

Cottam Solar Project

Preliminary Environmental Information Report: Volume 1

Prepared by: Lanpro
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Report Prepared for: Cottam Solar Project Ltd.

Preliminary Environmental Information Report

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1 Introduction

1.1 Background

- 1.1.1 This Preliminary Environmental Information Report (PEIR) has been prepared on behalf of Cottam Solar Project Limited ("the Applicant") and represents the preliminary findings of the environmental and social studies and the design evolution process for the Cottam Solar Project (hereafter referred to as 'the Scheme'). The PEIR is being used to inform the statutory consultation process of the proposed application for a Development Consent Order (DCO) to be submitted under Section 37 of the Planning Act 2008 (the "Act") to the Secretary of State for Department for Business, Energy & Industrial Strategy (BEIS).
- 1.1.2 The Scheme comprises a number of land parcels (the 'Site' or 'Sites') described as Cottam 1, 2 and 3 for the solar arrays, grid connection infrastructure and energy storage; and the cable route corridors. The Sites are located approximately 6.5km south east and 4km north east of Gainsborough.
- 1.1.3 The grid connection point will be at the National Grid substation at Cottam Power Station.
- 1.1.4 The Sites are shown on the overall Scheme plan at **Appendix 3**. The cable route corridor search areas are shown in light green shading on the overall scheme plan and the plans at **Appendix 3** show the expected maximum extent of land that would be included within the application for a DCO for the solar array, grid connection and energy storage elements which includes all land being considered for the purposes of the Scheme. Additional land may be included in the DCO application for mitigation works, such as highway improvement works, and ecological mitigation and enhancement measures.
- 1.1.5 The majority of the Scheme will be located within the administrative boundary of West Lindsey District Council and Lincolnshire County Council; with the grid connection infrastructure located within the administrative boundary of Bassetlaw District Council and Nottinghamshire County Council.

1.2 The Regulations

- 1.2.1 As the Scheme will generate over 50MW of electricity it is defined as a Nationally Significant Infrastructure Project (NSIP) under 14(1)(a) and 15(2) of the Act and will therefore require a DCO.
- 1.2.2 The Scheme is considered to be 'EIA development' as defined by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended in 2018) (the 'EIA Regulations') requiring an Environmental Impact Assessment. Under Regulation 12 of the EIA Regulations, the Applicant is required to set out in its

Statement of Community Consultation ('SoCC') how it intends to publicise and consult on the preliminary environmental information relating to the Scheme. Regulation 12(2) of the EIA Regulations states that the purpose of the PEIR is to provide sufficient information to enable stakeholders to develop an informed view of the likely significant effects of the development (and of any associated development). Planning Inspectorate Advice Note 7 explains that the PEIR does not need to constitute a complete assessment and is a compilation of the environmental information available at the point in time the PEIR is produced.

1.3 Purpose and Structure of the PEIR

- 1.3.1 The information contained in this PEIR is 'preliminary' and may not represent the final project design or include the final Environmental Impact Assessment (EIA) considerations and conclusions. The Applicant is seeking consultation responses to the information presented in order to continue to refine the development design and to continue to obtain information that will inform the final assessment of the impacts which will be contained in the Environmental Statement (ES) which will accompany the DCO application.
- 1.3.2 The PEIR is being published to accompany the statutory consultation under Sections 42 and 47 of the Planning Act 2008 and follows informal consultation undertaken by the Applicant in late 2021. The formal pre-application consultation runs for a period of 6 weeks in accordance with the SoCC.
- 1.3.3 The SoCC sets out how the applicant proposes to consult people affected by the development or living in the vicinity of the Scheme. A copy of the SoCC is provided at **Appendix 1.1** and has been developed in consultation with West Lindsey District Council, Bassetlaw District Council, Lincolnshire County Council and Nottinghamshire County Council.
- 1.3.4 The PEIR will be made available to the prescribed consultees, local authorities and landowners and to members of the public and the wider community. This will enable the consultees, including the local community, to understand the potential environmental effects and implications of the Scheme so as to inform their responses to consultation.
- 1.3.5 The PEIR takes the form of a draft / emerging ES. A significant amount of survey work has been completed to date to inform the EIA process. The table below sets out the structure of the PEIR and the topics that are covered. The Applicant is advised by a team of experienced and competent environmental consultants who have addressed each topic. The consultants are also identified below. A statement of competence will be provided within the ES for the authors of the various chapters.

Table 1.1: PEIR Structure

Document	Consultant
Non-Technical Summary	Coordinated by Lanpro
Volume 1 – Main Statement	Coordinated by Lanpro
Introduction, Methodology, Site Description, Proposed Development, Alternatives, Policy (Chapters 1 -6)	Lanpro
Climate Change (Chapter 7)	Lanpro / Bureau Veritas
Landscape and Visual; and Arboriculture (Chapter 8)	Lanpro
Ecology and Biodiversity (Chapter 9)	Clarkson and Woods
Hydrology, Flood Risk and Drainage (Chapter 10)	Delta Simons
Ground Conditions (Chapter 11)	Delta Simons
Minerals (Chapter 12)	Clover Planning
Cultural Heritage (archaeology and built heritage) (Chapter 13)	Lanpro
Transport (Chapter 14)	Transport Planning Associates
Noise and Vibration (Chapter 15)	Tetra Tech
Glint and Glare (Chapter 16)	Pager Power
Air Quality (Chapter 17)	Tetra Tech
Socio-Economics (Chapter 18)	Lanpro
Waste (Chapter 19)	Lanpro
Other Environmental Topics (Chapter 20) – Human Health; Electromagnetic Fields; Major Accidents and Disasters; Telecommunication, Utilities and Television and Light pollution (Chapter 20)	Coordinated by Lanpro
Volume 2- Technical Appendices	Coordinated by Lanpro

1.4 The Applicant

- 1.4.1 The Scheme is being developed by the Applicant. The Applicant is part of Island Green Power Limited (IGP), who is a leading international developer of renewable energy projects, established in 2013.
- 1.4.2 IGP has delivered 26 solar projects worldwide totalling more than 1GW of capacity. This includes 14 solar projects in the UK and Republic of Ireland. Their mission is to increase solar energy usage, making more renewable energy possible and saving thousands of tonnes of CO₂ in the process.
- 1.4.3 IGP are also progressing the West Burton Solar Project, which is within the same locality as the Scheme. Whilst the West Burton Solar Project is being run in parallel with the Scheme, it will be the subject of a separate DCO application and is therefore the subject of a separate PEIR. The statutory consultation periods for the two projects will be run in conjunction with each other.

1.5 Consultation

- 1.5.1 The importance of consultation is key to the Planning Act 2008 and is fundamental to the success of the Scheme. The Applicant has sought to engage with key stakeholders from an early stage to brief them on the Scheme, focus the environmental studies and to identify specific issues. Consultation is an ongoing process during the development of the Scheme. It enables mitigation measures to be incorporated into the design and enhance environmental benefits. The publication of the PEIR is a key part of the consultation process.
- 1.5.2 There are a large number of stakeholders with different interests in the Scheme which require different levels and forms of consultation. The types of stakeholders include landowners, local communities, statutory consultees and specialist interest groups. The consultation activities, therefore, have been tailored to be appropriate for the particular groups.
- 1.5.3 Stakeholder engagement for the Scheme is based on the following principles:
- To be open and transparent – To be open and honest about the proposals, sharing consistent information and messages with stakeholders;
 - Clear and well-timed – Promote understanding of the Scheme, its objectives and development process;
 - Proactive engagement – Seek to build relationships, support and mitigate risks;
 - Building trust with stakeholders – Develop good relationships, listening and ensuring stakeholders feel valued when providing views and clearly showing how we have taken feedback on board; and
 - Ensure appropriate statutory consultation is undertaken in compliance with requirements of the Planning Act 2008, EIA Regulations and associated guidance.

DCO Consultation Requirements

- 1.5.4 The DCO process sets out a number of statutory requirements regarding consultation. The Act requires applicants to carry out statutory consultation on their proposals ahead of a formal DCO submission. The requirements are:
- Section 42 of the Act requires the Applicant to consult with the ‘prescribed persons’ which includes consultation bodies such as Natural England, Environment Agency, Historic England, host authorities, neighbouring authorities and persons with interest in the land and those who may be affected by the Scheme.

- Section 47 of the Act requires the Applicant to consult with the local community. As part of this, a Statement of Community Consultation (SoCC) must be prepared which sets out how the applicant proposes to consult on the Scheme. The Applicant must consult with the host authorities on this document and have regard to their comments.
- The SoCC will also include how the PEIR document will be publicised and consulted on.
- Section 48 of the Act requires the Applicant to publicise the Scheme in the 'prescribed manner' in a national newspaper, The London Gazette, and local newspapers. The Section 48 notice also needs to be sent to prescribed consultees.
- Section 49 of the Act requires the Applicant to have regard to any relevant responses received to the consultation and publicity that is required by Sections 42, 47 and 48 of the Act.

Consultation to Date

- 1.5.5 A number of meetings have taken place with statutory consultees to introduce the Scheme and commence discussions on detailed matters relating to the Scheme which include:
- West Lindsey District Council (Officers and Members);
 - Lincolnshire County Council (Officers and Members);
 - Bassetlaw District Council (Officers and Members);
 - Nottinghamshire County Council (Officers);
 - Environment Agency;
 - Natural England;
 - Historic England; and
 - Nottinghamshire and Lincolnshire Wildlife Trusts.
- 1.5.6 The Applicant will undertake on-going consultation with the host authorities, the stakeholders identified above and other relevant consultees and stakeholders throughout the duration of the Scheme development and preparation of the ES.
- 1.5.7 Within each technical chapter of the PEIR there is further detail on any topic specific consultations that have taken place to date.

- 1.5.8 In respect of the local communities affected by the development, the Applicant has already undertaken a first stage of (non-statutory) public consultation throughout November and December 2021. Consultation is on-going with local communities and individual property owners where appropriate. A summary of the feedback received through the non-statutory consultation was made available to stakeholders via the project website. Responses to the consultations will be taken into account as part of the design process.
- 1.5.9 The Scheme was subject to EIA scoping with a Scoping Opinion issued on the 9th March 2022. In the preparation of the Scoping Report consultation was undertaken with key stakeholders where possible. The Planning Inspectorate consulted on the Scoping Opinion with the prescribed consultation bodies as listed in Schedule 1 of The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended). Those responses were included with the Scoping Opinion issued by the Planning Inspectorate. Any key matters raised in those responses will be covered in the individual technical chapters where relevant.
- 1.5.10 All of the pre-application consultation that is undertaken on the Scheme will be described in the Consultation Report that will form part of the DCO application.

2 EIA Process and Methodology

2.1 Introduction

- 2.1.1 EIA is the process undertaken to identify and evaluate the likely significant effects of a proposed development on the environment and to identify measures to mitigate or manage any significant negative effects. The EIA should be informed by consultation with statutory consultees, other interested bodies and members of the public. The purpose of identifying significant effects is to ensure decision makers are able to make an informed judgement on the environmental impacts of a proposal. The PEIR provides the preliminary environmental information obtained and assessed as part of the EIA.
- 2.1.2 This chapter of the PEIR explains the approach taken to assess and understand the potential environmental effects of the Scheme identified to date in the EIA process that the Applicant is undertaking. The approach taken in this PEIR is, where appropriate, to adopt relevant methodologies used in EIA and to report on the latest findings in the form of a draft/emerging ES. Any ES must contain the information specified in Regulation 14(2) of the EIA Regulations and must meet the requirements of Regulation 14(3) of the EIA Regulations. It must also include any additional information specified in Schedule 4 of the EIA Regulations which is relevant to the specific characteristics of the particular development or type of development and the environmental features likely to be significantly affected.
- 2.1.3 The EIA assessment, as reported in the PEIR, is being undertaken based on a number of related activities which will include the following:
- Consultation with the relevant statutory and non-statutory consultees throughout the process;
 - Consideration of local, regional and national planning policies, legislation and guidelines as relevant to EIA;
 - Consideration of technical standards for the development of significance criteria;
 - Review of secondary information, previous environmental studies and publicly accessible databases and information;
 - Physical surveys and monitoring;
 - Desk based assessment;
 - Computer modelling (where appropriate and proportionate); and
 - Expert opinion.

2.1.4 Regard has been had to the following documents:

- Planning Inspectorate Advice Note 3: EIA Consultation and Notification August 2017 Version 7;
- Planning Inspectorate Advice Note 7: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements June 2020 Version 7;
- Planning Inspectorate Advice Note 9: Rochdale Envelope July 2018 Version 3;
- Planning Inspectorate Advice Note 11: Working with Public Bodies in the Infrastructure Planning Process November 2017 Version 4; and
- Planning Inspectorate Advice Note 17: Cumulative Effects Assessment August 2019 Version 2.

2.1.5 The main objective of the EIA process is to present a clear, impartial assessment of the likely significant beneficial and adverse environmental impacts of the proposed development including direct or indirect effects.

2.2 EIA Scoping

2.2.1 The issues to be addressed within the PEIR (and the subsequent ES) were identified in the EIA Scoping Report submitted to the Planning Inspectorate (PINS) in January 2022. As noted above, the Secretary of State's (SoS) Scoping Opinion was received on 9th March 2022 (see **Appendix 2.1**). The Scoping Opinion confirmed which topics were scoped in and out of the EIA. Key issues raised in the Scoping Opinion are set out in the technical chapters in the PEIR and are being considered throughout the EIA process.

2.3 Assessment of Impacts

2.3.1 Each environmental topic to be considered in the PEIR will be given a separate chapter. Each of the technical assessments for the environmental topics has taken the following approach.

Baseline Conditions

2.3.2 In order to evaluate likely significant environmental effects, existing baseline conditions have been understood through a combination of desktop and physical surveys, and monitoring. This involves the Scheme Sites as well as the surrounding area. Once the baseline conditions are established, this is used to assess the sensitivity of receptors on and near the Scheme and what changes may take place during the construction, operation and decommissioning of the Scheme. Any effects

on these receptors will be assessed in full in the ES and assessments undertaken to date are reported on in the PEIR.

2.3.3 The data collected to establish the baseline conditions has been gathered from a variety of sources, including the following:

- Physical surveys and monitoring;
- Publicly accessible records and databases; and
- Environmental survey information that has been submitted for other development in the area.

2.3.4 The methods of data collection have been discussed with the relevant statutory and non-statutory consultees as appropriate. These discussions will be on-going through to submission of the DCO application. Consideration is also being given to how the baseline conditions will evolve, (the 'future baseline').

Spatial Scope

2.3.5 The topic chapters in the PEIR describe and justify the spatial scope, including the rationale for determining the specific area within which an assessment is focussed. The study areas are usually defined by the nature of potential impacts and the locations of potentially affected environmental resources or receptors.

Temporal Scope: Assessment Years

2.3.6 *Construction Phase.* For the purposes of the assessment, the construction phase effects are effects that result from activities during site preparation / enabling works, construction, and commissioning activities e.g. effects such as construction traffic, noise and vibration from construction activities, dust generation, site runoff, mud on roads, and the visual intrusion of plant and machinery on site. Some aspects of construction will last longer than others.

2.3.7 *Operational Phase.* These are effects associated with operation and maintenance activities during the generating lifetime of the Scheme e.g. the effects of the physical presence of the solar arrays and their use and maintenance. Timescales associated with these effects will be defined. In EIA terms, effects can be defined as short term (lasts for up to 12 months); medium term (lasts for 1 - 5 years); long term (more than 5 years); reversible long-term effects (long-term effects, which last for the lifetime of the Scheme, but which cease once it has been decommissioned; and permanent effects (those which cannot be reversed following decommissioning).

2.3.8 *Decommissioning Phase.* Effects are those arising from activities for the duration of the decommissioning stage and will likely be short term e.g. site traffic, noise and vibration from decommissioning activities, dust generation, site runoff etc.

- 2.3.9 *Assessment Years.* The EIA will consider the environmental impacts of the Scheme at all three stages described above. The operational period for the Scheme is anticipated to be approximately 40 years and this time period will be assessed in the EIA (and within this PEIR).
- 2.3.10 The 'existing baseline' year for assessment will be 2021 as this is the date on which baseline studies for the project were commenced. A future baseline will also be considered within the EIA (and this PEIR) for certain assessments. The future baseline considers factors that will change the current baseline, without the Scheme proceeding. Committed developments are one factor that can influence the future baseline ('committed developments', which are those with current planning permission or allocated in adopted development plans). The potential effects of the Scheme will be considered against both the current baseline and the future baseline in the EIA.
- 2.3.11 The assessment scenarios that are being considered for the purposes of the EIA (and considered in the PEIR) are:
- Existing Baseline 2021.
 - Construction 2024 – 2026.
 - Operation 2026. It has been assumed for the purposes of the EIA that the Scheme will be operational by end of Q1 2026.
 - Decommissioning 2066. This would be the year when decommissioning of the Scheme would commence and has been based on a typical 40-year operational lifetime for solar projects. It has therefore been assumed for the purposes of the EIA that the Scheme will be decommissioned in approximately 2066. However, the DCO will not specify a specific decommissioning date.
 - A future year of 2041 (15 years post opening of the Scheme) will be considered for the landscape and visual assessment i.e. 15 years after opening, which is the typical period for the maturation of landscape planting.

Assessment of likely effects

- 2.3.12 In order to provide for a consistent approach to the description of significance, a standard methodology is applied in instances where no specific criteria are required by technical guidance. The methodology for determining sensitivity will be assessed using the following criteria:

Table 2.1: Sensitivity Methodology

Sensitivity	Definition
High	The receptor or resource has little ability to absorb the change without fundamentally altering its present character or it is of international or national importance.
Medium	The receptor or resource has moderate capacity to absorb the change without significantly altering its present character or is of high and more than local (but not national or international) importance.
Low	The receptor or resource is tolerant of change without detrimental effect, is of low or local importance.
Negligible	The receptor or resource can accommodate change without material effect, is of limited importance.

2.3.13 The methodology for determining the impact magnitude will be assessed using the following criteria:

Table 2.2: Magnitude Criteria

Magnitude	Definition
Major	The total loss or major change/substantial alteration to key elements/features of the baseline (pre-development) conditions, such that the post development character/composition/attributes will be fundamentally changed
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions, such that post development character/composition/attributes of the baseline will be materially changed
Minor	A minor shift away from baseline condition. As change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation
Negligible	Very little change from baseline conditions. The change will be barely distinguishable and approximating to a non-change situation
Neutral	No change from baseline conditions

2.3.14 The general matrix to determine effects is shown below:

Table 2.3: Degrees of Significance

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 2.3.15 As noted above, the PEIR stage does not represent the final assessments, and whether an activity leads to a significant effect or the levels of significance of effects in many cases, and any mitigation required as a result, will not be concluded at this stage. Each technical chapter of the PEIR will explain the preliminary findings of the EIA process, give reasons as to why final conclusions cannot be reached at this stage, but also set out what on-going assessment work is taking place and how the final assessments will be concluded in the ES.

In-combination and Cumulative effects

- 2.3.16 The in-combination effects which will be assessed are:
- The combination of individual effects, for example, the combined effects of noise, dust and visual effects on a particular receptor;
 - The combination of individual topics, for example, the combined effects of climate change on ground conditions;
 - The combination of different works of the Scheme on a particular receptor for example, the in-combination effects of the construction of the cable route and the energy storage at the same time; and
 - The combined effects of the three generating stations (i.e Cottam 1, 2 and 3).
- 2.3.17 A Summary table will be provided in the ES which sets out the in-combination effects for the Scheme as a whole.
- 2.3.18 In accordance with EIA Regulations, the ES will also need to give consideration to the cumulative effects of the Scheme which will consist of the combined effects of the Scheme with other significant and relevant committed proposals within the vicinity of the Scheme. The Planning Inspectorate's Advice Note 17 identifies a four-stage approach to the assessment of cumulative effects which will be followed. In summary the following process will be undertaken:
- Stage 1 - Establish the Zone of Influence (ZOI) for each environmental aspect considered within the ES;
 - Stage 2 - Identify the 'other existing development and/or approved development' which fall into those ZOI and assign a level of certainty to them, subject to the level of detail that is available;
 - Stage 3 - Establish a shortlist of projects through the use of threshold criteria to ensure any projects which could have significant cumulative effects is taken forward; and

- Stage 4 - Information gathering of the shortlisted projects. The information should be secured through a number of sources including LPA websites, Planning Inspectorate (if relevant), statutory bodies and relevant applicants/developers.

