
Temperature	The average summer temperature is projected to increase by 4.5°C under the central estimate, which represents 'as likely as not' probability of change (50th percentile), and average winter temperature is projected to increase by 3.7°C (50th percentile).
Rainfall	Average summer rainfall is projected to decrease by 27%, whereas average winter rainfall is projected to increase by 26% (in the 50th percentile or central estimate of the projections for both).
Wind	Climate projections for wind are more uncertain than those for temperature and precipitation, due to inherent difficulty in modelling future wind conditions. However, overall an increase in extreme weather including wind is projected (Committee on Climate Change, 2017).

Source: UKCP09 Climate Projections

15.5.9. Climate projection data corresponding to the 2080s (2070-2099) under a high emissions scenario represent a conservative approach to the use of climate projections in the UK, and have been selected in line with NPS paragraph 4.41, which states:

- "Where transport infrastructure has safety-critical elements and the design life of the asset is 60 years or greater, the applicant should apply the UK Climate Projections 2009 (UKCP09) high emissions scenario (high impact, low likelihood) against the 2080 projections at the 50% probability level."

15.6. Consultation

15.6.1. No external consultation has been undertaken for the assessment at this stage. This would be undertaken, where necessary, as part of the ES. Consultation with the Proposed Scheme design team and environmental specialists is currently on-going and outcomes would be reported within the ES.

15.7. Design interventions

15.7.1. The current Proposed Scheme does not accommodate any specific climate design interventions. The scope to incorporate design interventions is part of the ongoing design development process and would be presented in the ES. Typical climate related interventions include minimising; design footprint, lighting and material use.

15.8. Potential mitigation measures

Effects on climate

15.8.1. In accordance with Highways England's Major Project Instructions, projects shall seek to minimise emissions as far as practicable in all cases in order to contribute to the UK's net reduction in carbon emissions. Mitigation of effects on climate (i.e. carbon emissions associated with the Proposed Scheme) will primarily take place throughout the design process in accordance with the principles of PAS 2080 (Carbon Management in Infrastructure). Details of any mitigation measures relevant to climate would be reported in the subsequent ES.

15.8.2. The duration of the construction works for the Proposed Scheme is anticipated to be approximately 18 months. As outlined in chapter 5 and 10 (Air quality and Materials), measures to be included in the Construction Environmental

Management Plan (CEMP) will serve to limit emissions. This mitigation could include the following:

- reduction of raw material usage and recycling
- the use of local suppliers
- ensuring vehicle engines and plant motors are switched off when not in use
- Further assessment of the carbon emissions associated with the Proposed Scheme would be reported in the ES

Vulnerability of the Proposed Scheme to climate change

15.8.3. The Proposed Scheme may be subject to weather extremes during construction, although it is not anticipated that significant climate change impacts would occur during the short construction period. Due to the Construction works are not being considered vulnerable to climate change, no associated mitigation, other than what would be reasonable site practice in relation to extreme weather events at the time of design finalisation, is considered to be necessary. This will be covered by the CEMP.

15.8.4. Any operational climate mitigation measures would be outlined within the ES.

15.9. Potential impacts

Effects on climate

15.9.1. IEMA guidance on assessing GHG emissions and evaluating their significance indicates that climate change and its consequences have the potential to lead to significant environmental effects (e.g. increased rainfall, sea level rise). Therefore, carbon associated with the Proposed Scheme should be minimised through mitigation measures, especially during the design development process.

15.9.2. Carbon emissions from infrastructure can be distinguished based on the stage at which they arise. Capital or embodied carbon refers to emissions associated with the creation of an asset, and this often aligns with the concept of capital cost. Operational carbon describes emissions associated with the operation and maintenance of an asset, analogous to operational cost. End-user carbon encompasses emissions from the end-users of infrastructure assets. For the purposes of this assessment, end-user carbon may be considered part of the ‘operation’ phase as it primarily relates to emissions from road traffic arising whilst the infrastructure is in operation.

15.9.3. Potential impacts related to emissions generated during Proposed Scheme construction and operation are outlined below. An appraisal of carbon

emissions arising from the Proposed Scheme would be carried out and reported in the ES.

Construction

15.9.4. The duration of the construction works for A47 Junction Improvement Wansford to Sutton would be approximately 18 months. Embodied carbon emissions from the use of construction materials are the main contributor to climate change, with additional greenhouse gas emissions arising from the use of plant and transport of materials.

Operation

15.9.5. The operation of the Proposed Scheme has the potential to result in an increase in local CO_2 emissions due to changes in traffic flow and speed limits. An appraisal of greenhouse gases for the Proposed Scheme opening year and design year, to derive the change in carbon dioxide equivalent (CO_2e) emissions for the Proposed Scheme, will be assessed within the.

15.9.6. An increase in carbon emissions from activities associated with the operation of the Proposed Scheme over the design life e.g. road lighting, are also to be expected.