2.3.19 As noted above, the final list of shortlisted projects will be agreed with the relevant statutory bodies and LPA's in due course including through the statutory consultation stage. At the PEIR stage the applicant has identified a long list of potential projects that may be required to be taken forward in any cumulative assessment. This is provided at **Appendix 2.2**. Notable projects in close proximity to the Scheme are:

- West Burton Solar Project (currently same timescales as the Scheme); and
- Gate Burton Energy Park (EIA scoping opinion issued December 2021).

2.3.20 Notably, the Scheme's Cable Corridor partially overlaps with Gate Burton Energy Park's 'Grid Connection Corridor Options'. The West Burton Solar Project Cable Corridor options also overlay the Gate Burton Energy Park's 'Grid Connection Corridor Options' very closely.

2.3.21 The Applicant and the developer progressing the Gate Burton scheme have worked collaboratively in respect of the overlap area (or 'Shared Grid Connection Corridor'). The land comprises an area within which the Gate Burton project will provide a connection to Cottam Power Station; the Cottam Solar Project will provide a connection to Cottam Power Station; and the West Burton Solar Project will provide a connection to West Burton Power Station. Given the proximity of the proposed schemes and a common grid connection area, the developers have worked collaboratively on design development and environmental avoidance mitigation to maximise opportunities for reducing overall environmental and social effects, in particular on communities in proximity to the grid connection corridor and on known ecological and archaeologically sensitive areas adjacent to the River Trent.

2.3.22 The installation of common elements that will accommodate three cable connections in the future would provide the potential for environmental and community benefit by substantially reducing the amount of disturbance and levels of construction activity in the area. The three Schemes are shown on the cumulative sites plan at **Appendix 2.3**, which indicates the potential area of overlap. This collaborative approach facilitates the ability to reduce environmental impacts through the following activities:

- Site survey, utility identification, site set out, fencing and security;
- Provision of reduced numbers of construction accesses

- Common construction routing options to grid connection working areas.
- Common construction compound and compound set up;
- Topsoil strip in sections and storage;
- Mark-out trench alignment;
- Excavation and installation of jointing pit;
- Use of common jointing pit dimensions;
- Installation of launch and exit pits for the River Trent directional drill;
- Trench excavation and placement of protective layer;
- Installation of cable ducts, either laid within the trench or via directional drill;
- Trench and jointing pit backfill and reinstatement.

2.3.23 The above activities will be subject to a single (common) environmental assessment to be included in all three ES's at the DCO application stages. Approval will be sought for the above activities within each of the three DCOs.

2.3.24 As part of their response to EIA scoping, Lincolnshire County Council requested that:

"A county-level alternative assessment area should be applied which as a minimum should consider scope for connection into the National Grid at the locations proposed by the registered NSIP solar projects, and with specific consideration of agricultural land impacts."

2.3.25 It is a fact that grid connection offers from West Burton and Cottam Power stations have been made available to the market and the developers of the Scheme, West Burton Solar Project and Gate Burton Energy Park are responding to this. The land at Mallard Pass Solar Park and Heckington Fen Solar Park are related to different points of connection and the developers of those projects have taken up grid offers. As noted above, grid connection availability is the key locational factor for solar projects as the further away from the grid connection point the array site is, the environmental factors can become more complex and a project becomes more costly. This point is further explained in **Chapter 5** of the PEIR. Notwithstanding, ongoing discussion is taking place with Lincolnshire County Council over the approach to cumulative assessment in respect of impacts on agricultural land, and this will be addressed in the ES at the DCO application stage.

2.3.26 More broadly, each technical chapter of the final ES will assess the potential for significant cumulative effects. At the PEIR stage, due to the information currently

available, a high-level review has been undertaken and where relevant within each topic chapter, commentary has been provided on the likelihood of which other developments may give rise to cumulative effects in combination with the Scheme.

Mitigation Measures

- 2.3.27 Paragraph 7 of Schedule 4 of the EIA Regulations notes that an ES should include “A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset and should cover both the construction and operational phases.”
- 2.3.28 Mitigation measures specified can relate to both methods of construction or particular design elements, that are to be incorporated within the completed Scheme. At the PEIR stage and given that the design of the Scheme continues to evolve, where mitigation has been identified it will be described. Notwithstanding, in many cases, because assessments have not been completed, the need for mitigation may not have been identified or the preferred mitigation measure may not have been selected.
- 2.3.29 Many mitigation measures will become integral to the design of the Scheme (‘embedded mitigation’). Where impacts cannot be avoided, even with embedded mitigation, further measures will be identified in order to assist in the reduction of effects to acceptable levels. Embedded mitigation, within the latest Scheme layouts, is described in **Chapter 5 Alternatives and Design Evolution**.

Consideration of Alternatives

- 2.3.30 Regulation 14(2)(d) of the EIA Regulations requires an ES to include “a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the options chosen, taking into account the effects of the development on the environment”.
- 2.3.31 Alternatives in respect of site selection, alternative cable routes and alternative design options is reported in **Chapter 5** of the PEIR. Further details of alternatives and options considered between PEIR and submission of the DCO application will be provided in the ES that accompanies the DCO application.

Summary

- 2.3.32 The assessments provided in this PEIR are preliminary. The design evolution of the scheme is continuing and the feedback from the statutory consultation stage and

ongoing discussions with stakeholders will inform further assessment work to be ultimately reported in the ES which is submitted with the DCO application. As such, different conclusions about the significance of effects may be reached in the ES at the DCO application stage.

3 Development Site

3.1 Introduction

3.1.1 This chapter describes the proposed development Site for the Scheme and its context. The Development Site comprises the following elements, which are described below:

- Sites for built development (Section 3.2 below); and
- Cable route corridors (Section 3.3 below).

3.1.2 This chapter is supported by site plans and figures contained in **Appendix 3.1**.

3.2 Sites for built development

3.2.1 The Sites identified for built development, namely, solar panels, sub-stations and energy storage for the Scheme are located within a 19km radius of the grid connection at the former Cottam Power Station.

3.2.2 Cottam 1 is made up of a number of sites / fields clustered within an area of countryside centred around the village of Coates in the District of West Lindsey. Cottam 2 sits to the north of Cottam 1 and is located to the east of the village of Corringham. Cottam 3 sits to the north of Cottam 2 and is split in to two areas:

- Cottam 3a, to the north-east and south-east of the village of Blyton; and
- Cottam 3b, to the east of Pilham.

Cottam 1 (CO1)

3.2.3 **Size:** 894ha

3.2.4 **Use:** The entirety of the Cottam 1 is in agricultural use. Isolated parts of the landholding appear to be used for storing materials associated with farming.

3.2.5 **Features:** The topography at Cottam 1 is relatively flat and the development Sites are predominantly well screened from their immediate surroundings by tall hedges around the boundaries of the Site.

3.2.6 The fields are generally large and typically have dividing hedgerows. There are only isolated trees outside of field margins. The Site is interspersed with other landholdings that accommodate farmsteads. The Site benefits from existing farm access tracks and field accesses.

3.2.7 The River Till meanders in a predominantly north/south direction across the western portion of the landholding. In some areas the river comprises part of the red line

area identified, and in others it adjoins the boundary. The banks of the river are lined with trees. A section of river, joining the River Till, in the north-eastern portion of the landholding, appears to have been canalised. Where this has taken place there are wide open river banks with only low lying vegetation.

- 3.2.8 There are many woodland blocks adjoining and within close proximity to the eastern portion of the landholding. Overhead lines cross parts of the Site.
- 3.2.9 **Settlements and Roads:** There is a chain of villages on the B1398, which runs north/south to the east of the Sites. The villages within close proximity of the Site are Glentworth, Fillingham, Ingham, Cammeringham, Brattleby, Aisthorpe and Scampton.
- 3.2.10 There is also a chain of villages on the B1241, running north/south to the west of the Site. The closest villages are Kexby, Willingham by Stow, Normanby by Stow, Stow, Sturton by Stow and Bransby.
- 3.2.11 Thorpe Lane runs along the southern edge of the landholding, connecting the settlement of Thorpe in the Fallows (with around five dwellings in total, with some slightly offset from the Site) to Sturton by Stow, to the west, and Brattleby, to the east.
- 3.2.12 Ingham Road, turning into Stow Lane runs east/west through the centre of the landholding, connecting the villages of Stow and Ingham. Part of the Site boundary adjoins the road. The settlement of Stow Pasture lies on this road, comprising around seven dwellings. The Site boundary adjoins the gardens of some of these properties and is in close proximity to others.
- 3.2.13 The small settlement of Coates, comprising around ten houses is accessed off the Ingham Road, and lies within the centre of the landholding area. Whilst the settlement is in the centre of the landholding, the closest Site boundary to any dwelling is over 500m. The settlement also contains the historically important St Edith's Church.
- 3.2.14 The closest larger settlements are Gainsborough, approximately 7km north-west of the landholding, and Lincoln, approximately 9km south-east of the landholding. The landholding is situated in the centre of a 'square' of A roads: The A15, A57, A156 and A631. The closest of these, the A15, is approximately 4km east of the landholding.
- 3.2.15 **Railway Lines:** The railway line to the west of the landholding, connecting Lincoln and Gainsborough is over 3km from the Site.
- 3.2.16 **Public Rights of Way:** There are public footpaths and bridleways running alongside and through the Site. The most notable of these are:

- The public footpath that connects Ingham, to the villages of Coates and Stow Pasture 'Stow/83/1' (part of which runs through the Site);
- The bridleway that connects Thorpe in the Fallows to Ingham Road 'Camm/31/1' (part of which runs through the Site);
- The bridleways extending north-west from Ingham, running alongside the Site: 'Fill/86/1' and 'Fill/85/2';
- The public footpath 'Stur/73/1' that extends to the east of Sturton by Stow terminates at the Site; and
- The public footpath running north from Broxholme 'TLFe/32/1' extends to Thorpe Lane (which runs along the south of the Site) joins the Site boundary.

3.2.17 **Power Stations:** The decommissioned Cottam Power Station is around 8km from the Site.

3.2.18 **Airfields:** There are airfields in the surrounding area including Scampton around 3.5km to the south-east of the landholding; and Sturgate around 3.5km to the north-west of the Site.

3.2.19 **Rivers:** The River Till meanders in a predominantly north/south direction across the western portion of the Site. In some areas the river comprises part of the red line area identified, and in others it adjoins the boundary. The banks of the river are lined with trees. A section of river, joining the River Till, in the north-eastern portion of the landholding, appears to have been canalised. Where this has taken place there are wide open river banks with only low lying vegetation.

3.2.20 **Woodland:** There are many woodland blocks adjoining and within close proximity to the eastern portion of the Site.

3.2.21 **Political Planning Boundaries:** The Site is distributed across the parishes of: Fillingham, Willingham, Stow, Cammeringham, Brattleby and Sturton by Stow. The Site also adjoins the parishes of Thorpe in the Fallows, Kexby and Glentworth.

Historic designations

3.2.22 **Conservation Areas:** A number of the villages on the B1398, to the east of the Site, accommodate conservation areas. The villages with conservation areas are Hemswell, Glentworth, Fillingham, Ingham, Brattleby, South Carlton and Burton-by-Lincoln.

3.2.23 In addition, the village of Springthorpe, south of the Site at Corringham, has a conservation area. There is also a small conservation area in the village of Saxilby.

- 3.2.24 **Listed Buildings:** There are a considerable number of listed buildings in the settlements around the Site.
- 3.2.25 **Archaeology:** There are two Scheduled Ancient Monuments (SAMs) in the centre of the Area, within the village of Coates, and a SAM adjoining the Site to the south.
- 3.2.26 Consideration of the setting of these SAM's and any proposed setbacks from the or other mitigation measures are set out in **Chapter 13 Cultural Heritage** of the PEIR.

Landscape designations

- 3.2.27 **Areas of Great Landscape Value (AGLV):** There is an AGLV which runs along the chain of villages on the B1398, to the east of the Sites. It extends on average between 500-900 metres from the road to the west. This AGLV comprises the B1398 'Cliff Road' and its immediate views over the landscape to the west. The Sites are generally over 1.5km west of the designation, however the undulating shape of the designation around the village of Fillingham means the closest landholding at Cottam 1 is 200 metres from the designation.
- 3.2.28 There is an AGLV designated around the town of Gainsborough, which encompasses woodland and surrounding farmland. The impact of the Scheme on the AGLVs and the setting of the AGLVs is set out in **Chapter 8 Landscape and Visual** of the PEIR.

Ecological designations

- 3.2.29 **Biodiversity improvement areas:** A significant portion of the Site is identified by Central Lincolnshire as either an opportunity for creation or an opportunity for management as part of the ecological network.
- 3.2.30 Opportunities for Biodiversity Net Gain are outlined in **Chapter 9 Ecology and Biodiversity** and a detailed Biodiversity Net Gain assessment will be carried out in due course to support the DCO application. It is anticipated that a significant gain will be possible for area based, linear and water habitats due to the large scale reversion of arable land to permanent grassland.
- 3.2.31 **Sites of Special Scientific Importance (SSSI):** There are none within close proximity to the Site.
- 3.2.32 **Special Areas of Conservation (SAC):** There are none within close proximity to the Site.
- 3.2.33 **Special Protection Areas (SPA):** There are none within close proximity to the Site.
- 3.2.34 **Local Wildlife Sites (LWS):** There is a single wildlife site – 'Willingham to Fillingham Road Verge LWS'. It is located along road verges within the red line boundary of the Site.

Geological designations

- 3.2.35 **Minerals safeguarding areas:** The majority of the Site at Cottam 1 to the north of the woodland 'Normanby Gorse', west of Normanby by Stow, is designated as a Sand and Gravel Area of Search in the Lincolnshire Minerals Local Plan. There are small parts of the Cottam 1 Site which also have this designation, around Lowfield farm and the corner of the field on the edge of the Site next to the bridge leading to Sturton by Stow from Thorpe in the Fallows.
- 3.2.36 The entirety of the Site is designated as a Petroleum Exploration Development Licence (PEDL) Block.

Flood Risk and Drainage designations

- 3.2.37 **Flood Risk:** Small parts of the Site are located in flood zones 2 and 3 and are at risk from Surface Water flooding.

Cottam 2 and 3 (CO2 & CO3)

- 3.2.38 **Size:** Cottam 2 is 132ha. Cottam 3 is 244ha.
- 3.2.39 **Use:** The entirety of the Sites are in agricultural use. This includes an area which appears to be used for storage in relation to farming.
- 3.2.40 **Features:** The Site at Cottam 2 is bounded by Corringham Beck to the north-west, and Yewthorpe Beck to the east. Corringham Beck appears to be canalised, with wide banks with only low vegetation. Yewthorpe Beck is a meandering river with established vegetation and trees lining its banks. There is a farmstead, and a house which are surrounded by the Site. The land is relatively flat and is predominantly well screened from its immediate surroundings by tall hedges around the boundaries of the Sites. The fields are generally large and typically have dividing hedgerows. There are only isolated trees outside of field margins. The Site benefits from existing field accesses. Overhead lines cross parts of the Site.
- 3.2.41 Part of the Site at Cottam 3a comprises a former airfield. Two former runways running north-west/south-east and north-east/south-west cross the Site. Their positioning is still visible from aerial imagery. Kirton Road (B1205) runs along the south of the Site. Most of the boundary with Kirton Road benefits from reasonably well-established hedges. There are sections with lower hedges.
- 3.2.42 The remainder of the former airfield, parts of which adjoin the Site, and parts of which are surrounded by the Site, are used for motorsport and storage and distribution. There is also a house next to the storage and distribution area, which adjoins the north-western part of the Site. The Site benefits from vehicular access from Kirton Road, which is shared with these other land uses. There are two isolated houses to the south of the B1205 in the proximity of the Site.

- 3.2.43 The A159 Laughton Road runs north/south along the western extent of the Site. There is reasonably well established hedging with trees along the boundary.
- 3.2.44 The village of Blyton is approximately 250 metres to the south-west of Cottam 3a. Properties from the village may have views towards the Site. A smaller number of these towards the northern edge of the village may have views of the western extent of the Site. There are scattered isolated dwellings to the north of the landholding, all more than 500 metres from the Site boundary.
- 3.2.45 The fields are generally large and some have dividing hedgerows. There are only isolated trees outside of field margins. Overhead lines cross parts of the Site.
- 3.2.46 The landholding at Cottam 3b comprises medium-large agricultural fields, approximately 400 metres east of the village of Pilham. A trainline runs along the northern border of the Site.
- 3.2.47 **Settlements and roads:** The Sites are situated approximately 5km to the east/north-east of Gainsborough. There are smaller villages between Gainsborough and the sites, including the closest villages of Blyton and Corringham. The villages of Springthorpe, Pilham, Laughton, Scotton and Northorpe are located in close proximity of the Site. There is a chain of settlements on the B1398, which runs north/south to the east of the Sites. The settlements within close proximity of the Site are the villages of Hemswell, Willoughton, Blyborough, Grayingham and the market town of Kirton in Lindsey.
- 3.2.48 The main roads in the surrounding area are the A159 Laughton Road which runs north/south along the western extent of Cottam 3; The A631 Corringham Road, which runs to the south of Cottam 2; and the A15 which runs north/south to the east of the Sites, beyond the chain of villages along the B1398.
- 3.2.49 **Railway Lines:** The railway line between Gainsborough and Kirton in Lindsey runs in a north-east/south-west direction in between the landholdings of Cottam 3a and 3b.
- 3.2.50 **Public Rights of Way:** There are no public footpaths or bridleways within close proximity of the Cottam 2 or Cottam 3a landholdings, although the public footpaths of note are:
- The public footpath to the north of Cottam 3 'Blyt/32/1' around 500 metres to the west of the Site where there may be views across the landscape to the Site.
 - The public footpath to the north of Corringham village 'Corr/22/1', which is around 500 metres to the west of the Cottam 2 Site. It appears that the footpath may afford views across the landscape to the Site.

- 3.2.51 There is a public footpath 'Phil/20/1' which runs alongside and through the Cottam 3b site in an east/west direction, through the south of the Site.
- 3.2.52 **Power Stations:** West Burton Power Station is around 10km from Cottam 2 and 11km from Cottam 3. Cottam Power Station is around 14km from Cottam 2 and 16km from Cottam 3.
- 3.2.53 **Airfields:** The closest airfield is Sturgate, approximately 3km south of Cottam 2.
- 3.2.54 **Rivers:** Cottam 2 is bounded by Corringham Beck to the north-west, and Yewthorpe Beck to the east. Corringham Beck appears to be canalised, with wide banks with only low vegetation. Yewthorpe Beck is a meandering river with established vegetation and trees lining its banks.
- 3.2.55 **Woodland:** There is limited woodland in the area surrounding the Sites, save for Laughton Forest, which is around 2km north and north-west of Cottam 3.
- 3.2.56 **Other:** Cottam 3 is surrounded by an ex-airfield which is now used for motorsport and storage and distribution.
- 3.2.57 **Political Planning Boundaries:** The Sites are split over four parishes: Corringham; Pilham; Blyton; and Laughton. The Cottam 3a Site adjoins the parish of Northorpe.

Historic designations

- 3.2.58 **Conservation Areas:** There is only one conservation area close to the area, within the village of Hemswell, to the east of Cottam 2. Potential impacts of the Scheme on the conservation areas and their settings are considered in **Chapter 8 Landscape and Visual** and **Chapter 13 Cultural Heritage** of the PEIR.
- 3.2.59 **Listed Buildings:** There are a couple of listed buildings in the rural area surrounding Cottam 3.
- 3.2.60 **Archaeological:** There are three SAMs in the area between the landholdings. None of these are in close proximity to the Sites.

Landscape designations

- 3.2.61 **Areas of Great Landscape Value (AGLV):** There is an AGLV which runs along the chain of villages on the B1398, to the east of the Sites. It extends on average between 500-900 metres from the road to the west. This AGLV comprises the B1398 'Cliff Road' and its immediate views over the landscape to the west. Cottam 2 is around 4km west of the designation.