Vulnerability of the Proposed Scheme to Climate

Construction

15.9.7. During the Proposed Scheme construction, climate change is not anticipated to bring about a measurable change in the risk of severe weather between the time of CEMP preparation and the start of construction, nor throughout the 18-month construction period. Therefore, climate change is not expected to affect the Proposed Scheme construction and has been scoped out of the vulnerability assessment.

Operation

15.9.8. During the Proposed Scheme's 60-year appraisal period, changes in climate as outlined in Table 15.2 would be experienced in the Study Area. This has the potential to pose a risk to the Proposed Scheme assets such as deformation and deterioration of asphalt surfacing associated with temperature increase and changes in precipitation affecting the foundation strength and deterioration of the road surface, with the potential to lead to an increased flood risk.

15.9.9. A Flood Risk Assessment (FRA) which is to be carried out will take into account the Environment Agency's 'Climate change allowances for planners' National Planning Policy Framework (NPPF) (2016) supporting guidance. In addition, the Proposed Scheme drainage design will be designed to accept flows generated by a rainfall event with a 1-in-100 year return period, plus an allowance for climate change. Higher temperatures and increased precipitation would increase the frequency of maintenance required for gantries. Also, higher wind speeds could pose a risk to gantries.

15.9.10. Changes in climate also have the potential to pose risks to the environmental receptors detailed throughout this Preliminary Environmental Information Report (PEIR), therefore further assessment on these in-combination impacts would be undertaken and reported in the ES.

15.10. Chapter summary

15.10.1. The Proposed Scheme is anticipated to generate an increase in carbon emissions during both construction and operation. Changes in climate have the potential to affect Proposed Scheme assets and environmental receptors during operation.

15.10.2. Further value engineering will be undertaken to develop design interventions to limit or reduce adverse impacts and promote opportunities for the environment in the study area where possible. The assessment of construction and operational effects, both on the climate and as a result of climate change, will also be reported in the ES.

16. Combined and cumulative impacts

16.1. Introduction

16.1.1. Combined and Cumulative Impacts result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. They can also be considered as impacts resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the Proposed Scheme, identified as:

- Combined Impacts from a single project (the interrelationship between different environmental factors)
- Cumulative Impacts from different projects (with the project being assessed

16.2. Legislation and guidance

16.2.1. The following legislation, standards and best practice guidelines are considered relevant to the Proposed Scheme with regard to combined and cumulative impacts and will be reported in the Environmental Statement (ES) as such;

- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017
- DMRB Volume 11, Section 2, Part 5 Assessment and Management of Environmental Effects
- The Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment

16.3. Consultation

16.3.1. An EIA Scoping Report was submitted to PINS in February 2018 in order to inform its Scoping Opinion. Highways England received the Scoping Opinion in March 2018 and has adjusted the scope of the EIA to reflect the opinion where appropriate.

16.3.2. Consultation with Peterborough City Council as the Local Planning Authority will be undertaken in advance of the production of the ES to agree a list of proposed developments to be included within the cumulative impacts assessment.

16.4. Study area

Combined impacts

16.4.1. The study area for the assessment of combined effects, for both construction and operation, are defined by the study areas identified within the relevant environment topic chapters of this PEIR.

Cumulative impacts

16.4.2. The study area used to identify the ZOI for environmental receptors included within the cumulative assessment, during both construction and operation, will reflect the individual ZOIs of the topic chapters. The ZOI will also be large enough to cover the proposed developments likely to contribute to cumulative impacts, whilst being proportionate to the scope and scale of the Proposed Scheme. Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5, details the study area for the assessment of cumulative impacts should be defined on a case-by-case basis reflecting the Proposed Scheme in question and the area over which impacts can reasonably be considered to have the potential to occur from both the Proposed Scheme and in combination with other developments. The ZOI would extend to include developments included in the uncertainty log of the traffic model generated for the Proposed Scheme.

16.5. Combined Impacts

16.5.1. The baseline for the combined impacts is described in the individual environmental topic chapters that precede this chapter. During construction and operation, there is the potential for combined impacts to various receptors including geology and soils, landscape, cultural features, communities, vehicle travellers, water environment, biodiversity, climate, and material resources as a result of the Proposed Scheme due to the potential impacts reported in Chapters 5 to 15.

16.5.2. During construction, impacts would be temporary in nature and best practice mitigation measures included in the Construction Environmental Management Plan (CEMP) would ensure that combined impacts are reduced as far as possible. Combined impacts during operation, which may be permanent would be reduced through best practice mitigation. Enhancement measures providing multiple benefits would be developed as part of the Proposed Scheme design and any monitoring requirements would be specified.

16.6. Cumulative impacts

16.6.1. During construction, there would be the potential for cumulative impacts on receptors as a result of the Proposed Scheme with other developments, where construction stages overlap. Impacts would be temporary in nature and best practice measures would be included in the CEMP for each of the other developments, reducing the likelihood of cumulative impacts.

16.6.2. Once operational there would be the potential for cumulative impacts to receptors, including (but not limited to) habitats, protected species, agricultural land, noise and air quality. Mitigation can be provided to avoid or reduce any environmental impacts and monitoring of residual impacts would also be in place for developments that have gone through the statutory EIA process.

16.6.3. The likely residual impacts and proposed mitigation for other developments would be identified and incorporated into the cumulative impacts assessment of the ES. The proposed major developments will be identified from the Traffic Team's Uncertainty Log, Peterborough Site Allocations Development Plan Document (Peterborough City Council, 2012) as well as any additional planning applications listed on Peterborough City Council's website.

16.7. Chapter summary

16.7.1. This chapter of the ES will bring together the principal findings of each topic chapters to identify and assess the combined and cumulative impacts of the Proposed Scheme in association with other existing or future developments within the study area.

17. Glossary

Acronym	Description
AADT	Annual Average Daily Traffic
ALC	Agricultural Land Classification
AOD	Above ordnance datum
AQMA	Air Quality Management Area
AQO	Air Quality Objectives
BAP	Biodiversity Action Plan
BDC	Broadlands District Council
BGS	British Geological Survey
BLI	Buildings of Local Importance
BMV	Best and Most Versatile Land
BoCC	Birds of Conservation Concern
BS	British Standard
c.	circa
CCI	Community Conservation Index
CEMP	Construction Environmental Mitigation Plan
CIRIA	Construction Industry Research and Information Association
CL:AIRE	Contaminated Land: Applications in Real Environments
CO_2	Carbon Dioxide
CRTN	Calculation of Road Traffic Noise
CWS	County Wildlife Site
DAFOR	Scale: Dominant, Abundant, Frequent, Occasional, Rare
DCLG	*(former)* Department for Communities and Local Government
DCO	Development Consent Order
Defra	Department for the Environment, Food and Rural Affairs
dB	Decibel
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DMV	Deserted Medieval Village
EAR	Environmental Assessment Report
EcIA	Ecological Impact Assessment
eDNA	Environmental DNA
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
GCN	Great Crested Newt
GHG	Greenhouse Gas
GI	Ground Investigation
GP	General Practitioner
GPA	Good Practice Advice
GVA	Gross Value Added
HADDMS	Highways England's Drainage Data Management System
HAGDMS	HAGDMS – Highways Agency Geotechnical Data Management System
HER	Historic Environment Records
HGV	Heavy Goods Vehicle

Acronym	Description
HRA	Habitats Regulations Assessment
HSI	Habitat Suitability Index
IAN	Interim Advice Note
IT	Interim Target
km	kilometre
kph	Kilometres per hour
LED	Light Emitting Diode
LCA	Landscape Character Areas
LGV	Large Good Vehicles
LIA	Local Impact Area
LLFA	Lead Local Flood Authority
LiDAR	Light Detection and Ranging.
LNR	Local Nature Reserve
LSOA	Lower Super Output Areas
LUC	Land Use Consultants
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
m	metre
MHCLG	*(former)* Ministry of Housing, Communities and Local Government
MMP	Materials Management Plan
MT	Motorised Travellers
$MtCO_2e$	Metric tons of carbon dioxide equivalent
NBIS	Norfolk Biodiversity Information Service
NCA	National Character Area
NERC	Natural Environment and Rural Communities
NHLE	National Heritage List for England
NIA	Noise Important Area
NMU	Non-Motorised User
NNR	National Nature Reserves
NNNPS	National Networks National Policy Statement
NO_2	Nitrogen dioxide
NO_X	Nitrogen Oxides
NPPF	National Planning Policy Framework
NSIP	Nationally Significant Infrastructure Project
NVZ	Nitrate Vulnerable Zone
ONS	Office for National Statistic
OS	Ordnance Survey
PA	Planning Act
PAS	Publically Available Specification
PCF	Project Control Framework
PCM	Pollution Climate Mapping
PEI	Preliminary Environmental Information
PEIR	Preliminary Environmental Information Report
PINS	The Planning Inspectorate
PPE	Personal Protective Equipment
PRF	Preliminary Roost Feature
PRoW	Public Right of Way

Acronym	Description
RBMP	River Basin Management Plan
RNR	Roadside Nature Reserve
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SEB	Statutory Environmental Bodies
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
SuDS	sustainable urban drainage systems
TAG	Transport Analysis Guidance
TEAM	Transparent Economic Assessment Model
TMP	Traffic Management Plan
µg/m_3	Microgram per metre cubed
UK	United Kingdom
UKCP	United Kingdom Climate Projections
WCHR	Walkers Cyclists and Horse Riders
WFD	Water Framework Directive
WHO	World Health Organization
WIA	Wider Impact Area
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility

18. References

Air quality

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European Commission, 2008, Directive 2008/50/EC on ambient air quality and cleaner air for Europe.

Highways Agency, 2007, Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1, HA 207/07, Air Quality.

Highways England, 2012, Interim Advice Note 170/12 Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11 Section 3. Part 1 Air Quality.

Highways England, 2013, Interim Advice Note 174/13 Updating advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality.

Highways England, 2013, Interim Advice Note 175/13 Updated air quality advice on risk assessment related to compliance with the EU Directive in ambient air quality and on the production of Scheme Air Quality Actions Plans for user of DMRB Volume 11, Section 3 Part 1 Air Quality.