- 3.2.62 There is an AGLV designated around the town of Gainsborough, which encompasses woodland and surrounding farmland. The closest land parcel of Cottam 2 is over 2km east of this designation.
- 3.2.63 The third AGLV of note comprises Laughton Woods AGLV, which is located to the north and west of Cottam 3. The closest part of Cottam 3 to the AGLV is around 1km, from the northernmost extent.
- 3.2.64 The impact of the Scheme on the AGLVs and the setting of the AGLVs is set out in **Chapter 8 Landscape and Visual** of the PEIR.

Ecological designations

- 3.2.65 **Biodiversity improvement areas:** There are no Biodiversity Opportunity Areas designated on the Sites, although an area to the north of Cottam 3 is identified for possible creation.
- 3.2.66 **Sites of Special Scientific Importance (SSSI):** There are SSSIs within Laughton Forest: Laughton Common SSSI; Scotton and Laughton Forest Ponds SSSI; Scotton Beck SSSI; Scotton Common SSSI; and Tuetoes Hills SSSI. Cottam 3 is in the impact risk zones for those SSSIs. Cottam 2 is outside of any impact risk zones.
- 3.2.67 **Special Areas of Conservation (SAC):** There are none within close proximity of the Sites.
- 3.2.68 **Special Protection Areas (SPA):** There are none within close proximity of the Sites.

Geological designations

- 3.2.69 **Minerals safeguarding areas:** The western third of Cottam 3 is designated as a Sand and Gravel Area of Search in the Lincolnshire Minerals and Waste Local Plan.
- 3.2.70 The fields to the west of Cottam 2 are designated as a Sand and Gravel Minerals Safeguarding Area.
- 3.2.71 The entirety of Cottam 2 and 3 are designated as a Petroleum Exploration Development Licence (PEDL) Block.

Flood Risk and Drainage designations

- 3.2.72 **Flood Risk:** A very small portion of Cottam 2 is in Flood Zone 3 and small parts are at risk from Surface Water flooding.

Agricultural Land Use Classification (ALC)

- 3.2.73 Initial draft ALC survey reports are appended to the PEIR at **Appendix 3.2** (dated May 2022). This indicates the following land grading within the full red line boundary

of the Cottam Sites - Grade 1 – 0%; Grade 2 – 2%; Grade 3a – 6.2%; Grade 3b – 91.7%. A breakdown of ALC per Site is also provided in the ALC report. Further soil sampling (including in-field carbonates testing) has been undertaken to supplement these reports and the samples are currently being processed. If the results become available during the statutory consultation period, and the results materially change the grading percentages above, the Applicant will update the information to be provided by way of an addendum to **Appendix 3.2**. The ES submitted with the DCO application will set out the survey results in full.

3.2.74 Built form will not impact the entirety of the land area within the red line boundary of the Scheme. As the design of the Scheme has evolved some areas of higher-grade agricultural land have been taken out of the Scheme and structures have been set back from Site boundaries generally, and for example, where there is the potential for impacts on residential amenity. As the Scheme design continues to evolve, the Applicant anticipates that the impact of the Scheme on Best and Most Versatile (BMV) agricultural land reported in the PEIR will be reduced even further. This will be set out at the DCO application stage.

3.2.75 In respect of the impacts on agricultural land quality relating to the cable routes. The cable route (and its length) for Cottam continues to be refined. At this stage, it could be in the region of 22 Km in length. A 25 metre working area is likely to be required during construction, with a lesser area being affected by intrusive works to install the underground cable. The impact on ALC will be addressed in the ES through consideration of the following:

- Natural England ALC high level mapping;
- limited land required for the cable route easements;
- the fact that once the cables have been constructed, the disturbed soils (having been protected during construction), will be re-instated; and
- farming practices can continue in these areas.

3.3 Cable Route Corridor Search Areas

3.3.1 The cable route corridors are shown on the plans in **Appendix 3.1**. The cable corridor as shown in the PEIR has been reduced and altered from the version submitted at the scoping stage, as further environmental assessments have been completed and conversations with landowners have advanced since then. There is still on-going assessment work in relation to the cable route which will inform the final corridor to be proposed in the DCO application.

3.3.2 The cable route corridor as shown in the PEIR links the Sites to the grid connection point running from Cottam Power Station north east towards Blyton. The majority

of the land within the corridor is agricultural land. Other land use types that the corridor crosses include the River Trent between Marton and Coates. There are some notable designations within the cable corridor including the Gilby medieval settlement and cultivation remains SAM which is located to the south of Pilham. The cable corridor goes around the north and west of Cottam Power Station. There are some small areas of the cable corridor which are located within Flood Zone 3 around the River Trent.

- 3.3.3 The voltage of the cables and the number of circuits will affect the width and number of cable trenches required. The range of typical cable trench widths is from 0.47m to 1.60m, with either one or two trenches anticipated to be required along the majority of the cable route. However, the width and spacing of the cable trenches may differ depending on environmental constraints, engineering requirements (for example, use of horizontal directional drilling or other trenchless techniques) or if crossing third party apparatus (e.g. railway lines).
- 3.3.4 In addition to the trenches, land will be required in the corridor for access and soil and cable 'lay down'. Construction compounds and access routes along the cable corridor will also be required. The likely temporary working area for the cable corridor is anticipated to be 25m in width.

4 Development Proposal

4.1 Development Summary

- 4.1.1 This chapter provides a description of the Scheme. The physical characteristics of the Scheme are described alongside the proposed programme. The key activities that will be undertaken during the construction, operation and decommissioning are included in this chapter and inform the technical assessments included in the PEIR.
- 4.1.2 The operational life of the Scheme is anticipated to be 40 years. Once the Scheme ceases to operate, the development will be decommissioned. A 40-year period for the operational phase of the development will be assessed in the EIA and reported in the ES accompanying the DCO application. However, as is typical for energy generation NSIPs, the DCO application will not seek a temporary or time limited consent.
- 4.1.3 The solar array Sites and associated substations and energy storage are to be connected to the National Grid at a substation at Cottam Power Station. The Scheme will connect to the National Grid substation via a new 400kV substation constructed as part of the Scheme to provide the connections to the various solar Sites at 132 or 33kV. The substations, cable connections and energy storage will be required for the duration of the Scheme. The substations and energy storage will be decommissioned and removed at the end of the lifetime of the Scheme but the underground cables are anticipated to be decommissioned in situ to minimise environmental impacts.
- 4.1.4 The solar panel installations within each of the three Sites will each have a generating capacity of more than 50MW and therefore each constitute an NSIP.
- 4.1.5 This chapter is supported by indicative layout plans for the solar array Sites at **Appendix 4.1**; the cable corridor plans; and indicative images of associated equipment.

4.2 Maximum Design Scenario

- 4.2.1 The DCO will be seeking to incorporate flexibility into the design of the Scheme which is supported through a number of the National Policy Statements on energy. The ES will consider two different design options for the solar panels.
- 4.2.2 The ES will employ a maximum design scenario approach reflecting the principle of the 'Rochdale Envelope'. This approach allows for a project to be assessed on the basis of maximum project design parameters i.e., the worst-case scenario in order to provide flexibility and take advantage of technological improvements, assessing

all potentially significant effects (positive or adverse) within the EIA process and reported in the ES.

4.2.3 As the design, environmental assessment and consultation processes (which run in parallel) evolve, the maximum parameters set out in the PEIR may change in order to deliver the best environmental outcomes for the Scheme. The design parameters have evolved since the submission of the Scoping Report.

4.2.4 Table 4.1 sets out the parameters that have been used for assessment by each of the technical topics in the PEIR to determine that disciplines significance. Each component is described in more detail in Section 4.3.

Table 4.1: Details of the design parameters used for the PEIR

Scheme Component	Parameter Type	Maximum Design Parameter
Solar Panels		
Tracking Panels	Maximum height of solar panels above ground level	4.5m
	Minimum height of the lowest part of the solar panel above the ground level	0.4m
	Indicative slope and orientation	+/- 60° aligned in north-south rows rotating east-west
	PV mounting structure	Metal frame securely fixed to the ground, other than where 'feet' may be required for archaeological protection, rather than intrusive works. Posts to be pile driven approximately 1.5-2m into the ground, dependant on ground conditions.
	Solar panel type	Bifacial monocrystalline panels
	Separation distance between rows	1 module in portrait tracker, between 4.5 and 6.5m pitch (pole to pole)

		2 modules in portrait tracker, between 9.5 and 12m pitch
Conversion Units/Inverters	Maximum dimensions	6.1m by 2.5m with a maximum height of 3.2m
	Materials	Units are housed in a container sitting on a concrete base or concrete feet.
	Fencing	Deer type wire and mesh and wooden post fencing with a maximum height of 2.5m
	Security	CCTV camera poles with a maximum height of 3m. Poles to be galvanized steel painted green
Substations		
400KV - Cottam 1	Maximum compound area	3.5ha
	Maximum height	13m to the top of the busbars
	Compound perimeter	2.6m high palisade fencing around the compound 2.5m high deer type wire mesh and wooden post fencing outside of the palisade fencing
	Access Track	Max 5m wide constructed of Permeable compacted hardcore
	Relay and Control Rooms – maximum dimensions	Maximum dimensions of 4.7m by 14.8m and maximum height of 3.85m
	33kV Switch Room – maximum dimensions	Maximum dimensions of 6m by 23.6m and maximum height of 3.85m
	Housing	Maximum height of 6m
132kV - Cottam 2 and 3	Maximum compound area	6.4m by 67.9m
	Maximum height	64.44m to the top of the busbars

	Compound perimeter	2.6m high palisade fencing around the compound 2.5m high deer type wire mesh and wooden post fencing outside of the palisade fencing
	Relay and Control Rooms – maximum dimensions	Maximum dimensions of 4.7m by 14.8m and maximum height of 3.85m
	Housing	Maximum height of 6m
Energy Storage		
Cottam 1 West Option A	Maximum compound area	6.58ha
	Maximum dimensions	16m by 3m and maximum height of 3.2m
	Compound perimeter	2.6m high palisade fencing around the compound. CCTV cameras will be installed (number to be confirmed)
	Access	4m wide. Parking bays will be provided (number to be confirmed)
Cottam 1 West Option B	Maximum compound area	15.34ha
	Maximum dimensions	16m by 3m and maximum height of 3.2m
	Compound perimeter	2.6m high palisade fencing around the compound. CCTV cameras will be installed (number to be confirmed)
	Access	4m wide. Parking bays will be provided (number to be confirmed)
Grid Connection Corridor	Maximum width	The range of cable trench widths will be from 0.47m to 1.60m, either 1 or 2 trenches are anticipated along the cable route.

		The cable corridor is expected to require a maximum of a 25m wide working area within the Grid Connection Corridor
	Maximum depth	2m subject to design and ground conditions
National Grid Connection	Point of connection	Connection from the 400kV substation to the existing Cottam Power Station substation

4.3 Proposed Built Development

- 4.3.1 The Scheme will consist of the infrastructure described as above and in further details below. Indicative layouts for each Site are provided at **Appendix 4.1**. Given the nature of the Scheme being made up of different Sites, there are variations to the proposed built development across the Sites to reflect the individual Site constraints and context. These variations are listed below.

Solar Panels

- 4.3.2 The panels will convert sunlight/daylight into electrical current. They are made up of a series of photovoltaic cells beneath a layer of toughened glass. Other PV technology is developing rapidly and may be available at the time of construction. The panel frames are typically built from anodised aluminium or steel.

Tracking panels

Photo 4.1 Typical tracking panels

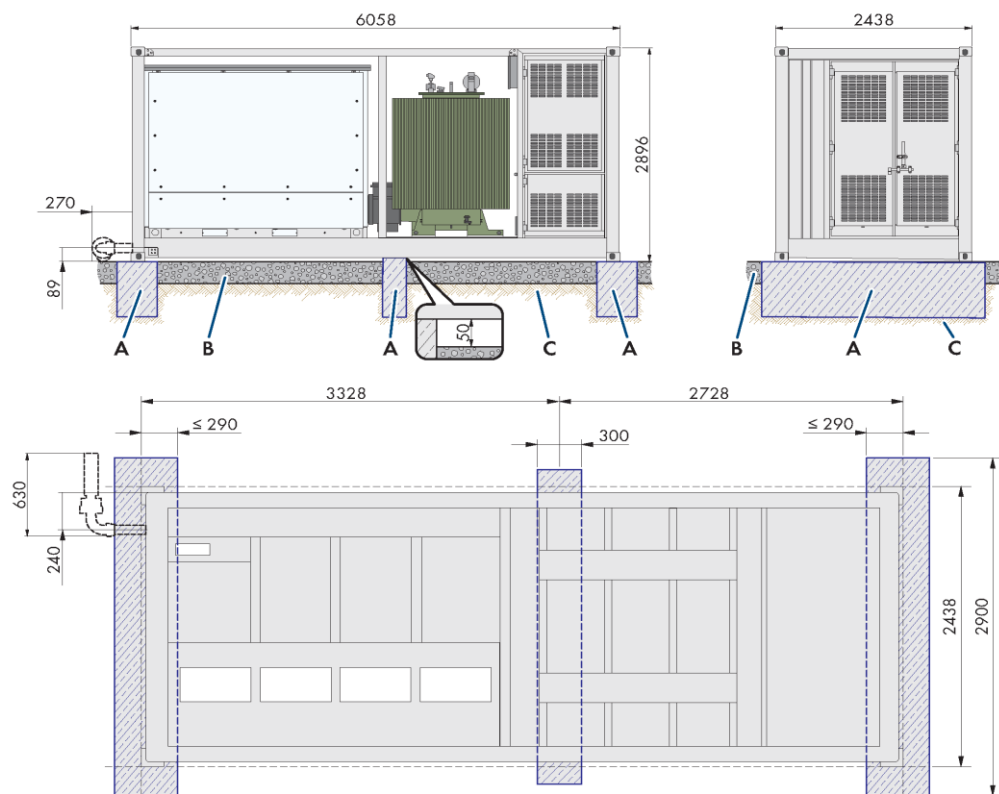


Conversion Units/Inverters

- 4.3.3 These units contain the inverters, transformers and associated equipment to convert the Direct Current (DC) electricity produced by the arrays, into Alternating Current (AC) electricity required to import into the grid. An example image is shown below.

Image 4.1 Typical inverter unit

SMA Solar Technology AG



Position	Designation
A	Strip foundation
B	Pea gravel ground
C	Solid ground, e.g., gravel

Substations

- 4.3.4 There are two types of substations required across the project as noted in Table 4.1. The 400kV substation which will be located within Cottam 1 and will be air insulated and an example of this type of substation is shown in Photo 4.2.

Photo 4.2 Typical (large 400kV) power transformer



- 4.3.5 On the Cottam 2 and 3 Sites there are proposed to be 132kV substations. The technical details on these are set out in Table 4.1. An example photo is provided below.

Photo 4.3 Typical 132kV substation compound



Energy Storage

- 4.3.6 The candidate technology being assessed for the energy storage facility will be batteries. The battery energy storage is designed to provide peak generation and grid balancing services to the electricity grid. It will primarily allow excess electricity generated from the solar PV panels to be stored in the batteries and exported to the grid when required. It will also allow excess energy from the grid to be imported to the batteries. The energy storage will provide flexibility and grid reliability.
- 4.3.7 The role of electricity storage facilities are becoming increasingly well placed to deliver a number of ancillary services for the National Grid electricity system which is of growing importance in Great Britain. Recent and projected development of the electricity storage sector points to significant growth which will support the integration of projected renewable generation capacity onto the transmission system, through both collocated and standalone schemes.
- 4.3.8 The battery storage system will require heating, ventilation and cooling systems to ensure the efficiency of the technology. These features are integrated into the units

they are housed in. The battery system will comprise Bi-directional AC/DC inverters to control the charge of the batteries from the solar PV energy output or the charge of the batteries when drawing energy from the grid.

Image 4.2 Typical Energy Storage Units



4.3.9 The Applicant is proposing that the energy storage will be located within Cottam 1. There are two options presented in the PEIR:

- Cottam 1 West Option A showing one potential area for energy storage; and
- Cottam 1 West Option B showing three potential areas for energy storage.

Fencing and Security

4.3.10 The location of the fencing is still being determined and will be reliant on the final designs which will be provided in the DCO application. The design principles of the fencing will be deer wire mesh and wooden post fencing with a maximum height of 2.5m as illustrated in Photo 4.4.

Photo 4.4 Typical Deer Fencing



- 4.3.11 Pole mounted internal facing CCTV systems will be used around the perimeter of the operational elements of the Sites. It is anticipated that these will be galvanised steel painted green poles with a maximum height of 3m.
- 4.3.12 There will be palisade fencing around the substations and energy storage compound which will have a maximum height of 2.6m.

Lighting

- 4.3.13 Lighting is not required within the solar arrays. Lighting will be provided within substations and within the Energy Storage site to be used only in the event of it being required for maintenance and security purposes. Down lighting would be used.

Cable Corridor

- 4.3.14 The electricity generated by the Scheme will be imported and exported via new underground cables to the National Grid at the existing substation at Cottam Power Station.
- 4.3.15 The electricity generated by the solar panels from the Scheme will be exported via new underground cables to the National Grid at the existing substation at Cottam Power Station. These underground cables will also import and export energy between the energy storage and the National Grid.

- 4.3.16 The cable corridor as shown in the PEIR has been reduced and altered from the version submitted at the scoping stage, as further environmental assessments have been completed and conversations with landowners have advanced since then. There is still on-going assessment work in relation to the cable route which will inform the final corridor to be proposed in the DCO application.
- 4.3.17 The voltage of the cables and the number of circuits will affect the width and number of cable trenches required. The range of typical cable trench widths is from 0.47m to 1.60m, with either one or two trenches anticipated to be required along the majority of the cable route. However, the width and spacing of the cable trenches may differ depending on environmental constraints, engineering requirements or if crossing third party apparatus (e.g. railway lines).
- 4.3.18 In addition to the trenches, land will be required in the corridor for access and soil and cable 'lay down'. Construction compounds along this route will also be required. The likely working area for the cable route is anticipated to be 25m wide.
- 4.3.19 Any existing overhead power lines will be retained, and no new overhead lines will be required.

District Network Operation Connections

- 4.3.20 It is envisaged that local grid connections to the distribution network (operated by Northern Powergrid and Western Power Distribution) will be made for each of the energy generating stations.
- 4.3.21 These will allow each generating station to connect to the local grid network to obtain short-term auxiliary power to the substations to maintain operation in the event that there is a technical problem with the connection to the National Grid.
- 4.3.22 Discussions are ongoing with the DNOs about the best place for these connections for each Site. These are likely to be via existing 11kV or 33kV lines either crossing the Sites or in the surrounding area, depending on grid capacity.

4.4 Access

- 4.4.1 During the temporary construction phase, the following construction access points will be required.
- Cottam 1: 11 access junctions including:
 - 1 from Thorpe Lane;
 - 1 from Stow Lane;
 - 1 from Ingham Road;

- 2 from Fleets Lane;
- 1 from South Lane;
- 3 from Willingham Road;
- 2 from an existing farm track to the west of Coates.
- Cottam 2: 1 access junction from the A631 to the east of Corringham;
- Cottam 3: 2 access junctions from the B1205, to the east of Blyton.
 - Where construction vehicle accesses utilise existing agricultural access points or tracks, the access points will be formalised and widened if necessary. Swept path analysis will be included within the ES to demonstrate that they can operate safely.
 - All construction vehicles will access the Site via the A15, from either the M180 Motorway to the north, or the A46 to the south. From the A15, construction vehicles will take the following routes to the Site:
 - Cottam 1 – either the A1500 Till Bridge Lane or Ingham Lane/Stow Lane;
 - Cottam 2 – A631;
 - Cottam 3 – B1205.

4.4.2 Where construction vehicle accesses utilise existing agricultural access points or tracks, the access points will be formalised and widened if necessary. Swept path analysis will be included within the ES to demonstrate that they can operate safely.

4.4.3 All construction vehicles will access the Site via the A15, from either the M180 Motorway to the north, or the A46 to the south. From the A15, construction vehicles will take the following routes to the Site:

- Cottam 1 – either the A1500 Till Bridge Lane or Ingham Lane/Stow Lane;
- Cottam 2 – A631;
- Cottam 3 – B1205.

4.4.4 Construction accesses will be upgraded to form operational accesses, or additional access points will be provided. The indicative layout plans show potential access gates. On-going dialogue is taking place with the relevant highway authorities over operational access points and the position will be updated at the DCO application stage.

4.5 Construction, Operation and Decommissioning

Construction and Phasing

- 4.5.1 The Scheme currently has a grid connection date of 2029. However, it is possible that an earlier connection date may be obtained. The construction of the Scheme is proposed to be phased over a two-year period and subject to the DCO consenting process, the earliest construction may start is 2024.
- 4.5.2 The construction period will vary across the Sites and for the larger Sites there will be opportunities for having multiple construction crews working at the same time. The following timeframes are anticipated for the solar array elements of the Scheme:
- Cottam 1 – 28 weeks
 - Cottam 2 – 18 weeks
 - Cottam 3 – 20 weeks
- 4.5.3 The energy storage construction period is likely to be 40 weeks in duration for Option A and likely to be around 80 weeks for Option B. There will be additional time for site preparation work with this likely to be done in parallel with the 400kV substation.
- 4.5.4 The 400kV substation will take in the region of 18-24 months to construct. Each 132kV substation will take in the region of 12 months to construct.
- 4.5.5 There will be temporary construction compounds required for the Sites and the grid connection works which is likely to be in the region of 12-18 months. An indicative plan of potential construction compound locations is provided at **Appendix 4.2**. The temporary construction compounds will comprise:
- Compound maximum dimensions will typically be 80m by 80m;
 - Temporary portacabins for construction operatives (the dimension of the portacabins would vary and the maximum size for individual units is expected to be 10m by 3m with a typical maximum height of 3m);
 - Perimeter security fencing with a typical maximum height of 3m;
 - Parking area for construction and workers vehicles;
 - Secure compound for storage;
 - Temporary hardstanding;

- Wheel washing facilities;
- Temporary gated compound;
- Storage bins for recyclables and other waste; and
- Lighting will be required during construction periods but will be temporary in nature and normal working hours will be adhered to except in specified circumstances (as set out below).

4.5.6 Construction activities are likely to be carried out Monday to Friday 07:00-18:00 and between 08:00 and 13:30 on Saturdays. However, some activities may be required outside of these times (such as the delivery of abnormal loads, night time working for cable construction works in public highways or horizontal direction drilling activities). Where possible, construction deliveries will be coordinated to avoid HGV movements during the traditional AM peak hour (08:00-09:00) and PM peak hour (17:00-18:00).

Construction Environmental Management Plan

4.5.7 Prior to the commencement of any phase of development a Construction Environmental Management Plan (CEMP) will be submitted to and approved by the relevant planning authority, and this will be secured by the Requirements in the DCO. The CEMP for each phase will be in accordance with the Outline CEMP which will be submitted as part of the DCO application. This will ensure the potential construction impacts are minimised.

4.5.8 A draft Outline CEMP is submitted as part of the PEIR and can be found in **Appendix 4.3**. The Outline CEMP will be updated and progressed alongside the design evolution process.

4.5.9 The CEMP outlines the allocated responsibilities, procedures and requirements for Site environmental management. It would include relevant Site-specific method statements, operating practices, and arrangements for monitoring and liaison with local authorities and stakeholders.

4.5.10 The Main Contractors undertaking the construction of the Scheme would need to adopt and comply with the CEMP, allocate environmental management responsibilities to a Site manager and ensure that all sub-contractors' activities are effectively managed in accordance with the CEMP.

4.5.11 If the Scheme and the West Burton Solar Project and Gate Burton Projects progress in parallel, the Applicant will seek to plan and co-ordinate any construction activities, via the CEMP and Construction Traffic Management Plan, to reduce environmental impacts, if possible and where practicable.

Operation

- 4.5.12 Once the Scheme is operational, traffic generated by it will be limited to that associated with occasional maintenance work.
- 4.5.13 Movement within the Sites will be by way of quad bike or small, farm utility vehicle. Personnel will visit the Sites from time to time to check the apparatus. No on-site staff will be required to operate the Scheme but there will be limited staff facilities located in the control rooms associated with the 400 and 132kV substations. Some permanent equipment for monitoring the Sites will be located in the Relay and Control Room. Whilst this would typically be accessed remotely, it would be available for occasional physical access during routine visits.
- 4.5.14 Noise impact is largely limited to the construction phase of the development. There would be a small amount of noise generated by the vehicle movements across the site coupled with the installation of equipment. There will be some noise transmitted from the transformers, substations, tracking panels and energy storage but these levels are predicted to be low and are addressed in full in the noise Chapter.

Decommissioning

- 4.5.15 The decommissioning of the Scheme is expected to take 12-24 months and will be undertaken in phases. A Decommissioning Plan will be prepared will be submitted to and approved by the relevant planning authority prior to decommissioning, and this will be secured by the Requirements in the DCO. The Decommissioning Plan for each Site or phase of decommissioning will be in accordance with the Outline Decommissioning Plan which will be submitted as part of the DCO application. This will ensure the potential decommissioning impacts are minimised.
- 4.5.16 A draft Decommissioning Statement is submitted as part of the PEIR and can be found in **Appendix 4.4**. This will be updated and progressed alongside the design evolution process.
- 4.5.17 The Solar PV arrays and related built infrastructure, ancillary infrastructure, substations and energy storage will be removed and recycled or disposed of in accordance with good practice and market conditions at that time.
- 4.5.18 The underground ducting within the Cable Corridor will be decommissioned but left in-situ to avoid unnecessary intrusion. It is possible to remove the cable itself by extracting it at the joint bays from within the ducting, so that the cable can be recycled. This will be considered further in the ES.
- 4.5.19 The effects of decommissioning are similar to, or often of a lesser magnitude than construction effects and will be considered in the relevant sections of the PEIR.

However, there can be a high degree of uncertainty regarding decommissioning as legal and policy requirements engineering approaches and technologies are likely to change over the operational life of the Scheme.

Waste

- 4.5.20 Waste will be generated during all phases of the development. Solid waste materials generated during construction and decommissioning will be segregated and stored on site prior to transport to an approved, licensed third party landfill and recycling facility. Waste arisings are addressed in **Chapter 19 Waste** of the PEIR and will be assessed as appropriate in the ES.

Site Reinstatement

- 4.5.21 The land within the Sites will be returned to its original use after decommissioning. This will include the substations, converter units/inverters and energy storage.
- 4.5.22 As noted above, underground ducting within the Cable Corridor will be decommissioned but left in-situ to avoid unnecessary impacts. It is possible to remove the cable itself by extracting it at the joint bays from within the ducting, so that the cable can be recycled.
- 4.5.23 It is anticipated that some of the areas of habitat and biodiversity mitigation and enhancement will potentially be left in situ given that they could contain protected species. The need for any relevant protected species licenses will be considered at that time if reinstatement activities are likely to have an impact.

4.6 Ecology and Landscaping

Ecological Mitigation and Enhancement

- 4.6.1 The Sites currently comprise of arable and pastoral fields with the majority of the land considered to be of low ecological value due to intensive agricultural practices... There are features within the Sites such as hedgerows, field margins and ditches/watercourses which are considered to have some ecological value.
- 4.6.2 To date Preliminary Ecological Appraisals (PEA) have been undertaken on the Sites along with protected species surveys which have been seasonally appropriate to carry out (please refer to accompanying PEA's at **Appendix 9.1**). There will be further surveys carried out in the 2022 survey window. Once the full suite of species surveys have been carried out any new habitat land and/or mitigation that is appropriate will be identified and included in the DCO application.
- 4.6.3 A number of the Sites fall within the Central Lincolnshire Local Plan ecological enhancement and opportunity areas. The Scheme will be looking to contribute towards this opportunity and connect up networks where practical and appropriate.

The Scheme includes proposals for significant areas of new lengths of native hedgerow and sympathetic management of adjacent road verges. This is set out further in **Chapter 9 Ecology**. Further detail will be provided within the DCO submission.

4.6.4 As a general principle the following ecological mitigation and enhancement measures are used on solar projects:

- Land between and under the arrays to be sown as grassland and meadow management with limited cutting and a mix of some areas being grazed and others not;
- Gaps within existing hedgerows will be filled with additional native species to increase diversity, and hedgerows will be managed on a rotational basis to enable wildlife to benefit from them year-round;
- Appropriate vegetated buffers will be maintained comprising native planting; and
- Installation of bird nest and bat boxes on trees will be retained around the Site to provide opportunities for a range of species recorded within the local area.

4.6.5 Mitigation land will be provided for skylark plots. The exact quantity of this will be based on the final total area that is covered by built infrastructure.

4.6.6 Prior to the commencement of any phase of development a Landscape and Ecological Management Plan (LEMP) will be prepared and submitted to and approved by the relevant planning authority, and this will be secured by the Requirements in the DCO. This will ensure the potential construction and operational impacts are minimised. The LEMP will be in accordance with the Outline LEMP which will be submitted as part of the DCO application. A draft Outline LEMP is submitted as part of the PEIR and can be found in **Appendix 4.5**. This will be updated and progressed alongside the design evolution process.

Surface Water Drainage

4.6.7 Flood Risk Assessments and a Drainage Strategy are being developed as part of the design process. The assessments identify how the Scheme will manage surface water across the Sites and not increase flood risk. The drainage strategy will detail the measures to manage the surface water drainage from the Scheme and any required changes needed to existing land drainage.

Landscaping

4.6.8 Given the scale of the Scheme, the impact on the landscape context and the visual impact is a prime consideration. As part of the PEIR the Sites have been assessed to

establish where the key viewpoints are into and out of the Sites and to identify where potential mitigation planting would be needed.

4.6.9 As a general principle the following landscape enhancements and mitigation are used on solar projects:

- The creation of new woodland blocks and belts;
- Planting new hedgerows;
- Reinforcing existing boundary hedgerows; and
- New tree planting.

4.6.10 The proposed landscape strategy will also be seeking to increase the green infrastructure and link up ecological networks (as noted above). This may include enhancing Public Rights of Way or providing improved connectivity of them.

5 Alternatives and Design Evolution

5.1 Introduction

- 5.1.1 This chapter of the PEIR describes the consideration of alternatives and design evolution in relation to the Scheme.
- 5.1.2 This chapter has been provided to demonstrate “[a] description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects” as required under Paragraph 2 of Schedule 4 of the EIA Regulations.
- 5.1.3 National Policy Statement (NPS) EN-1 confirms that there is no general requirement to consider alternatives or to establish whether a development represents the best option, stating (at paragraph 4.4.1) that: *“as in any planning case, the relevance or otherwise to the decision-making process of the existence (or alleged existence) of alternatives to a proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS”*. This position is carried forward into the draft NPS EN-1.
- 5.1.4 Whilst specifically identifying the legal requirement as set out in the EIA Regulations, the NPS recognises other specific legislative requirements and policy areas which require the consideration of alternatives. Paragraph 4.4.3 of NPS EN-1 states *“where there is a policy or legal requirement to consider alternatives the applicant should describe the alternatives considered in compliance with these requirements”*.
- 5.1.5 To ensure compliance with the policy and legal requirements as identified above, this chapter describes the iterative approach to the Scheme’s development undertaken to date, as well as identifying the following alternatives considered:
- Alternative sites;
 - Alternative technologies;
 - Alternative site layouts;
 - Alternative cable routing.
- 5.1.6 The consideration of “no development” as an alternative to the Scheme has not been explored within this Chapter. This is due to the consideration of “no development” being unreasonable as it would not deliver the generation of renewable electrical power and energy storage proposed.
- 5.1.7 The overarching ‘need’ for the development is set out in Section 6.2 of the PEIR.

5.2 Scheme definition and Site Search

- 5.2.1 There is no standard methodology for the selection of sites for solar energy generating stations. The process that has evolved and been adopted for the Scheme is described below.

Stage 1 – Identification of the Area of Search

- 5.2.2 Irradiation (sunlight) levels and topography are key factors when determining the location of solar development. Solar developments are currently found across the UK; however, their efficiency is determined by the levels of irradiation at their location. The whole of England is well located geographically for solar gains. The Applicant had no restrictions on where developments should be, located in relation to irradiation levels.
- 5.2.3 The preference is for a site with a southerly aspect; however, sites with other aspects cannot be dismissed. If a site with another aspect is pursued there is likely to be a need to increase the overall development footprint as there would be an operational need to increase the distance between arrays in order to avoid overshadowing.
- 5.2.4 A viable grid connection is an essential material consideration for proceeding with a development and is instrumental in defining the search area. During discussions with National Grid in 2019, the Applicant was notified of grid capacity at West Burton, Cottam, and High Marnham Power Stations. This capacity was available at these locations due to the closures of the coal fired elements of those sites. Due to the immediate availability of these Points of Connection (POCs), the Applicant did not consider any further alternative grid connection points. Through further discussion with National Grid on the Cottam POC, National Grid advised that connection at Cottam would be preferred over connection at High Marnham. The Applicant therefore made a grid connection application to National Grid for connection at Cottam Power Station and an offer was made for 600MW.
- 5.2.5 IGP also made an application for a grid connection at West Burton Power Station for 480MW and as noted previously in this PEIR, this is the subject of a separate DCO application, including its associated land parcels. Subsequently, and through further discussion with National Grid on the Cottam POC, they advised that connection at Cottam would be preferred over connection at High Marnham.
- 5.2.6 As the grid connection offer was not site-specific IGP proceeded to look at sites that could accommodate a solar project to support the grid capacity available at both Cottam and West Burton. In respect of Cottam and a grid connection of 600MW, a site size of approximately 1,300 ha was considered to be needed. The Applicant generally seeks to find a site which is around 10% larger than is needed for the grid connection offer. This larger site size allows for a scheme to accommodate mitigation measures and environmental constraints that will become known

through the design development process. It was considered that it would be highly unlikely that a single site of this size would be available.

- 5.2.7 Opportunities for solar arrays on previously developed land (PDL)/brownfield land, commercial rooftops, and lower grade agricultural land were explored. To be suitable as an NSIP a Scheme needs to be generating a minimum of 50MW of energy production. A site needs to be at least 75ha in size to meet the required 50MW energy production minimum.
- 5.2.8 An assessment of PDL/brownfield land in the host authorities of West Lindsey and Bassetlaw Districts identified no land of an adequate area to facilitate a large-scale solar project. In 2017, it became a requirement for each Local Planning Authority to keep a register of PDL suitable for residential development. The latest data for the two District Councils in the search area is from 2020 (Bassetlaw) and 2021 (West Lindsey). In the host authority areas, all sites smaller than 75ha have been discounted due to their inability to provide capacity for a 50MW solar project. No sites were found over 62ha and therefore no individual brownfield site from the register provides an adequate area to facilitate a large-scale solar project. The three sites summarised in Table 5.1 below are the only listed sites on the two registers above 10ha. All three are within Bassetlaw District with planning permission for a range of residential and commercial uses which attract significantly higher land values than agricultural land and therefore would be unviable for solar development.
- 5.2.9 Of the remaining registered 72 sites across both districts, there are 16 sites which are more than 1ha in area. A full assessment of PDL sites will be set out in the DCO application.

Table 5.1: PDL sites from Brownfield Registers of Bassetlaw and West Lindsey

Location	Site Size (ha)	Comments
Harworth Colliery, Scrooby Road, Harworth and Bircotes	62	Site has outline planning permission for redevelopment for up to 966 dwellings, 2,044sqm of A1 retail space and 76,645sqm of B1, B2 and B8 uses and community uses. Since the approval in 2009 various applications have been submitted for reserved matters and discharge of conditions. Therefore, given the site size falling below the minimum threshold and the extant planning permission the site was not considered any further.
Welbeck Colliery, Budby Road, Welbeck	33.63	Site has planning permission for a hybrid application for a mixed use development consisting of residential dwellings, country park, Use Classes B8, B1, B2, A1 and A3. Since the approval in 2015 various applications have been submitted to discharge conditions. The construction of the

		development commenced in 2016 according to the application forms submitted. Therefore, given the site size falling below the minimum threshold and the extant planning permission the site was not considered any further.
Firbeck Colliery, Doncaster Road, Carlton in Lindrick	13.77	Site has planning permission for a hybrid application for a residential development of up to 400 dwellings. Since the approval in 2019 various applications for reserved matters, discharge of conditions and amendments have been submitted and approved. According to the most recent discharge of condition application the development has not commenced. Therefore, given the site size falling below the minimum threshold and the extant planning permission the site was not considered any further.

- 5.2.10 An assessment of commercial rooftops in the host authorities of West Lindsey and Bassetlaw Districts identified no rooftops or combined premises of an adequate area to facilitate a large-scale solar project.
- 5.2.11 A high-level review of lower grade agricultural land was undertaken to identify areas of lower likelihood of containing best and most versatile (BMV) agricultural land. Based on the Natural England agricultural land classification maps, notably, much of the land along the valleys of the Rivers Till, Trent, and Idle is likely to be of lower agricultural land quality (in planning terms). Notwithstanding, these areas are at a high risk of flooding, with some identified areas acting as flood storage areas. Other areas identified are of much greater distance from the point of connection than the chosen sites.
- 5.2.12 In addition to the broad considerations set out above, an initial search area was identified at a 5km radius from the POC, however this was later expanded with the clear preference of identifying land as close to the POC as possible, the search area was then enlarged incrementally until suitable options were found.

Stage 2 – Identifying Environmental Constraints

- 5.2.13 Stage 2 of the site selection process was to map the search area and identify the initial environmental constraints within it using sources including MAGIC Map, Natural England Agricultural Land Classification maps and any other publicly accessible records.
- 5.2.14 Table 5.2 below sets out the constraints that were mapped and considered.

Table 5.2: Environmental Constraints Considerations

Consideration	Discussion
Topography and site orientation	<p>The site should be either level or have a gentle sloping topography. It is important to note the following:</p> <p>Where potential sites are subject of physical obstructions which cannot be removed (such as Public Rights of Way, field boundaries, woodlands, rivers, highways and topography) the site area will need to be increased.</p> <p>The preference is for a site with a southerly aspect; however, sites with other aspects cannot be dismissed. If a site with another aspect is pursued there is likely to be a need to increase the overall development footprint as there would be an operational need to increase the distance between arrays in order to avoid overshadowing.</p>
Agricultural Land Classification and Land type	<p>Solar farms are temporary structures and unlike most built development and other renewable energy proposals (such as energy from waste plants) they do not constitute significant permanent development resulting in the loss of agricultural land.</p> <p>Planning policy seeks to minimise impacts on the best and most versatile agricultural land (defined as grades 1, 2 and 3a). and preferably use land that is not classified as best and most versatile (grades 3b, 4 and 5) and where possible utilise previously developed land, brownfield land, contaminated land or industrial land (see Table 5.1 for previously developed land sites considered).</p> <p>The Schemes location has been determined through the exclusion of land that the best available data identifies as being within an agricultural land classification category that is, or includes, best and most versatile land.</p>
Designated international and national ecological and geological sites	<p>The following designations were identified and any land that included any were excluded: Sites of Special Scientific Importance (SSSI), Special Areas of Conservation (SAC), Special Protection Areas (SPA), SPA protection buffer, Ramsar sites and National Nature Reserves (NNR)</p>
Nationally designated landscapes	<p>The presence of any areas of Outstanding Natural Beauty or National Parks were considered in the area of search.</p>
Proximity to sensitive human receptors	<p>Consideration of the proximity of nearby sensitive human receptors which include residential dwellings, populated areas/villages and Public Rights of Way (PRoW).</p>

5.2.15 Following the initial assessment of the 5km search area using the above constraints, it became clear that sites outside of this area would need to be assessed as insufficient land was available. As noted above, the Applicants preference is for the

land to be as close to the POC as possible, so the search area was enlarged incrementally until suitable options were found.

Stage 3– Identifying Landowners within the Search Area

- 5.2.16 Stage 3 runs alongside Stage 2 and is the process of identifying landowners within the search area. Enquiries were made with landowners and their agents on sites which had been identified as being suitable for solar arrays from a technical and constraints perspective. Whilst planning policies and environmental constraints are significant factors in site selection, a willing landowner is also a key consideration.
- 5.2.17 Once a landowner had indicated they would be willing for their land to be included within the Scheme, the Applicant and relevant environmental consultants undertook site visits and further desktop assessments to continue to assess site suitability.