Highways England, 2015, Interim Advice Note 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11m Section 3, Part 1 Air Quality and Volume 11 Section 3 Part 7 Noise.

Statutory Instrument, 2002, The Air Quality (England) (Amendment) Regulations 2002, No. 3043.

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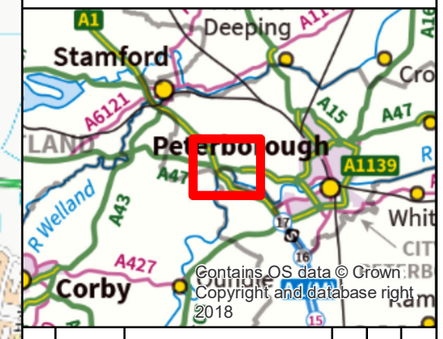
Appendix A: Proposed Scheme Location

N

Notes

Proposed Design

RLB_31_08_Plygon



Rev	Date	Amendment Details	Drawn	Chk'd	App'd
	13/07/18	Initial Draft	BOH	JF	SC

Mott MacDonald Sweco

Client: highways england

Drawing Status	Suitability
S01	S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix A: Proposed Scheme Location

Scale	Designed	Drawn	Checked	Approved
1:2500	Ben O'Hickey	Ben O'Hickey	Jackie Fookes	Stefan Craciun
Original Size	**Date**	**Date**	**Date**	**Date**
A1	13/07/18	13/07/18	13/07/18	13/07/18

Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number

HE551492 - MMSJV - EGN - 000 - DR - LX - 00001

Project Ref. No.: HE551492

Revision: P01

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Appendix B: Proposed changes to Scheme DCO Boundary

N

0 60 120 240 360 480 Meters

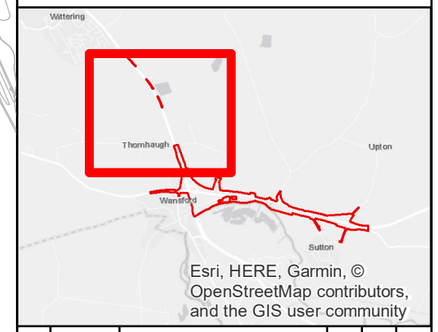
Notes

Proposed Design

Proposed Scheme DCO Boundary

Extent of previous Proposed DCO Boundary (02/2018)

Note: where previous and current Proposed DCO Boundary align only a redline is shown



Rev	Date	Amendment Details	Drawn	Chk'd	App'd
	13/07/18	Initial Draft	BOH	JF	SC

Mott MacDonald Sweco

Client: highways england

Drawing Status: S01

Suitability: S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix B.1: Proposed changes to Scheme DCO Boundary

Scale	Designed	Drawn	Checked	Approved
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Original Size: A1	Date: 06/09/18	Date: 06/09/18	Date: 06/09/18	Date: 06/09/18

Drawing Number: HE P/N | Originator | Volume
HE551492 - MMSJV - EGN -
000 - DR - LX - 00008
Location | Type | Role | Number

Project Ref. No.: HE551492

Revision: P01

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N

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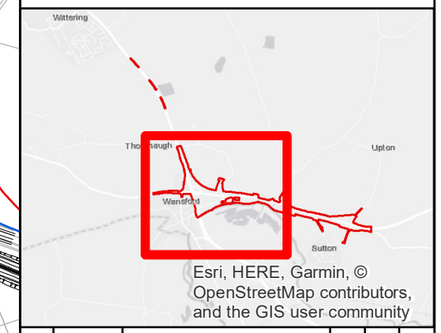
Notes

Proposed Design

Proposed Scheme DCO Boundary

Extent of Previous Proposed DCO Boundary (02/2018)

Note: where previous and current Proposed DCO Boundary align only a redline is shown



Rev	Date	Amendment Details	Drawn	Chk'd	App'd
	06/09/18	Initial Draft	BOH	JF	SC

Mott MacDonald Sweco

Client: highways england

Drawing Status: S01

Suitability: S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix B.2: Proposed changes to Scheme DCO Boundary

Scale	Designed	Drawn	Checked	Approved
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Original Size: A1	Date: 06/09/18	Date: 06/09/18	Date: 06/09/18	Date: 06/09/18

Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number

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Project Ref. No.: HE551492

Revision: P01

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N

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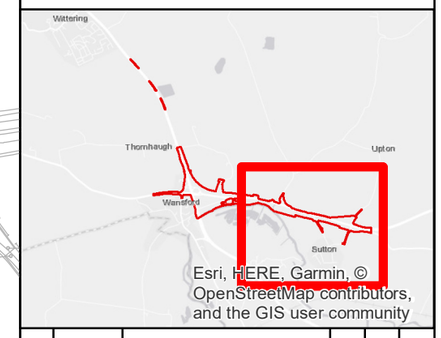
Notes

Proposed Design

Proposed Scheme DCO Boundary

Extent of Previous Proposed DCO Boundary (02/2018)

Note: where previous and current Proposed DCO Boundary align only a redline is shown