Stage 4 - Further Evaluation of Potential Solar Development Areas

- 5.2.18 Stage 4 continues the assessment work that is undertaken in the earlier stages to establish particular field parcels suitability to accommodate a solar development, taking into consideration planning and environmental factors derived from national and local planning and environmental policy objectives contained in National Policy Statement EN-1: Overarching National Policy Statement for Energy; National Policy Statement for Electricity Networks Infrastructure EN-5, draft National Policy Statements EN-1; EN3 and EN5, National Planning Policy Framework and relevant local planning policy. The factors which are considered include biodiversity, landscape and visual amenity, cultural heritage, flood risk, access and other technical matters relating to grid connection.
- 5.2.19 Table 5.3 below sets out the matters that have been considered.

Table 5.3: Constraints Considerations

Consideration	Discussion
Biodiversity	Outside of the designations identified as sensitive in the EIA Regulations, there are local and regional designations of ecological significance such as a County Wildlife Sites, Local Nature Reserves and Local Wildlife Sites.
Landscape and Visual	<p>Outside of the designations identified as sensitive in the EIA Regulations, there are local and regional designations of landscape significance such as Areas Great of Landscape Value.</p> <p>The landscape and visual effects of energy projects will vary on a case by case basis but the applicant seeks to find well contained sites which have a good level of existing screening in the form of boundary hedgerows and trees without having to rely heavily on new planting.</p>

Cultural Heritage	Consideration is given to whether the proposals would give rise to harm to heritage assets. This includes built heritage and below ground archaeology.
Flood Risk	Having a site in a flood risk zone is not unacceptable as solar panels are water resistant but some of the associated infrastructure is not compatible. Therefore, entire sites which are located within flood zone 2, 3a or 3b should be avoided.
Access	Appropriate highway infrastructure is a material consideration as there needs to be appropriate provision to allow for the HGV's to access the sites during the construction process.

Stage 5 Additional land presented to the Applicant following publication of the Scheme

- 5.2.20 Once the Applicant launched the Scheme publicly and carried out the non-statutory consultation during November 2021 other parcels of land were submitted from landowners or suggested through the consultation feedback. These were logged and considered following the same stages as noted above.

Alternative Sites and the defined scheme

- 5.2.21 The exercise carried out as described above identified a number of potential sites that could accommodate solar arrays. In addition to the early stage site selection process, a non-statutory consultation exercise was undertaken over a 6-week period in November-December 2021. Feedback from this resulted in a number of suggestions of alternative sites for the scheme. The sites considered and reasons for discounting them will be reported in the full site selection report included in the ES for the DCO application.
- 5.2.22 The land parcels that make up the Scheme described in PEIR represent the most appropriate and viable configuration of sites to take advantage of the POC at Cottam Power Station.

5.3 Alternative Technologies

- 5.3.1 The Applicant has taken into consideration (and continues to consider) alternative technologies within the development. Notwithstanding, the DCO application will maintain a degree of flexibility to allow different technologies to be included within the Scheme's Rochdale envelope to account for localised environmental considerations and constraints, whilst also allowing suitable flexibility for technological advances between the time of the DCO application and site construction.

Solar PV Arrangement

- 5.3.2 The predominantly favoured technology for the solar panels is double height (2P) portrait tracking panels, laid out in north-south rows. These are favoured due to their higher energy output and efficiency, as they are able to track the movement of the sun throughout the day to maximise energy production. However, where glint and glare or landscape and visual issues have been identified, an alternative single panel (1P) tracking module can be utilised due to its lower height.
- 5.3.3 The sites may alternatively require south-facing fixed panelling (laid out in east-west rows) due to site and environmental constraints. The type of site constraints that may require this configuration to be implemented are to mitigate glint and glare or landscape and visual impacts. However, fixed panels tend to have a greater ground cover ratio and therefore shading than tracker panels.
- 5.3.4 Where greater peak capacity is required, the use of bifacial solar panels has been indicatively explored to achieve a greater peak electrical output per hectare.
- 5.3.5 Fixed panels are also less susceptible to flooding and can be positioned in areas that can experience greater flooding depths than tracker panels. Furthermore, fixed panels are more flexibly designed to withstand greater flood depths by having more opportunity for raised panel frames and support structures.

Solar PV Array Foundations

- 5.3.6 There are two main options for fixing the solar panels to the ground. Primarily, the Site will use the industry-standard penetrative metal screw piles. These are anticipated to be used for most of the site due to their ease of installation, minimal size, and recyclability. The main alternative, to be used where screw piling would cause excessive damage to underground archaeological remains, would be shallow concrete foot pads.
- 5.3.7 The impacts of both types of foundation on ground conditions, particularly with regard to soil quality, are to be explored in greater detail in the DCO application.

Energy Storage System

- 5.3.8 The likely design for the energy storage system are container-type units which contain the batteries, and associated AC/DC inverters, heating, ventilation and cooling systems, to maximise efficiency and safety of the storage system. These units are expected to be a maximum size of 16m by 3m with a maximum height of 3.2m. The compound will be set out over a maximum of 15.4ha. The design has been chosen due to it being of an industry standard, and due to its layout flexibility and ability to be suitably screened by way of landscape mitigation planting.

Substations

- 5.3.9 Substation design has been primarily driven by electrical design requirements for the Scheme as a whole. Each of the constituent sites has an individual substation, from where energy generated by the solar panel arrays is transported to the connection point by underground cable. The substations have been sized on the basis of the anticipated peak output from the solar arrays.
- 5.3.10 Optionality between the use of standard air-insulated substations, or enclosed gas-insulated substations has been explored. The functionality of air and gas insulated substations is identical, however gas-insulated substations have the benefit of a smaller footprint and ability to be enclosed, thus given optionality for the substation to be regarded as an agricultural building, as well as having greater noise insulating properties. However, gas-insulated substations are more expensive, require higher safety measures, and can be taller, and thus more visible in the landscape, than air-insulated substations.

5.4 Alternative Layouts and Design Evolution

- 5.4.1 The design and extent of the solar array layouts and cable corridors have been subject to an iterative process involving the Applicant, the design team, the environmental consultant team and as informed by feedback from various forms of consultation including with stakeholders and statutory consultees, host authorities, local communities, local residents and through the scoping process. The various stages of iteration are set out in the table below:

Table 5.4: Scheme Design Iterations

Stage	Layout	Consultation	Considerations and Evolution
Phase 1 Consultation (Nov-Dec '21)	Outline site areas and initial cable routes	Non-statutory consultation events with the public, internal project team and landowners only National Grid offer for grid connection	Based on site option agreements and initial specification for cable route
EIA Scoping (Jan 2022)	Outline site areas and initial cable routes	First engagement event with statutory bodies, internal project team and landowners only	Based on site option agreements and initial specification for cable route Supporting survey information informed by stakeholder engagement
Version 1 site layout (Mar 2022)	Site areas populated with panel layout and	Public consultation from Phase 1 events	Full solar PV layout on CO1-3 based on

	indicative substation and energy storage layout	Ongoing focussed consultation with residents Statutory body consultation from EIA Scoping Ongoing stakeholder engagement Environmental surveys	consultation and initial survey data. Aimed as a capacity maximisation study. Key constraints regarding ecological, flooding, and landscape comments used to inform development parameters.
V2 / PEIR site layout (Jun 2022)	Site areas refined with panel layout and indicative substation and energy storage layout Refined cable route corridor	Ongoing stakeholder engagement Further environmental surveys	Full solar PV layout on CO1-3 based on refined survey data. Further input from technical consultants and key stakeholders to drive higher-precision development parameters. Substation and energy storage location and layout finalised. Cable route corridor refined based on landowner engagement, utilities providers, and stakeholder engagement regarding rail and river crossings
Future Stages			
Preparation for DCO Submission (Oct 2022)	Site areas panel layout completed Full substation and energy storage layout Defined cable route	Public and statutory consultee consultation Ongoing stakeholder engagement Further environmental surveys	Amendments to layout based on public and statutory body comments Full substation and energy storage layout provided by electrical design consultants Cable route agreed following geophysical surveys
Additional requirements (post-DCO consent)	Final site layout and detailed design Site technology confirmation	Statutory consultee consultation as part of the discharge of requirements. Required additional environmental surveys	Full site design ahead of construction taking into account any statutory consultee comments provided as part of the discharge of requirements

		Updates in technological advances	
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Solar Panel Areas

- 5.4.2 The layout of the solar panel areas has been informed by the matters set out in Table 5.5. below. These considerations were implemented as blanket parameters across the development site to ensure consistency of approach. Parameters such as offset distances were informed by the technical consultant team based on their professional judgement and previous experiences. Once applied, the remaining site area was designated the “developable area” for the solar array, inverters, substation, and access roads. Security fencing was able to be placed along the parameter boundary. Areas between the fencing and the development site boundary was made available for ecology and landscape mitigation or enhancement.

Table 5.5: Design Parameters for Site Panel Areas

Criteria	Consideration	Parameters
Planning, policy and legislation	Planning applications and allocations	Avoidance of any land subject to pending planning applications and site allocations.
Technical and engineering requirements	Access	Accessibility by vehicle to all field parcels for maintenance access Accessibility by vehicle to all inverters Accessibility by vehicle to site substation
	Electrical Design	Inverters to be positioned for every 1MW of solar panels
Environmental constraints	Landscape and Visual	Proximity of residential properties – minimum 50m offset to curtilage boundary Identification of key visual receptors and key views
	Ecology and Biodiversity	Avoidance of national ecological designations Proximity to local ecological designations and sensitive ecological receptor – minimum 20m offset to designated area Proximity to major watercourses – minimum 20m offset Proximity to minor watercourses and ditches – minimum 8m offset Proximity to badger setts – minimum 30m offset Proximity to GCN sites – minimum 50m offset Proximity to trees with low, medium or high bat roost potential – minimum 8m, 12m, 20m offset

	Hydrology, Flood Risk, and Drainage	Avoidance of flood storage areas Avoidance of areas of surface water flooding greater than 1m depth
	Cultural Heritage	Avoidance of national cultural heritage designations Areas of significant archaeology to be avoided Areas of moderate archaeology to be limited to restricted loading and non-penetrative foundations Context of cultural heritage assets to be considered
	Transport and Access	Sensitivity of watercourse crossings for construction traffic Consideration of existing access points and local highway network Accessibility by vehicle to all field parcels for maintenance access Accessibility by vehicle to all inverters Accessibility by vehicle to site substation
	Glint and Glare	Consideration of panel backtracking or additional mitigation to screen glint and glare
	Agricultural Land Classification	Consider avoidance of best and most versatile land
	Telecommunications, Utilities, and Television Receptors	Avoidance of underground utilities – subject to easement widths Avoidance of overhead power lines – subject to easement widths, 15m minimum to pylons
Land use and ownership constraints		Seeking to use land in the same ownership for each site Where possible reducing interaction on rail network, strategic road infrastructure, utilities and other infrastructure.

5.4.3 The key considerations made between site layout iterations have been shown in Table 5.6 below. The layouts included within PEIR are subject to on-going review and may change prior to submission of the DCO application. The areas referenced in Table 5.6 and Table 5.8 (e.g. D7) refer to the field numbering plans which can be found in **Appendix 3.1** Figures 3.7-3.9.

Table 5.6: Design Iterations for the Site Panel Areas

Site Area	Stage	Key Design Considerations
Cottam 1	EIA Scoping	Overall site area published.
	Version 1 site layout (Mar 2022)	Implementation of key parameters

		<p>Additional offsetting from the River Till due to flood risk and its designation as major watercourse.</p> <p>Offsets from telecoms and utilities have been introduced, which has impacted the layout of fields D7, D16-D20, D23, D26, D29, E4 and G1. Additional offsets to 132kV OHLs in M2 and M3</p> <p>Removal of fields A3, A4 (south), B1, C14-19 and D19 following resident consultation</p> <p>Fields D1, D7 (west end), D8, and E3 were removed at the request of Stow Parish Council and F1, F2, and F7 were removed upon request by Normanby by Stow Parish Council.</p>
	V2 / PEIR site layout (Jun 2022)	<p>Amendments to ecology offsets to hedgerows and trees</p> <p>Access tracks removed from ecology offset areas</p> <p>Panels reintroduced to fields A4 and C14-19, subject to landscape montages being produced to demonstrate level of visual impact on residences</p> <p>50m buffer from the property boundary to the panel area.</p> <p>Panels removed from C28, F1, F2 and F7 due to results of geophysical survey</p> <p>Noise barriers have been introduced to mitigate impacts on residential properties</p> <p>Two options on energy storage presented:</p> <p>Option A – located in the centre of field G1</p> <p>Option B – location as option A plus two small areas in G2 and G3</p>
Cottam 2	EIA Scoping	Overall site area published.
	Version 1 site layout (Mar 2022)	<p>Implementation of key parameters</p> <p>50m offsets from residences</p> <p>Offsets from telecoms and utilities have been introduced, which has impacted the layout of fields H1, H4, H5, H8, H10 and H11</p>
	V2 / PEIR site layout (Jun 2022)	<p>Amendments to ecology offsets to hedgerows and trees</p> <p>Habitat areas in H5 and H8 were extended</p> <p>50m buffer has been introduced around field H2 for residences</p>

		Noise barriers have been introduced to mitigate impacts on residential properties
Cottam 3	EIA Scoping	Overall site area published.
	Version 1 site layout (Mar 2022)	Implementation of key parameters Offsets to 132kV OHL (K3-K6) and Fields K2, K5 and K6 are also impacted by underground power and telecoms lines. 20m Offsets to trees with high bat roosting potential along eastern edge of K14, K16 and K18 Offsetting from PRow crossing the site of Cottam 3b
	V2 / PEIR site layout (Jun 2022)	Amendments to ecology offsets to hedgerows and trees Security fencing moved to clear ecological offset areas Removal of K12 and SE corner of K18 for turtle dove mitigation and visual impact from B1205

Substations

- 5.4.4 The positioning of a substation within each of the Sites, and a main substation near to the point of connection, are requirements of the Scheme driven by electrical design. The considerations made by the Applicant and consultant team have been listed in Table 5.7 below. Most of these considerations were implemented as blanket parameters across the development site to ensure consistency of approach, however site-specific requirements – led by the substation size – were also included. Parameters such as offset distances were informed by the technical consultant team based on their professional judgement and previous experiences. Once applied, a RAG assessment was undertaken at each of the sites to determine the most suitable areas within the developable area for the positioning of the substations.

Table 5.7: Design Parameters for Substation Location

Criteria	Consideration	Parameters
Planning, policy and legislation	Planning applications and allocations	Avoidance of any land subject to pending planning applications and site allocations.
	Neighbouring land use	Avoidance of location within 300m of residential properties

Technical and engineering requirements	Access	Accessibility by vehicle to site for maintenance and construction Accessibility by oversized loads to substation site
	Site Area	Large enough size to accommodate substation design (site specific)
	Electrical Design	Proximity to cable exit point – no more than 500m
Environmental constraints	Landscape and Visual	Identification of key visual receptors and key views
	Ecology and Biodiversity	Avoidance of national ecological designations Proximity to local ecological designations and sensitive ecological receptor Avoidance of onsite species-rich habitat
	Hydrology, Flood Risk, and Drainage	Avoidance of Flood Zone 2 or 3 Avoidance of areas of medium or higher surface water flooding risk
	Cultural Heritage	Avoidance of national cultural heritage designations Areas of significant archaeology to be avoided Context of cultural heritage assets to be considered
	Agricultural Land Classification	Consider avoidance of best and most versatile land
	Telecommunications, Utilities, and Television Receptors	Avoidance of underground utilities – subject to easement widths Avoidance of overhead power lines – subject to easement widths
	Safety	Avoidance of location within 300m of residential properties
	Noise and Vibration	Avoidance of location within 300m of residential properties Allowance for noise mitigation where within 500m of residential properties
	Ground conditions	Avoidance of unstable ground Consideration of ground capacity for heavy infrastructure

5.4.5 The assessment of the substation locations using the above parameters was used for drafting the first iteration of the site layout plans. These were then amended further by site-specific constraints and recommendations from statutory consultees, key stakeholders, and members of the public. The substation designs have been determined by the potential site export capacity and are therefore subject to further refinement by the consultant team ahead of DCO application where site layout amendments are taken into account. The locations of the substations within each

Site and their detailed design will therefore be open to review following statutory consultation, and as such should be viewed as indicative for the purpose of commentary.

Table 5.8: Design Iterations for the Substation Locations

Site Area	Stage	Key Design Considerations
Cottam 1	RAG Rating (Nov 2021)	Implementation of key parameters for 2.68ha 400kV/132kV air insulated substation F3-5, east of G1, G2 and G3 were identified as most suitable.
	Version 1 site layout (Mar 2022)	Substation located in SE corner of G1
	V2 / PEIR site layout (Jun 2022)	Substation location unchanged Bunding is proposed for mitigation from noise and residences
Cottam 2	RAG Rating (Nov 2021)	Implementation of key parameters for 0.35ha 132kV/33kV air insulated substation Fields H4, H5 and H8 deemed most suitable
	Version 1 site layout (Mar 2022)	Implementation of key parameters Substation located in centre-north of H5
	V2 / PEIR site layout (Jun 2022)	Substation location unchanged
Cottam 3a	RAG Rating (Nov 2021)	Implementation of key parameters for 0.35ha 132kV/33kV air insulated substation Fields K4, K7, K10-12 and SW of K17 and K18 deemed most suitable
	Version 1 site layout (Mar 2022)	Implementation of key parameters Substation located in NE corner of field K7
	V2 / PEIR site layout (Jun 2022)	Substation location unchanged
Cottam 3b	RAG Rating (Nov 2021)	Implementation of key parameters for 0.35ha 132kV/33kV air insulated substation NW corner of field J4 deemed as most suitable
	Version 1 site layout (Mar 2022)	Implementation of key parameters Substation location unchanged
	V2 / PEIR site layout (Jun 2022)	Parameters based design only No changes from V1 to V2/PEIR layout

5.5 Alternative Cable Routes

- 5.5.1 The proposed cable route corridor set out at the PEIR stage has been refined / reduced from that set out at the scoping stage (see **Appendix 5.1**). The guiding design parameters for definition of the cable corridors are set out in Table 5.9 below.

Table 5.9: Design Parameters for Cable Route Corridors

Criteria	Consideration	Parameters
Planning, policy and legislation	Planning applications and allocations	Avoidance of any land subject to pending planning applications and site allocations.
Technical and engineering requirements	Electrical design	Seek to achieve the shortest route between Sites
Environmental constraints	Ecology and Biodiversity	Avoidance of national ecological designations Proximity to local ecological designations and sensitive ecological receptor Minimisation of crossings of major watercourses
	Cultural Heritage	Avoidance of national cultural heritage designations
Land use and ownership constraints		Avoidance of residential properties and curtilage Affecting a minimum number of landowners. Where possible reducing interaction on rail network, strategic road infrastructure, utilities and other infrastructure.

- 5.5.2 The main area of refinement of the cable route between the scoping and PEIR stages has taken place around the crossing of the River Trent, with a preferred location chosen to the southwest of Marton. The Applicant and the West Burton Solar Project have been actively collaborating with the Gate Burton Energy Park Project to seek to establish a combined route in this area where all three projects need to cross the River Trent. This approach will have the benefit of reducing the environmental impact of all three projects with regard to land use, ecology, heritage, and reduced construction works. The preferred river crossing route has been determined based on avoidance of ecological constraints and notable historic environment features, such as the Roman Town at Littleborough, and the Viking Camp at Torksey.
- 5.5.3 Further refinement of the wider cable corridor has helped to produce a more focussed route to be presented for PEIR. This has been led primarily by landowner consultation. This consultation has been used to identify which landowners would be most supportive of the use of their land for the cable route. Alongside this, a desk-based parameters approach (as set out in Table 5.9) has identified land with extant planning permissions or ongoing planning application, so that these can be avoided. Considerations have also been made to ensure the routing avoids

ecological designations, residential properties, and avoids areas of cultural heritage identified through Historic Environment Records.

- 5.5.4 As has been identified previously, the cable corridor presented for PEIR is still indicative and is to be refined following statutory consultation. Upon selection of a preferred route, geophysical and ecology surveys will be carried out to explore micro-siting options ahead of DCO application.

6 Energy Need, Legislative Context and Energy Policy

6.1 Introduction

- 6.1.1 This chapter of the PEIR sets the legislative and policy framework for the proposals. Regard is had to primary legislation, national energy policy, national planning policies and guidance, and local planning policies, when undertaking the EIA.
- 6.1.2 A summary of the key legislative and policy provisions is provided below and considered in more detail in **Appendix 6**.
- 6.1.3 Each technical chapter in the PEIR will set out the relevant policy applicable to that environmental topic.