Rev	Date	Amendment Details	Drawn	Chk'd	App'd
	06/09/18	Initial Draft	BOH	JF	SC

Mott MacDonald Sweco

Client: highways england

Drawing Status: S01

Suitability: S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix B.3: Proposed changes to Scheme DCO Boundary

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Drawing Number: HE PIN | Originator | Volume | Location | Type | Role | Number

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Project Ref. No.: HE551492

Revision: P01

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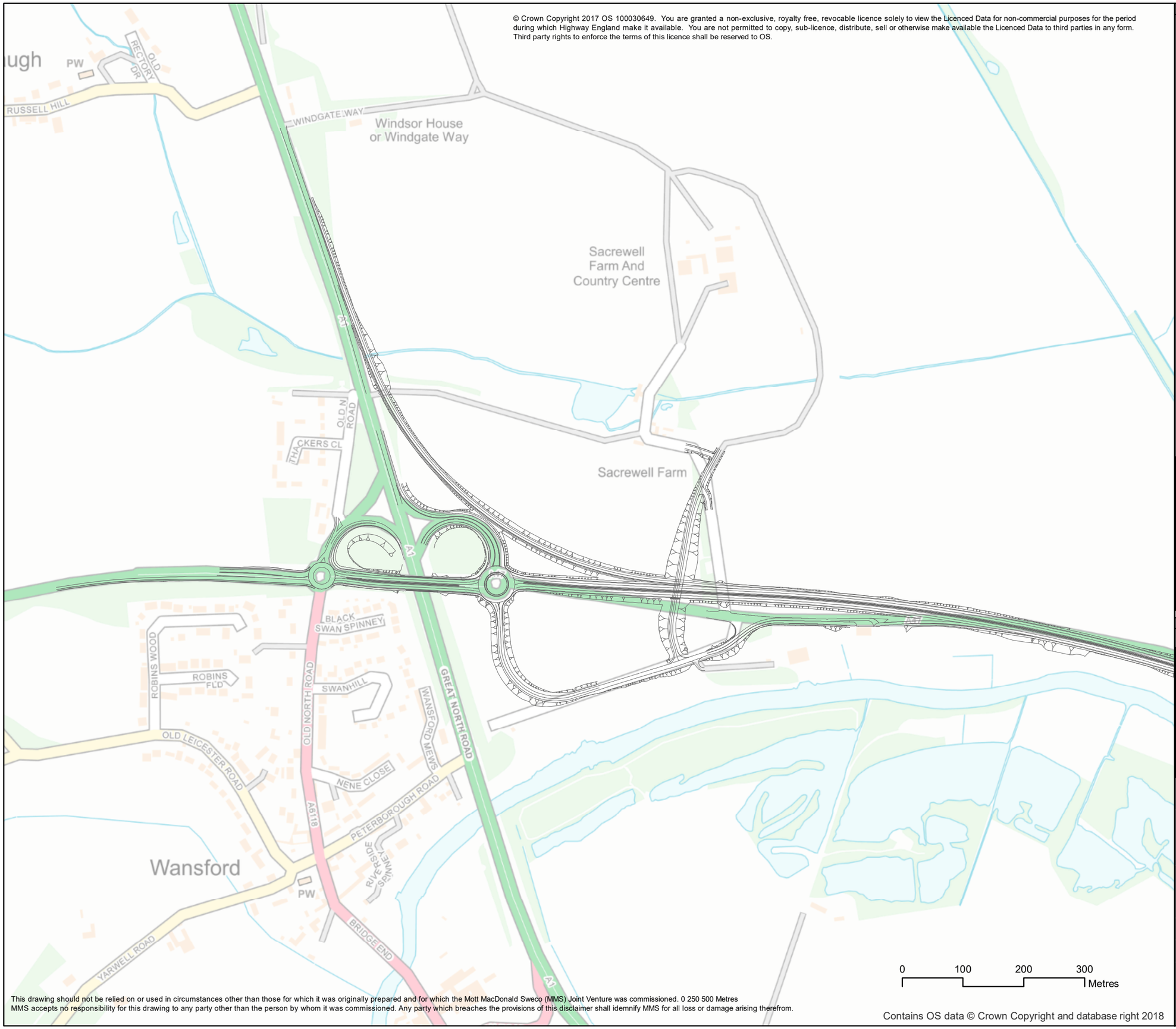
Appendix C: General Layout



0 100 200 300 Metres

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Key to symbols

The Proposed Scheme

References drawing

Rev	Date	Amendment Details	Drawn	Chk'd	App'd
01	10/07/18	Drawing Produced	BO	JF	SC

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel : +44 (0)113 262 0000

Client: highways england

Drawing Status: For Information

Suitability: S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix C.1: General Layout (west)