6.2 Energy Need

- 6.2.1 Decarbonisation is a UK legal requirement and is of global significance. In June 2019, Government passed law to end the UK's contribution to global warming by 2050: Net Zero.
- 6.2.2 Carbon Budgets set the trajectory for decarbonisation actions required to meet this commitment. They recognise that atmospheric carbon has a cumulative global heating effect and therefore that urgent action is necessary. The Sixth Carbon Budget (enshrined in law in June 2021) runs from 2033 to 2037 and requires a 78% reduction in UK territorial emissions between 1990 and 2035.
- 6.2.3 UK electricity demand is expected to double by 2050. Decarbonisation requires the electrification of energy which is currently generated by burning fossil fuels and the UK's pathway to achieving Net Zero by 2050 must involve wider transitions outside of the power sector, including transport, industry, agriculture and homes. Extensive electrification requires support from a major expansion of renewable and other low-carbon power generation to ensure that the UK is capable of securely meeting future electricity demand, with a significantly lower carbon intensity. The decarbonisation of the UK's electricity generation sector is therefore vitally important to meet the UK's legal obligations on carbon emissions.
- 6.2.4 The decommissioning of existing generation assets increases the requirement to develop new low-carbon generation with urgency in order to "keep the lights on". Nuclear power has historically met circa 20% of GB demand, but existing nuclear stations began to close in 2021. Only one will remain beyond 2028. One new nuclear project is scheduled to commission in the late 2020s, any others will not be commissioned before the mid-2030s. Only one UK coal station is still in operation and in 2021, Government brought forward the final closure date for coal to 2024. Carbon Capture, Utilization and Storage (CCUS) is being developed to support Net Zero by facilitating the decarbonisation of the UK's thermal (carbon emitting) fleet,

currently circa 40GW, decarbonising industry, producing low-emissions hydrogen and delivering greenhouse gas removal technologies. Recent progress has been made towards bringing CCUS clusters forward by the end of the decade however Government recognises that *“the technology has not been delivered at scale and significant risks remain”*.

- 6.2.5 The UK has substantial renewable energy resources, including 40% of Europe’s wind resource, and Government is targeting 50GW of offshore wind to be operational by 2030 to harness that resource and protect consumers from volatile international energy markets. But wind on its own is not sufficient. In April 2022, HM Government published the British Energy Security Strategy. In it, the Prime Minister wrote that *“If we’re going to get prices down and keep them there for the long term, we need a flow of energy that is affordable, clean and above all, secure. We need a power supply that’s made in Britain, for Britain.”* The strategy also recognises the critical role of renewables in accelerating the transition away from fossil fuels, and notes that renewable capacity in the UK is currently set to increase by a further 15% by the end of 2023. The strategy notes, that further and faster actions are required to increase UK national energy security and reduce dependency on fossil fuels, and the exposure consumers currently have to volatile prices. It sets an ambition for solar of up to 70GW by 2035.
- 6.2.6 Solar generation is a critical element of the plan to decarbonise the UK electricity sector with urgency and is already a leading low-cost generation technology in the UK. The national need for solar generation is urgent and the capacity required is significantly greater than the capacity of projects currently understood to be in development.
- 6.2.7 Solar addresses all important aspects of existing and emerging government policy. It will make a critical and timely contribution to decarbonisation and security of supply in the UK, will help shield consumer bills from volatile energy prices, and provides the potential to deliver biodiversity net gains through its development.

6.3 Primary Legislation

- 6.3.1 The Act sets out the process for the consenting of major infrastructure projects and is the principal legislation governing an application for development consent for a NSIP. The Act therefore forms the basis for the decision to grant a DCO.
- 6.3.2 Under the Act the Scheme constitutes an NSIP if:
- it consists of “the construction or extension of a generating station” (Section 14(1)(a) of the Act);
 - “it is in England” (Section 15(2)(a) of the Act);

- “its capacity is more than 50 megawatts” (Section 15(2)(c) of the Act)

6.3.3 If a National Policy Statement (NPS) has effect in relation to the type of development to which the DCO relates then the Secretary of State must decide the DCO application in accordance with the relevant NPS (unless an exception applies) (Section 104 of the Act). If the DCO application relates to a type of development where no NPS has effect, then the Secretary of State must have regard to the local impact report and any other important and relevant matters (Section 105 of the Act).

6.4 Energy Policy

6.4.1 National Policy Statements (NPS) set out the policy basis for NSIPs. At present, there is no NPS which specifically deals with ground mounted solar developments, and therefore Section 105 of the Act applies. However, there are aspects of three Energy NPSs which are relevant to decision making and are important material considerations, in addition to other relevant and important national and local planning policies. The Secretary of State will therefore have regard to: -

- National Policy Statement for Energy (EN-1)
- National Policy Statement for Renewable Energy Infrastructure (EN-3); and,
- National Policy Statement for Electricity Networks (EN-5)

6.4.2 The Department for Business, Energy and Industrial Strategy is currently undertaking a review of the six NPSs for energy infrastructure. Consultation on the revised draft NPSs closed on 29 November 2021. As drafted NPS EN3 on renewable energy has been expanded to provide policy on solar development. Currently there is no timescale in place for when the draft NPS will be adopted. The transitional provisions in draft NPS EN-1 state that the 2011 NPSs will be the applicable national policy statements for any DCO application that is accepted for examination before the designation of the updated NPSs. However, the policies set out in the emerging draft NPSs (or those designated but not having effect) are potentially capable of being important and relevant considerations in the decision-making process. The extent to which they are relevant is a matter for the relevant Secretary of State (SoS) to consider within the framework of the Planning Act 2008 (PA2008) and with regard to the specific circumstances of each DCO application.

6.4.3 The revised EN3 addresses a range of matters including:

- Design Flexibility;
- Temporary nature of solar farms;
- Site Selection;

- Irradiance and site topography and capacity of site;
- Proximity of a site to dwellings;
- Grid Connection;
- Accessibility;
- Agricultural Land Quality;
- Site Layout and appearance;
- Landscape and Arboriculture;
- Ecology and Biodiversity;
- Built heritage and archaeology;
- Flood risk and drainage;
- Highways and Access; and
- Glint and Glare.

6.4.4 On the 7th April 2022, the Government announced its energy strategy which sets out how Britain's energy security will be boosted following rising global energy prices and volatility in international markets. The Government wants to accelerate the deployment of wind, new nuclear, solar and hydrogen whilst supporting the production of domestic oil and gas which would see 95% of electricity by 2030 being low carbon.

6.4.5 Specifically in reference to solar, the ambition is to look to increase the UK's current 14GW of solar capacity up to 5 times by 2035. The Government stated that it will continue supporting the effective use of land by encouraging large scale projects to locate on previously developed, or lower value land, where possible, and ensure projects are designed to avoid, mitigate, and where necessary, compensate for the impacts of using greenfield sites.

6.5 Other Planning Policies

6.5.1 The planning policies considered relevant to the Scheme are identified below and will be considered as part of the assessment.

- National Planning Policy Framework (NPPF) (as amended July 2021)
- Planning Practice Guidance (PPG) (as amended March 2015)

- Paragraph 013 Reference ID 5-013-20150327 – “What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic farms?”

6.5.2 Host Authority Planning Policies are drawn from the following documents:

- Central Lincolnshire Local Plan 2012 – 2036 (Adopted 2017)
- Emerging Draft Central Lincolnshire Local Plan (Proposed Submission) March 2022
- Neighbourhood Plans:
 - Saxilby with Ingleby Neighbourhood Plan
 - Sturton by Stow and Stow Neighbourhood Plan
 - Brattleby Neighbourhood Plan
 - Sturton Ward Neighbourhood Plan (Review)
- Bassetlaw District Council Core Strategy (Adopted 2011)
- Emerging Draft Bassetlaw Local Plan 2020-2037 (Publication Version) August 2021, Addendum January 2022 and Second Addendum May 2022
- Nottinghamshire Minerals Local Plan (2021)
- Lincolnshire Minerals and Waste Local Plan (Core Strategy & Development Management Policies (June 2016) and Site Locations (Dec 2017) documents.
- Greater Lincolnshire Enterprise Partnership Strategic Economic Plan
- Growth Strategy for Lincoln
- Lincolnshire Joint Health and Wellbeing strategy
- Lincolnshire Joint Strategic Needs Assessment.
- Corporate Plans for City of Lincoln, North Kesteven and West Lindsey
- Lincolnshire Biodiversity Action Plan
- Lincolnshire Local Transport Plan and local transport strategies
- Joint Lincolnshire Flood Risk and Drainage Management Strategy

7 Climate Change

7.1 Introduction

- 7.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings of the Environmental Impact Assessment (EIA) work undertaken to date concerning the potential impacts of the Scheme on the Climate during the construction, operation and maintenance and decommissioning stages. The resilience of the Scheme to physical impacts caused by climate change will also be considered.
- 7.1.2 The following aspects will be considered in the climate change assessment process and will align with the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations (2017) (Ref 7.1)
- Lifecycle greenhouse gas (GHG) impact assessment – The impact of GHG emissions arising from the Scheme on the climate over its lifetime;
 - Climate Change resilience (CCR) Review – The resilience of the Scheme to climate change impacts; and,
 - In-combination Climate Change Impact (ICCI) – The combined impact of the Scheme and future climate change on the receiving environment.

7.2 Planning Policy Context and Guidance

- 7.2.1 Legislation, planning policy and guidance relating to climate change relevant to the Scheme:

Legislation and Planning policy

- Climate Change Act 2008 (Ref 7.2)
- Climate Change Act 2008 (2050 target amendment) (Ref 7.3)
- Carbon Budgets Order (2009) (Ref 7.4) Carbon Budget Order (2011) (Ref 7.5), Carbon Budget Order (2016) (Ref 7.6), Carbon Budget Order (2021) (Ref 7.7)

National Planning Policy

- National Policy statement (NPS) EN-1 (Ref 7.8), with particular reference to paragraphs 2.2.9 and 4.8.2 in relation to climate impacts and adaptation; paragraphs 4.1.3 to 4.1.4 in relation to adverse effects and benefits; paragraphs 4.2.1, 4.2.3, 4.2.4, 4.2.8 to 4.2.10 in relation to Environmental Statement assessment methodology; 4.5.3 and 4.8.1 to 4.8.12 in relation to adaptation measures in response to climate projections; and paragraphs 5.7.1

to 5.7.2 in relation to climate projections, flood risk and the importance of relevant mitigation.

- The Revised (Draft) National Policy Statements for Energy; Business, Energy and Industrial Strategy Committee (Ref 7.9) has also been reviewed for relevant emerging policy;
- NPS EN-5 (Ref 7.10) – paragraph 2.4.1 regarding NPS EN-1 and the importance of climate change resilience, and paragraph 2.4.2 in relation to ES requirements regarding climate change resilience. Draft update to NPS EN-5 (Ref 7.11) paragraph 2.6 in relation to Climate Change resilience.
- National Planning Policy Framework (NPPF) (Ref 7.12) – paragraphs 8, 20 and 149 in relation to adaptation, mitigation and climate change resilience; paragraphs 148 and 157 in relation to flood risk and damage to property and people; paragraphs 150 and 153 in relation to reduction of CO2 emissions through design and reduced energy consumption; and paragraphs 155 to 165 in relation to climate projections, associated flood risk and adaptation.

National Guidance

- Planning Practice Guidance, Climate Change (March 2019) (Ref 7.13)

Local Planning Policy

- Lincolnshire County Council Carbon Management Plan (2019) (Ref 7.14)
- Nottinghamshire County Council Carbon Management Plan (2007) (Ref 7.15)
- West Lindsey District Council Sustainability, Climate Change and Environment Strategy (2021) (Ref 7.17)
- Central Lincolnshire draft Local Plan- in relation to Climate Change (Ref 7.18)
- Bassetlaw District Council Renewable and Low carbon study (2010) (Ref 7.19)
- Bassetlaw draft Local Plan (Ref 7.20), specifically policy ST45: Climate Change Mitigation and Adaptation and Policy ST46: Renewable Energy Generation

7.3 Assessment Methodology

- 7.3.1 The methodologies described in the following section have been developed in line with the relevant planning policy and appropriate industry guidance for assessing GHGs (Ref 7.21) and considering climate change resilience and adaptation (Ref 7.22) in EIA.

- 7.3.2 While the lifecycle GHG impact assessment assesses the significance of the GHG impact of the Scheme, the CCR review does not assess the significance as only a review of the impacts is required in line with the IEMA guidance.

GHG Impact Assessment

- 7.3.3 All GHG emissions arising over the Scheme will be assessed through the Lifecycle GHG impact Assessment. Direct emissions from activities within the Sites, indirect emissions from activities outside the Site and embodied carbon within construction materials are considered the study area for the GHG impact assessment.
- 7.3.4 The applicant and design team will provide data and information that will underpin the lifecycle GHG impact assessment, which will then be evaluated using the methodology set out below.
- 7.3.5 In line with the GHG Protocol, the potential effects of the Scheme on the climate during the construction phase will be assessed (Ref 7.23). It has been identified that materials and activities will likely produce the greatest amount of GHG emissions and mitigation efforts will concentrate on these priority areas. As set out by the Institute of Environmental Management and Assessment (IEMA) document 'Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance'; the approach is consistent with the guidance provided by the succeeding document provided by IEMA (Ref 7.21).
- 7.3.6 The approach to assessing emissions will follow the different stages of the scheme including construction, operation and maintenance and decommissioning.
- 7.3.7 The BEIS 2021 emissions factors guidance (as shown below) will be used as a calculation-based methodology for estimating the anticipated GHG emissions arising during the construction, operation and maintenance and decommissioning activities of the Scheme (Ref 7.24):

$$\text{Activity data} \times \text{GHG emissions factor} = \text{GHG emissions value}$$

- 7.3.8 The seven Kyoto Protocol GHGs have been considered in this assessment, which are in-line with the 'GHG protocol' (Ref 7.23):
- 1. Carbon dioxide (CO₂);
 - 2. Methane (CH₄);
 - 3. Nitrous oxide (N₂O);
 - 4. Sulphur hexafluoride (SF₆);
 - 5. Hydrofluorocarbons (HFCs);

- 6. Perfluorocarbons (PFCs);
- 7. Nitrogen trifluoride (NF₃).

7.3.9 It should be noted that within this assessment, 'GHG emissions' broadly represent all seven Kyoto Protocol GHGs and will be given the unit of tCO₂e (tonnes CO₂ equivalent) or MtCO₂e (Megatonnes of CO₂ equivalent).

Significance criteria

7.3.10 The sensitivity of the receptor (global climate) to increases in GHG emissions is always defined as 'high' as any additional GHG impacts could compromise the UK's ability to reduce its GHG emissions and therefore meet its future 5-year carbon budgets and Net Zero by 2050 target. The extreme importance of limiting global warming to below 2°C this century is broadly asserted by the International Paris Agreement and the climate science community.

7.3.11 Standard GHG accounting and reporting practices have been followed to assess the magnitude of impact caused by the Scheme. The IEMA guidance states that 'It is up to the GHG practitioner's professional judgement to decide which tool is most appropriate for the project at hand with regards for assessing the magnitude of GHG impacts'. The GHG accounting method is deemed most appropriate for this part of the assessment.

7.3.12 With reference to national carbon budgets, these can be used to investigate the significance of the Scheme's GHG emissions and potential impact to the climate.

7.3.13 Emission sources that are <1% of a given emissions inventory can be excluded through the concept of 'de minimis' contribution. This has been supported by both the Department for Business, Energy and Industrial Strategy and Publicly Available Specification PAS:2050 (2011) (Ref 7.25)

7.3.14 For this assessment, future emissions inventory scenarios have been supported by UK national carbon budgets. At present, the sixth carbon budget (2033 – 2037) has been set and detailed by the Government and formally adopted into legislation before parliament under the Carbon Budget Order 2021 (Ref 7.7). The amount of GHGs that the UK can emit over the 5-year period (2033 – 2037) is 965 million tonnes of carbon dioxide equivalent.

7.3.15 Developments that have emissions <1% of the current carbon budget would unlikely impact the UK's capacity to reach its net zero by 2050 target, as set out in the Climate Change Act 2008 (2050 Target Amendment).

7.3.16 The following criteria summarized in Table 7.1 will be used to assess the magnitude of the GHG impact associated with the Scheme, as it is applicable for this type of assessment.

Table 7.1: GHG Impact Assessment magnitude criteria

Magnitude	Magnitude Criteria
High	GHG emissions >1% of the applicable annual National carbon budget
Low	GHG emissions <1% of the applicable annual National carbon budget

- 7.3.17 The purpose of the UK national carbon budgets is to reduce the amount of GHG emissions that the UK can release over the 5-year period (Ref 7.26). At the time of writing, the UK is in the 3rd carbon budget period with the 4th carbon budget commencing in 2023.
- 7.3.18 It is expected that the construction stage of the Scheme will occur during the 4th national carbon budget (2023 – 2027). Additionally, the operational stages of the Scheme will occur during the 4th (2023 – 2027), 5th (2028 – 2032) and 6th (2033 – 2037) carbon budgets. However, as the current carbon budgets are only available up to 2037 and the Scheme is expected to be operational past this; a qualitative approach can be applied to resolve this issue. Using professional judgement; the significance of the impacts associated with GHG emissions produced by the Scheme will be determined.
- 7.3.19 As shown in Table 7.2, the UK national carbon budgets up to 2037 convey the future amount of GHG emissions that the UK will be able to emit.

Table 7.2: National Carbon Budgets

Carbon Budget	Total budget (MtCO ₂ e)
3rd (2018 – 2022)	2,544
4th (2023 – 2027)	1,950
5th (2028 – 2032)	1,725
6th (2033 – 2037)	965

- 7.3.20 Any amount of increase or reduction in GHG emission is considered significant in relation to the impact on the sensitivity of the global climate. The traditional EIA Criteria is not deemed as a suitable method for climate change mitigation, as highlighted by IEMA guidance on Assessing GHG emissions and Evaluating their Significance (Ref 7.21). Therefore, for this assessment, the following criteria (Table 7.3) will be used to determine the magnitude of significance.

Table 7.3: Matrix for the significance of Effects for GHG Impact Assessment

Magnitude	Significance
Low (<1% of carbon budget)	Minor significance
High (>1% of carbon budget)	Major significance

- 7.3.21 As set out in the Climate Change Act 2008 (2050 target amendment); it is mandatory for the UK to reach net zero by 2050 by reducing and offsetting its emissions. Carbon budgets have only been established up to 2037 and budgets beyond 2037 are presently not known. Although it is anticipated that the total budget of emissions will decrease over time; any emissions that are released are likely to be significant as it would impact the UK's ability to achieve future carbon budgets and reach the net zero target by 2050.

Climate Change Resilience Review

- 7.3.22 For the CCR Review, the Scheme itself; during construction, operation and decommissioning, is considered the receptor. The climate resilience review will provide a description of how the Scheme will be impacted by climate change impacts and how it will be designed to be more resilient to the impacts identified during the review of the UK Climate Projections 2018 (UKCP18) data (Ref 7.26).
- 7.3.23 UKCP18 data and historic climate data from the Met Office have been acquired to establish the future and historic baseline climate conditions (Ref 7.27)
- 7.3.24 The Scheme's design has been adapted to include CCR measures.
- 7.3.25 EIA regulations require information regarding the vulnerability of the Scheme to climate change. An assessment has been developed based on the IEMA 'Environmental Impact Assessment Guide to: Climate Change Resilience and Adaption' document (Ref 7.21), which assesses the Scheme's resilience to potential impacts caused by climate change.
- 7.3.26 As part of the review, the Scheme's associated infrastructure and assets will be incorporated. This includes the risks associated with an increased frequency of extreme weather events, as highlighted by UKCP18 projects and the Scheme's resilience against gradual climatic changes.
- 7.3.27 Vulnerable and sensitive receptors will be identified and the sensitivity of the receptors determined using quantifiable data, where available. The susceptibility and vulnerability of the receptor will be considered alongside its value and importance.

7.3.28 The susceptibility of the receptor will be determined using the following scale:

- **High susceptibility** = receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevaling climatic factors (e.g. lose much of its original function and form).
- **Moderate susceptibility** = receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevaling climatic conditions (e.g. retain elements of its original function and form).
- **Low susceptibility** = receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevaling climatic factors (e.g. retain much of its original function and form).

7.3.29 The vulnerability of the receptor will be determined using the following scale:

- **High vulnerability** = receptor is directly dependent on existing/prevaling climatic factors and reliant on these specific existing climate conditions continuing in future (e.g. river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions.
- **Moderate vulnerability** = receptor is dependent on some climatic factors but able to tolerate a range of conditions (e.g. a species which has a wide geographic range across the entire UK but is not found in southern Spain).
- **Low vulnerability** = climatic factors have little influence on the receptors.

7.3.30 The importance of the receptor is associated with the economic value the receptor represents. Due to the scale of the Scheme this is considered to be high for all receptors.

7.3.31 The likely effects of climate change on the development will be evaluated to identify the magnitude i.e., the degree of change from the relevant baseline conditions. Magnitude is based on a combination of likelihood and consequence.

7.3.32 The criteria to assess the likelihood of climate change impact is defined in Table 7.4. The consequence of the climate risk will be determined using professional judgement and supporting evidence.

Table 7.4: Criteria to Assess Likelihood of Climate Change Impact

Level of Likelihood	Definition of Likelihood
Very unlikely	It is highly improbable that the impact will occur during the operational phase or the construction phase of the assets or systems.

Level of Likelihood	Definition of Likelihood
Unlikely	Impact is not expected to occur during the operational phase or the construction phase of the assets or systems
As likely as not	Impact may occur during the operational phases or the construction phase of the assets or systems
Likely	Impact is expected to occur during the lifespan of the assets or systems or the construction phase.
Very likely	It is highly probable that the impact will occur during the lifetime of assets or systems including the construction phase.

7.3.33 The receptor sensitivity and magnitude of effect will be combined to reach an overall judgement on the significance of the likely environmental effect. As there is no legislative definition of 'significance' the conclusion of whether an effect is significant will be based on the outcomes of the CCR review.

7.3.34 Mitigation measures which have been incorporated into the Scheme will be considered as part of the review of potential impacts. Existing resilience measures that are already present or planned will also be identified by the review.

In Combination Climate Change Impacts

7.3.35 The ICCI assessment methodology has been developed in line with the Institute of Environmental Management and Assessment (IEMA) – 'Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation' (Ref 7.22).

7.3.36 The guidance defines an ICCI effect as 'When a projected future climate impact (e.g. increase in temperatures) interacts with an effect identified by another topic and exacerbates its impact. For example, if the biodiversity topic identifies an effect on a habitat or species receptor due to a project/scheme, such as loss of habitat, and in addition projected future higher temperatures will increase the vulnerability of this habitat to fragmentation, this is an ICCI.'

7.4 Assessment Assumptions and Limitations

7.4.1 The baseline and scheme design at the time of writing this PEIR Report will inform the preliminary assessment of the Scheme. As part of the EIA, a full assessment is being undertaken, which will be stated in the ES and put forward with the DCO application.

Assumptions for Construction Plant

- 7.4.2 At this stage, fuel use for construction plant is not known. It is not expected that emissions from construction plant would be significant and best practice measures are included in the draft Outline CEMP (Ref 7.34) to limit emissions during the construction phase.

Assumptions for Construction Worker Vehicle Movements

- 7.4.3 A 1-way distance of 30km per journey has been assumed for the worker transportation calculations, which is a conservative estimate as, where possible, staff will be located within 30km of the Sites according to currently available data. The UK Government 2021 emissions factors for 'Average car' and 'Average Diesel van', including well-to-tank (WTT) emissions¹, have been applied to this distance and total worker numbers to calculate GHG emissions associated with worker transport.
- 7.4.4 The intention is for any non-local workers to use local accommodation and use minibuses to transport them to the Sites which will reduce the overall vehicle construction worker vehicle trips as set out in the **Transport and Access Chapter (Chapter 14)**.

Assumptions for Transport of Materials

- 7.4.5 As of writing, the manufacturer of solar photovoltaic PV panels has not yet been chosen and therefore the number and size of modules likely to be installed is not available. As it is anticipated that the PV panels will be sourced from China or a country of similar distance from the UK, there will be an increase in embodied carbon and transport emissions, which would otherwise be lower if sourced from Europe². Therefore, the manufacture and transport of PV panels will likely be the largest sources of GHG emissions from the Scheme.
- 7.4.6 HGV and sea freight distances assumed for transportation of materials and waste are outlined below. The country of origin for materials have been chosen as Europe and China, and assumptions have been made around the specific ports used based on proximity to relevant manufacturing facilities within each country.
- HGV transport of materials within China prior to sea freight transportation – 150km (based on the average distance of a number of major manufacturing centres in and around Shanghai to the nearest port);

¹ Well-to-tank emissions, also known as upstream or indirect emissions, are the GHG emissions released into the atmosphere from the production, processing and delivery of a fuel to the point of use.

² A supply chain statement will form part of the DCO application and be in accordance with the statement made on Solar Energy UK (0)

- HGV transport of materials within Europe, including distance prior to, and following, sea freight transportation – 1,750km (based on half of the reasonable maximum distance equipment might be transported within Europe, plus the distance between Dover and the DCO Site);
- Sea freight distance from China to England –21,880km (based on the sea freight distance between Shanghai and Dover);
- Sea freight distance from Europe to England –50km (based on the sea freight distance between Calais and Dover);

7.4.7 For HGV transportation of materials, the UK Government GHG 2021 Conversion Factors for 'Rigid HGV >7.5-17t' and 'Articulated HGV >3.5 – 33t' has been applied, including WTT emissions. It has been assumed that HGVs are 50% laden;

7.4.8 For sea freight transportation, the UK Government GHG 2021 Conversion Factors for 'General Cargo –Average' has been applied, including WTT emissions.

Assumptions for Embodied Carbon within Products

7.4.9 At this stage, due to limited technical specifications available, a worst-case estimation of the embodied carbon has been calculated assuming an average solar panel and mounting weight of 20kg/m² and a total coverage of approximately 1,035ha. The total coverage has been estimated based on the total area of each Site subtracted by the area designated for the substations and energy storage. The dominant materials associated to the manufacture of solar panels are metals and glass and therefore GHG emission estimates have been based on the production of these materials using emission rates from the Inventory of Carbon and Energy version 3 (ICE v3) database (Ref 7.33) for glass and UK Government GHG Conversion Factors for Company Reporting 2021 database (Ref 7.24) for metals.

7.4.10 Within the ES a more in-depth assessment will be used to calculate the embodied carbon for the Scheme using the Environmental Product Declaration (EPD) of a widely used PV panel from China or the specific EPD associated with the chosen panel type, in conjunction with the known information about the size and number on panels.

7.4.11 To calculate the embodied carbon associated with the production of the transformers to be used on site, the material breakdown of a typical transformer as reported in a lifecycle assessment produced by Hegedic et al (2016) (Ref 7.29) was used as a benchmark to estimate material quantities associated with the transformers required for the Scheme. This breakdown assumes 77% metal, 19% oil and 4% 'other'. It has been assumed for the purposes of this assessment that 'other' relates to plastics. Embodied carbon factors for each of these materials from the UK

Government GHG Conversion Factors for Company Reporting 2021 database (Ref 7.24) have been applied.

- 7.4.12 At the stage of writing the PEIR, there was not enough technical data available to estimate the embodied carbon of the PV inverters, switchgear, batteries, cabling and structures. The worst-case scenario assessed for the embodied carbon emissions generated from the production of the solar panels is expected to compensate for the missing information. A more detailed analysis of the individual products will be provided within the ES.

Assumptions for Climate Change Resilience

- 7.4.13 Climate change projections are subject to uncertainties due to the complexity of the climate system and uncertainty over future greenhouse gas emission levels and modelling uncertainties used to develop the Met Offices predictions.
- 7.4.14 To address these uncertainties, UKCP18 provides a range of likely climate changes to give a lower and upper estimates. This allows for provision of a greater level of confidence for the magnitude and impact of climate change effects.

Limitations – Operational Phase

- 7.4.15 Due to the limited information currently available, the calculation of operational GHG emissions has been isolated to GHG emissions associated with worker transportation to and from the site during the life span of the Scheme. It is acknowledged that consideration of maintenance activities as well as fuel and water use on site are still required. However, in comparison to the overall GHG emissions expected from the construction phase, the operational activities are likely to be significantly lower.

7.5 Stakeholder Engagement

- 7.5.1 For this Scheme, the stakeholders that have been involved are statutory consultees, landowners, local communities, land managers, heritage groups. Additionally, continuing engagement and communication with statutory and non-statutory consultees will help include climate considerations that will be later addressed in the ES.
- 7.5.2 Since September 2021, monthly meetings have been scheduled with all four local authorities involved in the Scheme (Lincolnshire County Council, Nottinghamshire County Council, Bassetlaw District Council and West Lindsey District Council). Climate change has been included within discussions during these meetings.
- 7.5.3 The following table (Table 7.5) outlines the consultation to date.

Table 7.5: Main Matters Highlighted During Consultation

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
Planning Inspectorate	The ES should also consider how other developments cumulatively may affect the vulnerability of the Proposed Development to climate change e.g. any changes in flood flows, and cumulative GHG emissions/savings.	This has been addressed within the PEIR and will be addressed within the ES. In particular, the two other nearby major Solar Projects have been taken into consideration (West Burton and Gate Burton Solar Projects)	Cumulative Assessment
Planning inspectorate	The ES should utilise the most up to date modelling available.	Latest UK Climate Projections (UKCP) and EA modelling has been used in the CCR and Hydrology assessment.	Referenced throughout
Bassetlaw District Council	It is considered that a full climate change chapter should be scoped into the ES rather than a proportionate one to allow a full assessment to be undertaken in this regard.	Climate Change scoped into PEIR	n/a
Lincolnshire County Council	The potential for a microclimate to be created by battery storage.	The design of the battery storage will allow for natural ventilation in order to prevent a microclimate from being generated.	Scheme Design
Lincolnshire County Council	What is the energy consumption and associated carbon emissions of the battery system?	The total emissions are unknown at this stage as specifications for the energy	n/a

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
		storage system have not yet been defined. However, as stated in the assumptions and limitations, conservative estimation has been applied to account for additional products.	
Lincolnshire County Council	What are the carbon emissions associated with the solar PV panels themselves –separated into manufacture, operation, and maintenance (and which panels are to be used – poly, multi, single crystal silicon)? Is the embedded carbon associated with the panel manufacture included in any payback of carbon (bearing in mind that the panels are likely to be imported)?	Solar Panel Types are Bifacial monocrystalline panels. Embodied carbon assessed as part of GHG assessment	GHG assessment
Lincolnshire County Council	Power losses and associated carbon footprint of connecting cables to the grid need estimating	The total emissions are unknown at this stage as specifications for the cabling have not yet been defined. However, as stated in the assumptions and limitations, conservative estimation has been applied to account for additional products.	n/a
Lincolnshire County Council	With regard to greenhouse Gas Emissions this should be directly compared to the number of years it will take for development to be	Assessed as part of GHG assessment	GHG assessment

Consultee	Main matter raised	How has the concern been addressed	Location of response in chapter
	carbon neutral. However, to get a true reflective understanding of the benefits/harm to the environment it should be compared to a least one fossil fuel, nuclear and at least one alternative renewable energy. It is considered that by doing this the clear environmental benefits should be highlighted and allow for careful consideration against the impacts of the development.		
Natural England	The ES should identify how the development affects the ability of the natural Environment to adapt to climate change, including, its ability to provide adaption for people.	CCR assessment included	CCR assessment
Natural England	Consideration of net zero by 2050.	Calculation of Carbon Neutrality included	Referenced throughout

7.6 Baseline Conditions

- 7.6.1 The baseline environmental conditions of the Scheme are described in this section. Additionally, reference to the surrounding area in relation to GHG emissions and climatic conditions is discussed.

GHG impact Assessment

Current Baseline

- 7.6.2 Due to the nature of the Sites, which comprises mainly arable land – current baseline GHG emissions are largely derived from agricultural practice. However, this is dependent on the soil, vegetation type present and the fuel use of vehicles and other agricultural machinery.
- 7.6.3 The current land use is considered to have minor levels of associated GHG emissions. For the purposes of the GHG assessment, a conservative approach assuming the existing Sites have zero baseline emissions has been used.

Future Baseline

- 7.6.4 For the lifecycle GHG impact assessment, the baseline is a 'business as usual' scenario whereby the Scheme is not implemented. The baseline comprises existing carbon stock and sources of GHG emissions within the Sites from the existing activities on-site.

Climate Change Resilience Review

Current Baseline

- 7.6.5 Historic climate data acquired by the Met Office from the closest Met Office Station to the Scheme (Waddington) for the 30-year climate period of 1981 – 2010 will provide the current baseline for the CCR Review (Ref 7.27). This is summarized in Table 7.6 below.

Table 7.6: Historic Climate data

Climatic Factor	Month	Figure
Average annual maximum daily temperature (°C)	-	13.6
Warmest month on average (°C)	July	21.5
Coldest Month on average (°C)	February	1.3
Mean annual rainfall levels (mm)	-	614.1
Wettest month on average (mm)	July	59.5
Driest month on average (mm)	February	36.1

- 7.6.6 Historic 10-year averages for the East and Northeast of England obtained from the Met Office have identified gradual warming and increased rainfall between 1969 – 2018. The table below summarizes these findings.

Table 7.7: Historic climate data for 10-year averages for temperature and rainfall for the East and Northeast of England region

Climate period	Climate variables	
	Mean Maximum annual temperatures (°C)	Mean annual rainfall (mm)
1969 - 1978	12.0	709.2
1979 - 1988	11.8	792.5
1989 - 1998	12.7	713.5
1999 - 2008	13.2	829.8
2009 - 2018	13.1	785.2

Future Baseline

- 7.6.7 It is anticipated that the future baseline will be different from the current present-day baseline, due to changes in climate. For this assessment, UKCP18 probabilistic projections have been provided for 20-year periods from 2020 - 2079 and obtained for the following climate variables which includes annual and seasonal changes in climatic conditions over the land area of the Scheme.
- Mean annual air temperature;
 - Mean summer air temperature;
 - Mean winter air temperature;
 - Maximum summer air temperature;
 - Minimum winter air temperature;
 - Mean annual precipitation;
 - Mean summer precipitation;
 - Mean winter precipitation;
 - Mean annual cloud cover;
 - Mean summer cloud cover; and,
 - Mean winter cloud cover.
- 7.6.8 A 25 km² grid square that encompasses the Scheme's location has been used to analyse the UKCP18 probabilistic projections. Temperature, precipitation, and cloud anomalies are considered relative to the 1981 – 2000 baseline. These variables are illustrated in Table 7.8,
- 7.6.9 Table **7.9** and
- 7.6.10 Table **7.10**.
- 7.6.11 There are a range of different climate scenarios also known as Representative Concentration Pathways (RCPs) used in UKCP18 that help inform future trends in emissions (Ref 7.26). For this assessment RCP 8.5 has been used, which assumes a 'business as usual' pathway for climate change as recommended by the IEMA guidance.
- 7.6.12 The impact of climate change will be determined over the course of the Scheme's design life, which is estimated to be 40 years for the purpose of the EIA. For the

assessment, the climatic impacts of GHG emissions at the 10%, 50% and 90% probability levels up to 2079 are included which covers the assessment up to the 2066 estimated decommissioning date.

Table 7.8: Predicted changes in temperature variables (°C)

Climate Variable	Time Period		
	2020 – 2039	2040 – 2059	2060 – 2079
Mean annual air temperature anomaly at 1.5 m (°C)	+ 0.99 (+0.33 to +1.66)	+1.75 (+0.83 to +2.73)	+2.7 (+1.23 to +4.25)
Mean summer air temperature anomaly at 1.5 m (°C)	+1.18 (+0.35 to +2.03)	+2.17 (+0.83 to +3.55)	+3.29 (+1.09 to +5.57)
Mean winter air temperature anomaly at 1.5 m (°C)	+0.94 (-0.02 to +1.92)	+1.60 (+0.40 to +2.90)	+2.43 (+0.70 to +4.17)
Maximum summer air temperature anomaly at 1.5 m (°C)	+1.27 (+0.19 to +2.43)	+2.43 (+0.76 to +4.22)	+3.67 (+1.03 to +6.44)
Minimum winter air temperature anomaly at 1.5 m (°C)	+0.86 (-0.11 to +1.89)	+1.56 (+0.29 to +3.00)	+2.36 (+0.65 to +4.28)

Table 7.9: Predicted changes in precipitation variables (%)

Climate Variable	Time Period		
	2020 – 2039	2040 – 2059	2060 – 2079
Annual precipitation rate anomaly (%)	+1.57 (-3.15 to 6.59)	-1.20 (-8.4 to +6.23)	-1.18 (-6.64 to +4.42)
Summer precipitation rate anomaly (%)	-5.44 (-25.22 to +15.00)	-17.27 (-37.91 to +3.84)	-23.85 (-51.34 to +4.07)
Winter precipitation rate anomaly (%)	+3.79 (-5.13 to +13.38)	+7.68 (-4.46 to +20.39)	+12.86 (-3.06 to +29.0)

Table 7.10: Predicted changes in cloud cover variables (%)

Climate Variable	Time Period		
	2020 – 2039	2040 – 2059	2060 – years
Annual total cloud anomaly (%)	-1.66 (-4.74 to +1.14)	-1.20 (-8.4 to +6.23)	-1.18 (-6.64 to +4.42)
Summer total cloud anomaly (%)	-3.64 (-10.34 to +2.69)	-8.21 (-18.51 to +1.88)	-23.85 (-51.34 to +4.07)
Winter total cloud anomaly (%)	-0.19 (-2.15 to +1.62)	+0.13 (-2.01 to +2.06)	+5.22 (-1.65 to +2.68)

- 7.6.13 For the Climate Change Resilience Review, the Scheme and all associated infrastructure and assets are considered as a sensitive receptor.

7.7 Embedded Design Mitigation

- 7.7.1 Various GHG mitigation measures are embedded within the Scheme and are included within the draft Outline CEMP and the Outline CTMP. A Schedule of Environmental Mitigation will be produced for the ES, which outlines how this mitigation will be secured.

- 7.7.2 This embedded mitigation will be implemented to reduce the GHG impact of the Scheme. Specific embedded mitigation measures include:

- Increasing recyclability by segregating construction waste to be re-used and recycled where reasonably practicable;
- Adopting the Considerate Constructors Scheme (CCS) to assist in reducing pollution, including GHGs, from the Scheme by employing good industry practice measures;
- Designing, constructing and implementing the Scheme in such a way as to minimise the creation of waste and maximise the use of alternative materials with lower embodied carbon, such as locally sourced products and materials with a higher recycled content where feasible;
- Reusing suitable infrastructure and resources already available within the Sites where possible to minimise the use of natural resources and unnecessary materials (e.g. reusing excavated soil for fill requirements);
- Encouraging the use of lower carbon modes of transport by identifying and communicating local bus connections and pedestrian and cycle access routes to/ from the Scheme to all construction staff, and providing appropriate facilities for the safe storage of cycles;
- Liaising with construction personnel for the potential to implement staff minibuses and car sharing options;
- Implementing a Travel Plan to reduce the volume of construction staff and employee trips to the Scheme;
- Switching vehicles and plant off when not in use and ensuring construction vehicles conform to current EU emissions standards; and

- Conducting regular planned maintenance of the construction plant and machinery to optimise efficiency.

7.7.3 Regular planned maintenance of the Scheme will also be conducted during operation to optimise efficiency.

7.7.4 A Decommissioning Statement (**Appendix 4.4**) has been set out. Similar measures to the CEMP will be developed prior to the decommissioning phase to encourage the use of lower-carbon and more climate change resilient methods. It would not be appropriate to specify such requirements now as the decommissioning environment beyond 2065 is likely to be considerably different to today.