Scale	Designed	Drawn	Checked	Approved
1:12,000	O'Hickey, Ben	O'Hickey, Ben	Fookes, Jackie	Craciun, Stefan
Original Size	**Date**	**Date**	**Date**	**Date**
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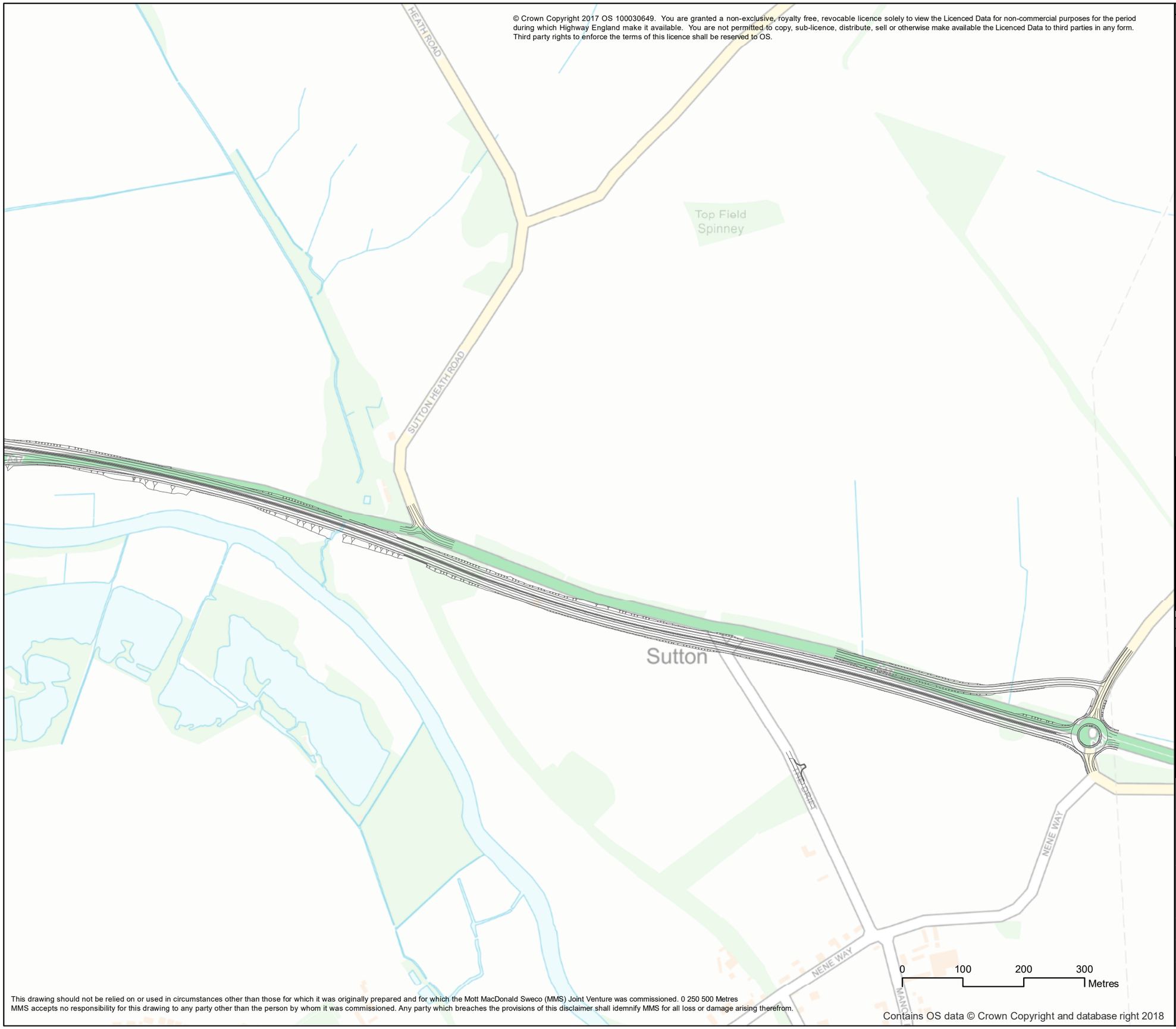
Project Ref. No.: HE551492

Revision: P01



Key to symbols

The Proposed Scheme

References drawing

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Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel : +44 (0)113 262 0000

Client: highways england

Drawing Status: For Information

Suitability: S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix C.2: General Layout (east)

Scale	Designed	Drawn	Checked	Approved
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Original Size	**Date**	**Date**	**Date**	**Date**
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Drawing Number: HE PIN HE551492 | Originator MMSJV | Volume EGN | Location 000 | Type DR | Role LX | Number 00005

Project Ref. No.: HE551492

Revision: P01

Appendix D: Environment Constraints Map

Sutton Heath Road
Top Lodge Farm
Sutton Wood
Abbott's Cottages
Sacrewell Lodge
Windsor House or Windgate Way
Russell Hill
hornhaugh
Sacrewell Farm And Country Centre
Sacrewell Farm
Upton
A6118
Wansford
Yarwell Road
Great North Road
River Nene
Church Lane
Stibbington
Old Great North Road
New Lane
Ship End House
Waters Edge
Elton Road
Wansford
Sibson
Yarwell
Sibson House
Lower Lodge Farm
Sutton
A1
0 200 400 600 800 Metres

Key to symbols

- The Proposed Scheme
- Proposed Scheme DCO Boundary
- Known Bat Roost
- 500m Buffer
- Important Hedgerow
- Footpath
- Bat_roosts
- Group Tree Preservation Order
- Main River
- County Wildlife Site
- Ecological Exculsion Zone
- Noise Action Important Area

Listed Buildings

Listed Building - Grade

- I
- II
- II*

- Sites of Special Scientific Interest (SSSI)
- Scheduled Monument

References drawing

Rev	Date	Amendment Details	Drawn	Chk'd	App'd
01	10/07/18	Drawing Produced	BO	JF	SC

Mott MacDonald Sweco
Grove House
Mansion Gate Drive
Leeds
LS7 4DN
Tel : +44 (0)113 262 0000

Client: highways england

Drawing Status	Suitability
For Information	S0

Project Title: A47 Wansford to Sutton

Drawing Title: Appendix D: Environmental Constraints Site Level

Scale	Designed	Drawn	Checked	Approved
1:15,000	O'Hickey, Ben	O'Hickey, Ben	Fookes, Jackie	Craciun, Stefan
Original Size	**Date**	**Date**	**Date**	**Date**
A3	21/08/18	21/08/18	21/08/18	21/08/18

Drawing Number					Project Ref. No.
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Location	| Type	| Role		| Number	

Appendix E: Letter from the Environment Agency

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Our ref: AN/2018/127282/02-L01
Your ref: EA/Wansford

Date: 05 June 2018

Dear Jacqueline

Planning advice for Wansford Peterborough

Thank you for accepting our offer to provide advice on this development covering

- A review of the Environmental Impact Assessment Scoping Report with particular emphasis on flood risk, drainage and water protection; and
- Attending a meeting with representatives from Highways England and Mott MacDonald Sweco.

We are providing our planning advice under our agreement no. ENVPAC/1/LNA/00004. The review has taken 11 hours and an invoice for £1100 will be issued in July.

Following the meeting held at our offices on Thursday 24 May 2018 we provide the following advice on the proposed development:

1.0 Flood Risk

1.1 Floodplain compensation

Parts of the site are adjacent to the River Nene and Wittering Brook designated `Main Rivers' and lie partly within a high risk flood zone (flood zone 3). It is important that there is no loss of floodplain as a result of the proposals and the Flood Risk Assessment (FRA) should provide further details on any raising or lowering of land within the floodplain. Any loss of floodplain should be compensated for on a level for level, volume for volume basis (i.e. re-grade the land at the same level as that taken up by the development) therefore providing a direct replacement for the lost storage volume.

The FRA will need to provide detailed information to demonstrate how this can be achieved. The location of any compensation works must relate hydraulically and hydrologically to the location of the site. The FRA must also confirm and provide detailed information of any temporary floodplain compensation that may be required for the works.

Further advice and guidance on the provision of floodplain compensation can be found in the Section A3.3.10 Compensatory Flood Storage of CIRIA Guide C624: Development and Flood Risk, guidance for the construction industry. We stipulate that

excavation of the compensation is complete before infilling commences to ensure that flood plain capacity is maintained during construction of the development.

Compensation schemes must conserve and where possible enhance the biodiversity value of a site. Where developers are providing compensatory storage close to normal river levels, we would encourage the creation or restoration of wetlands and any opportunities to improve the river corridor and add value to the landscapes character.

We do not hold flood level data from the model for the Wittering Brook or the Mill Stream. The flood zones for this area have been produced based on national scale generalised modelling and not from local scale detailed modelling. We are therefore unable to provide detailed information such as flood levels. The national scale generalised modelling covers all watercourses with a catchment greater than 3km^2.

1.2 Surface Water drainage
The Lead Local Authority (LLFA) (in this case Peterborough City Council) is responsible for commenting on all surface water drainage schemes. We therefore recommend that you contact the LLFA at your earliest convenience to discuss the surface water management scheme for this development.

For discharge into the River Nene (Main River), the discharge rate will be based on the calculated pre-development (Greenfield) runoff rate for the site. For a simple control structure this will be based on the QBAR rate. Complex discharge controls should reflect the original discharge or run-off rates from the site across the range of storm events. E.g. QBAR, 3.3% (1in30), 1% (1in100), 1% (1in100) plus climate change; OR they should only limit discharge for all events to the flow predicted by the QBAR event. Ultimately, there should be no increase in run off as a result of the development up to and including the 1% (1 in 100) event with an allowance for climate change.

1.3 Climate change
The FRA will need to take into account the effects of climate change on the development. Information relating to our new climate change guidance is available at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

1.4 Floodline Warnings Direct
During the meeting we discussed the possibility of you signing on to the Environment Agency's Floodline Warnings Direct Service for the construction phases of the works to ensure you have advanced warning of high flows within the River Nene. This would be by way of an Emergency Contacts Arrangement form. We are happy to provide you with this document nearer the time.

1.5 Environmental Permitting
Under the terms of the Environmental Permitting Regulations 2016, a permit or exemption may be required for any proposed works or structures, in, under, over or within 8m of the River Nene designated a 'main river'. For more information please visit https://www.gov.uk/guidance/flood-risk-activities-environmental-permits

During the meeting we discussed our intention to incorporate the permit requirements into the future Development Consent Order.

2.0 Drainage
All of the advice provided in the following section is derived from modelled data and not empirical observations, so caution should be used.

2.1 Groundwater interactions with Mill Stream and Wittering Brook
We have a groundwater model which gives expected indicative interactions between groundwater and surface water, under different scenarios (wet, average and dry recharge conditions).

The model indicates the following:
Dry periods of rainfall:

- Stream flow in Mill Stream is around 0.5-5 Ml/d, with a very small baseflow contribution from groundwater of around <0.1 Ml/d.
- Stream flow in Wittering Brook is higher, >5 Ml/d, but again the baseflow contribution is very small, <0.1 Ml/d.

Average periods of rainfall:

- Stream flow in Mill Stream is around 5-50 Ml/d, with a small baseflow contribution from groundwater of around <0.5 Ml/d.
- Stream flow in Wittering Brook is higher, >50 Ml/d, but again the baseflow contribution is small, <0.5 Ml/d.

Wet periods of rainfall:

- Stream flow in Mill Stream is around >50 Ml/d, with a more baseflow contribution from groundwater, up to 1 Ml/d.
- Stream flow in Wittering Brook is also >50 Ml/d, but again the baseflow contribution is small, <0.5 Ml/d.

There doesn't seem to be any condition where we would expect the watercourses to loose water to ground. Vertical flow volumes under all recharge scenarios supports this data, showing a small amount of upward leakage from both the superficial deposits (where present) and also from the bedrock into the superficial deposits along the watercourse routes. The model confirms that groundwater level should be close to the ground level, as expected and stated in the Environmental Impact Assessment Scoping Report.

2.2 Hydrogeological requirements of Sutton Heath Bog
The Bog appears to sit directly on Lincolnshire Limestone outcrop, with no drift deposits. The limestone outcrop gives way to the underlying Grantham Formation and Whitby Mudstone to the western boundary of the Bog. Our groundwater model doesn't give any indication of vertical leakage from the Limestone to the bog, but stream leakage indicates that the direction of water flow is likely to be downward, i.e. infiltrating into the Limestone. Under wet conditions, up to 1 Ml/d may infiltrate into the limestone in the area of the Bog. The infiltration volumes become negligible in dry scenarios, because they are entirely dependent on effective rainfall (i.e. the rainfall which infiltrates, so total rainfall minus evapotranspiration and other losses such as runoff). Limestone is quite permeable so is likely to allow rapid infiltration.

The Bog sites on sloping ground, with several springs emerging within it from the base of the limestone outcrop where it meets the less permeable Grantham Formation/Whitby Mudstone. This is further evidence of the higher permeability of the limestone – rainfall appears to infiltrate at higher elevations to the east and emerge again downslope within the bog, heading westwards. These springs or seepages, which feed into Wittering Brook, are likely to be important features within the Bog.

There are three groundwater monitoring points within Sutton Heath Bog. It is our understanding that you already hold this data. This data will help in interpreting groundwater/surface water interactions. We are unable to provide a definitive response

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on the hydrogeological requirements of the Bog, but would surmise that it appears to be entirely rainfall-dependent. Rainfall will rapidly infiltrate and re-emerge downslope with little residence time.

2.3 HAWRAT Assessment (Q95 flow)
Natural Q95 flow data for the area is contained in the CAMS Ledger and is as follows:

- Wansford at grid ref 508124, 299560 – 111.5Ml/d (Natural flow)
- Orton Lock at grid ref 516603, 297215 – 120.6 Ml/d (Natural flow)

Unfortunately we don't have Q95 values for the Mill Stream or Wittering Brook.

There is some information on the National River Flow Archive that may be useful http://nrfa.ceh.ac.uk/data/station/info/32020.

2.4 Gauging station
To ensure that the development does not impact on the existing gauging station measurements, we advise that an unaltered channel is protected all the way up to the A1 road bridge (approximately 450 meters upstream of the gauge).

Please note, this response is based on the information you have made available at this time. It is based on current national planning policy, associated legislation and environmental data/information.

3.0 Water Framework Directive
The effects of the proposed development on Water Framework Directive (WFD) water bodies will need to be considered. In particular, the impacts on the River Nene and Wittering Brook. The development must not result in a deterioration of a water body or failure to meet WFD objectives.

We have some reservations that road drainage from the existing carriageway is not to be upgraded during the development and that surface water will enter the River Nene without passing through interceptors. Justification will need to be provided as to why this is not considered a pollution risk.

Investigation into improving fish, eel and otter passage through the existing A47 culvert should also be carried out. This work would ties into the improved culvert design that is to be installed under the new carriageway.

We are investigating potential WFD related mitigation and environmental enhancement opportunities within the area and will provide this to you when we have more information.

Should you require any additional information, or wish to discuss these matters further, please do not hesitate to contact me on the number below.

Yours faithfully

Jennifer Moffatt
Sustainable Places Planning Adviser

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