7.7.5 Further climate change resilience measures embedded within the Scheme, particularly in relation to flood risk, are outlined below. The specific flood risk impacts and associated mitigation measures are discussed in more detail in Chapter 10: Hydrology, Flood Risk and Drainage and include:

- Access to the Site during construction and operation will be taken from permeable and existing farm tracks accessed from the local highway network. This limits the potential for increased surface water runoff rates and sedimentation effects during construction.
- Non-flood sensitive infrastructure forming the wider development (PV arrays, cabling, inverters and transformer stations) have been sequentially located outside the 1 in 100 plus climate change annual probability extent (1% +CC) or where this is not possible restricted to areas which experience less than 1 m depth of flooding during the same event. Depending on the final type of panel chosen, the bottoms of the majority of the panels are likely to be between 0.45 and 0.6m off the ground. For areas of flooding higher panels may be considered as a mitigation strategy.
- Critical infrastructure within the Scheme (the substations and battery storage compounds) have been sequentially located within Zone 1, an area with a “Low probability of flooding” and therefore in land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%); and

7.7.6 Health and safety plans developed for construction and decommissioning activities will be required to account for potential climate change impacts on workers, such as flooding and heatwaves.

7.8 **Assessment of Likely Impacts and Effects**

GHG Impact Assessment

7.8.1 For each lifecycle stage of the Scheme (construction, operation, and decommissioning), the associated GHG emissions are identified and assessed.

- 7.8.2 A summary of the anticipated GHG emissions arising from the Scheme can be showed below:

Table 7.11: Possible sources of GHG emissions

Lifecycle Stage	Activity	Primary emission sources
Production Stage	The extraction of raw materials and manufacturing of products necessary to make equipment.	GHG emissions that are embodied within the product.
	This stage is anticipated to create a significant input to GHG emissions, due to the materials that contain high levels of embodied carbon, complex manufacturing processes and equipment design.	GHGs that are produced during manufacturing
	Materials that are transported for manufacturing.	Vehicle GHG emissions
Construction Stage	Construction activity on-site, which includes construction compound emissions.	Energy consumption of on-site vehicles and generations and commuting construction workers.
	Construction materials that are transported and not integrated in embodied GHG emission. Equipment required is likely to require shipment, due to overseas origin.	Transportation of materials to the sites and the amount of fuel consumed.
	Construction worker that would need transportation to the site.	Transportation of workers to the sites and resulting GHG emissions.
	Waste produced during the construction process that need to be disposed.	GHG emissions produced from the transportation and removal of waste materials
Operation Stage	Water use	Treatment of wastewater and supply of potable water
	Scheme operation Scheme maintenance	GHG emissions from energy consumption from operation and maintenance, supply of potable water and wastewater treatment from staff facilities. These operational aspects are expected to be negligible in the context of overall GHG emissions.

Lifecycle Stage	Activity	Primary emission sources
		Emissions from routine maintenance are expected to be negligible. However, the periodic replacement of components has the potential to have significant impacts given the complexity of the equipment involved.
Decommissioning Stage	Decommissioning activity occurring on-site	Energy consumption of on-site vehicles and generators.
	Removal and transportation of any waste materials	GHG emissions generated from the transportation and disposal of waste materials. This has the potential to be significant given the complexity of the design of the equipment, and the use of materials with high associated waste treatment emissions.
	Workers that would need to be transported to the site	Transportation of workers to site and resulting GHG emissions

- 7.8.3 For the purposes of this assessment, it has been considered that any increase in GHG emissions compared to the baseline has the potential to have an impact, due to the high sensitivity of the receptor (global climate) to increases in GHG emissions. This is in line with the IEMA guidance (Ref 7.21), which states that all GHG emissions have the potential to be significant. The application of the standard EIA significance criteria is not considered to be appropriate for climate change mitigation assessments. GHG impacts will be put into context in terms of their impact on the UK's 5-year carbon budgets, including sub-sectoral budgets for energy generation, which set legally binding targets for GHG emissions.
- 7.8.4 While it is important to understand the GHG impacts at each individual lifecycle stage, it is also important to understand the net lifecycle GHG impact of the Scheme due to the long-term, cumulative nature of GHG emissions over the assessed lifetime of the Scheme.
- 7.8.5 Therefore, the net impact of the Scheme is also identified and assessed, taking into account the renewable energy generation and the benefit of this in the context of

the wider energy generation sector and the National Grid average GHG intensity. This overall assessment, which accounts for all GHG emissions over the assessed lifetime of the Scheme, compares the Scheme's GHG intensity to the National Grid average GHG intensity to quantify the net GHG impact of the Scheme compared with other predicted grid energy generation sources.

Construction (2024 - 2026)

- 7.8.6 The construction period will take approximately 18 -24 months. Construction activities will be carried out Monday to Friday 08:00-18:00 and between 08:00 and 13:30 on Saturdays.
- 7.8.7 The construction phase for the solar element of the Scheme includes the preparation of the Sites, installing the access tracks, erection of security fencing, assembly and erection of the PV arrays, installation of the inverters/transformers and grid connection.
- 7.8.8 The construction of the energy storage system element of the Scheme will include the preparation of the Sites, installation of the access roads, erection of security fencing, assembly of the battery system, and installation of the switch-room and grid connection.
- 7.8.9 During the construction stage, the greatest impact of GHGs is the result of embodied carbon in the materials used for construction. As mentioned previously; the PV panels are expected to be sourced from China or a country of similar distance and therefore, the manufacture and supply of PV panels will likely be the largest source of GHG emissions. A worst-case estimate has been carried out in the absence of additional technical data for all products to be provided on site.

Table 7.12: Construction GHG Emissions

Emissions Source	Emissions (tCO₂e)	% Construction Emissions
Products (PV arrays)	748,209	88.7
Products (Transformers)	12	<1
Transportation of Materials by land	21,906	2.6
Transportation of Materials by sea	71,777	8.5
Worker Transportation	1,229	<1
Total	843,133	100

- 7.8.10 In the ES, estimates of GHGs from other sources of emissions during the construction stage will be included. These include and are not limited to; GHG emissions from energy and fuel use during construction activities, disposal of waste

materials from the Sites, water use and further details with regards to the embodied carbon of products to be installed on site. In the interim, the estimated GHG emissions associated with the PV arrays has been calculated as worst case to compensate for the missing data.

- 7.8.11 It is assumed that with the conversion of arable land to grassland required for the installation of Solar PV panels; there will be an increase in sequestered carbon. Although this figure has not been estimated yet, it will be discussed in the ES.

Significance of Effect (Construction)

- 7.8.12 Total GHG emissions from the construction phase are estimated to equate to around 843,133 tCO₂e as a worst-case assumption.
- 7.8.13 GHG emissions from construction activities will be limited to the duration of the construction programme (2 years). When annualised, the total annual construction emissions equate to around 421,566 tCO₂e.
- 7.8.14 Table 7.13 presents the estimated construction emissions against the carbon budget period during which they arise. Construction emissions will fall under the 4th UK carbon budget.
- 7.8.15 As the construction phase and the first three years of the operation phase both fall within the 4th carbon budget, the annual emissions of each phase have been compared to the relevant annualised carbon budgets to enable assessment of the phases individually.

Table 7.13: Construction GHG Emissions

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO ₂ e)	Annual Construction Emissions for the Scheme During Carbon Budget Period (tCO ₂ e)	Construction Emissions for the Scheme as a Proportion of Carbon Budget
4th Carbon Budget (2023 to 2027)	390,000,000	421,566	0.1080%

- 7.8.16 Annual emissions from the construction of the Scheme do not contribute to equal to or more than 1% of the annualised 4th carbon budget. The magnitude of effect is therefore considered low. GHG emissions from the construction of the Scheme are therefore considered to have a minor adverse likely significant effect on the climate. A negligible likely significant effect is not possible where any GHG emissions are released to the atmosphere.

Operation (2026–2066)

- 7.8.17 During the operational stage, GHG emissions will likely arise from the generation of consumed mains electricity to heat and power any proposed buildings on site, i.e. the substations, control room and energy storage areas. Within the ES, an annual energy demand for the buildings will be obtained from benchmark data to estimate a worst case in terms of emission scenario.
- 7.8.18 GHG emissions will also be generated as a result of additional operational activities such as the transportation of operational workers to and from the Site and some minor emissions from mains water consumption, wastewater treatment and the transport and treatment of waste from staff facilities.
- 7.8.19 At the time of writing this chapter only the transportation data for the operational workers to and from the Sites was available. Assuming a 30km distance of travel, the operational phase of the project would generate approximately 10 tCO₂e as a result of operational workers travelling to and from the Sites twice a month for maintenance.
- 7.8.20 As shown from the GHG emissions associated with worker transportation, it is likely the GHG emissions associated with the additional operational activities will be small compared to emissions from energy consumption.
- 7.8.21 The operational GHG emissions to be calculated will reflect a robust worst-case as the calculations for worker transportation and maintenance will have been carried out using current emissions factors to estimate emissions over the operational lifetime of the Scheme. However, carbon and emissions associated with energy and fuel use throughout the supply chain are anticipated to be lower in the future as a result of grid decarbonisation and machinery and vehicle electrification in line with the UK's net zero carbon emissions target for 2050.
- 7.8.22 While sulphur hexafluoride (SF₆) is a potential source of GHG emissions over the lifetime of the Scheme (i.e. derived from certain electric items such as gas-insulated switchgear and gas-insulated transformers during production, operation through leakage, and dismantling), it has not been possible to quantify fugitive emissions from the leakage of SF₆ due to insufficient research data being available on this topic. SF₆ is one of the seven GHGs identified by the Kyoto Protocol (Ref 7.23) due to its high Global Warming Potential (GWP) of 23,900.
- 7.8.23 It is not anticipated that SF₆ emissions will significantly affect the overall outcome of this assessment, however. For example, total annual SF₆ emissions from the National Grid Transmission Network in 2015-2016 equated to 216,645 tCO₂e (Widger and Haddad, 2018; Ref 7.30) and are assumed to be similar each year. As the Scheme will provide less than 1% of total generation capacity to the National Grid Transmission Network, and as switchgear and transformers are not limited to power

generation facilities but can be found all across the network, it is anticipated that the Scheme's contribution to this total will be minimal.

- 7.8.24 Future climate change impacts, as identified in Section 7.6, may affect the lifetime energy generation modelled. For example, cloud cover is projected to decrease, which is expected to increase solar resource and have a positive impact on the productivity of the solar PV modules. This benefit, however, is assumed to be counterbalanced by temperature increases projected, which are anticipated to have a negative impact on the efficiency of the solar PV modules and on energy transmission losses (Ref 7.24). Any overall positive or negative effect is not anticipated to have a material impact on the outcome of the assessment.
- 7.8.25 Energy generation from the Scheme during the first year of operation is estimated to be 778,500 MWh. A standard assumed 0.55% degradation factor has been assumed for each subsequent year, resulting in an estimated energy generation figure of 624,382 MWh in the final year of operation, and a total energy generation figure of around 28,645,904 MWh over the estimated 40-year assessed lifetime.
- 7.8.26 At this stage only the construction phase GHG emissions can be used to estimate the GHG intensity of the scheme as a benchmark. Based on the total energy generation of the Scheme and the worst-case assumption for construction GHG emissions of 843,133 tCO₂e, the intensity of the Scheme is estimated to be 29.4 gCO₂e/kWh. This compares favourably with fossil fuel electricity generation and is comparable with other low carbon energy generation as shown in Table 7.14 (Ref 7.32).

Table 7.14: Comparison of energy intensities of various forms of energy generation

Energy Generation Type	GHG Intensity (gCO ₂ e/kWh)
Combined Cycle Gas Turbine (CCGT)	380 to 500
Nuclear	5 to 55
Offshore Wind	5 to 24
Onshore Wind	7 to 20
Cottam Solar Project	29.4

- 7.8.27 A further calculation has been completed to understand at what point the GHG reductions from National Grid through the use of renewable energy at the scheme would offset the calculated worst-case emissions generated from the products and the construction phase. The calculation has used the UK Government Conversion factor for UK Electricity from 2021 to calculate the tCO₂e generated by the scheme year on year with a 0.55% reduction in efficiency per year. It is acknowledged that the emissions from energy usage is expected to be reduced in future years as the

UK becomes less reliant on fossil fuels. Table 7.15 shows the expected year for the operation of the scheme to offset the construction emissions.

Table 7.15: Calculation of Savings to Offset Construction GHG Emissions

Year of Operation	GHG Savings as a Result of Scheme (kgCO ₂ e)	Offset from Construction Emissions (kgCO ₂ e)
Year 1	165299	677,834
Year 2	164390	513,444
Year 3	163486	349,959
Year 4	162586	187,372
Year 5	161692	25,680
Year 6	160803	-135,123

- 7.8.28 As shown above, it is expected that the savings from the scheme would result in offsetting the construction emissions within 5-6 years of operation based on worst case assumptions used for the PEIR.

Significance of Effect (Operation)

- 7.8.29 As previously stated, the operational stage of the Scheme will encompass the 4th 2023 – 2027), 5th (2028 – 2032) and 6th (2033 – 2037) national carbon budgets, however, budgets beyond this have not been published yet. Due to the nature of the Scheme; it is unlikely that any emissions derived from the operational stage will produce GHG emissions >1% of the 4th, 5th, and 6th carbon budgets. It is anticipated that the magnitude of effect is likely to be low.
- 7.8.30 Compared to other types of electricity generation; the Scheme is expected to have a major beneficial impact on the climate.
- 7.8.31 The ES chapter will outline the complete estimated operational GHG emissions expected during the lifespan of the Scheme.

Decommissioning (2066 - 2067)

- 7.8.32 During the decommissioning stage, total GHG emissions will be supplied; including the source of emissions, any related emissions and the contribution of each emission source (as a percentage) to the overall GHG emissions produced.
- 7.8.33 As the decommissioning activities associated with the Scheme will occur far into the future; there is uncertainty over the total estimate of GHG emissions that will be produced. Therefore, prior to decommissioning, a Decommissioning Plan will be prepared.

Significance of Effect (Decommissioning)

- 7.8.34 The projected lifespan of the Scheme is estimated to be 40 years so it is unknown at this stage what the effects will be in the future. However, based on the scale of the development, it is expected that the magnitude of effect will be low.

Overall GHG Impact

- 7.8.35 It is anticipated that the construction and decommissioning stages of the Scheme will result in a minor adverse impact on the climate. However, the overall operation stage will likely have a major beneficial impact.

Climate Change Resilience Review

- 7.8.36 In the sections below, associated impacts and effects of climate change during the construction, operation and decommissioning stages of the scheme are discussed.
- 7.8.37 The receptor for the review of climate change resilience is the Scheme itself, including all infrastructure, assets, and workers on-site during construction, operation, and decommissioning. The sensitivity of the receptors has been evaluated based on their vulnerability, susceptibility to climate change associated impacts and their overall importance.

Table 7.16: Sensitivity of Receptors

Receptors	Vulnerability	Susceptibility	Importance	Overall Sensitivity
Buildings and infrastructure including equipment and building operations	Moderate	Moderate	High	Medium
Human Health including construction workers and site users	Moderate	Moderate	High	Medium

Construction (2024 - 2026)

- 7.8.38 Due to projected changes in climate and increased environmental extremes; sensitive receptors during the construction process may be vulnerable. The climate risks are summarised in the table below.

Table 7.17: Construction Phase Climate Risks

Climate Risk	Receptor	Consequence	Likelihood of Impact	Magnitude of Effect
Increased probability of extreme weather events	Buildings and Infrastructure	Restriction to site access and working hours causing delay to construction	As likely as not	Medium
Increased heatwaves	Human Health	Poor working conditions impacting specific construction activities	Likely	High
Increase rainfall events	Human Health	Poor working conditions impacting specific construction activities	Likely	High

7.8.39 The climatic changes expected to take place during the construction phase have the potential to cause delays to the construction schedule due to the occurrence of severe weather events. The extreme weather conditions may also impact the health and safety of the workers on site. Nonetheless, the construction phase takes place within the early stages of the 2020 – 2039 range of climate scenarios as detailed in Table 7.8,

7.8.40 Table **7.9** and

7.8.41 Table **7.10**. As a consequence, the expected climate changes are not as severe and will likely be able to be mitigated against.

Operation (2026 - 2065)

7.8.42 The projected changes in climate and increased environmental extremes are likely to be more severe during the estimated 40 years life span of the Scheme. The climate risks are summarised in the table below.

Table 7.18: Operation Phase Climate Risks

Climate Risk	Receptor	Impact	Likelihood of Impact	Magnitude of Effect
Increased frequency of severe weather events	Buildings and Infrastructure	Damage to infrastructure/assets due to heat stress or storm/flood damage	As likely as not	High
Increased summer and winter temperatures	Buildings and Infrastructure	Increase in the ambient temperature of energy storage units, resulting in higher ventilation	As likely as not	High

Climate Risk	Receptor	Impact	Likelihood of Impact	Magnitude of Effect
		and cooling requirements		
Increased summer temperatures	Human Health	Health and safety risk due to increased risk of fire	As likely as not	High
Increased winter precipitation	Human Health	Health and safety risk due to increase in surface water flooding and standing water leading to land subsidence	As likely as not	High

Decommissioning (2065 – 2067)

- 7.8.43 During the decommissioning stage, the impacts of climate change are expected to worsen and increase. This may increase the vulnerability of sensitive receptors mentioned above for the construction process.

Overall CCR Impact

- 7.8.44 Based on the above assessment, without appropriate mitigation the Scheme is at high risk to climate change impacts.
- 7.8.45 Embedded mitigation measures to increase the resilience of the Scheme to climatic changes are outlined in previous sections.
- 7.8.46 The CCR review has considered the measures which are integrated into the design (see Section 7.7) and based on the outcomes of the assessment, are considered an adequate response to the projected climate change impacts to which the Scheme would be exposed.

In Combination Assessment

- 7.8.47 The greatest risk of in combination affects are of increased flooding events from extreme weather arising from a changing climate.
- 7.8.48 The risk of flooding from has been determined to be unlikely through the Hydrology assessment work and consultation with the Environment Agency and use of EA models, though there are cumulative risks of increased flooding as a result of Climate Change. The below is summarised from the Hydrology PEIR.

Table 7.19: Flood Risks from Climate Change

Area	Flood Risk Summary	Likelihood of Impact
Cottam 1	<p>No flooding with a depth greater than 0.9 m is present across any of the Site parcels. Flooding with a depth between 0.6 – 0.9 m is present along the western boundary of Parcel 1 and the north-western corner of parcel 2.</p> <p>The EA's Long-Term Flood Risk Map indicates that Surface Water flooding with a High Risk (>3.3% Annual Probability) of occurrence is present across the whole northern part of the Site and across the western and eastern extents of the southern part of the Site.</p> <p>Parcel 1 has High Risk areas associated with some land drains that cross the Parcel is the east and a topographical low point in the west. Parcels 2 and 3 have High Risk areas associated with the route of the River Till. There are multiple flow paths in the surrounding area that flow towards the Site.</p> <p>During the 0.1% AEP + CC scenario, the majority of the Site remains flood free however a greater proportion of the Site is shown to hold flooding with a depth greater than 0.9 m.</p>	Very Low to High
Cottam 2	<p>During the 0.1% AEP + CC scenario, a minor portion of Parcel 1 is encroached by flooding however the depths are shown to remain below 0.4 m. Flooding is shown on both side of the River Till within the centre of Parcel 2, with some areas indicated to have flooding reaching depths above 0.9 m. The majority of the northern Parcel 3 is shown to be flooded however the depths are shown to be below 0.7 across the entire parcel. The eastern extent of the southern Parcel 3 is shown to be impacted, with maximum flood depths</p>	Very Low to High

Area	Flood Risk Summary	Likelihood of Impact
	<p>above 0.9 m in the eastern area of the parcel that bounds the River Till.</p> <p>The EA's Long-Term Flood Risk Map indicates that Surface Water flooding with a High Risk (>3.3% Annual Probability) of occurrence is present across the Site. Parcel 1 has High Risk areas associated with some land drains that cross the Parcel to the east and a topographical low point in the west. Parcels 2 and 3 have High Risk areas associated with the route of the River Till. There are multiple flow paths in the surrounding area that flow towards the Site.</p>	
Cottam 3	<p>The EA's Long-Term Flood Risk Map indicates that the majority of the Site is at Very Low to Low (<0.1 - 1%) risk of Surface Water flooding. Isolated areas of the Site are at Medium to High Risk (1 - 3.3% Annual Probability), notably on the north-eastern boundary of the Site for approximately 1 km. This forms a Surface Water flow path, running along the boundary and away from the Site northwards. Other isolated areas of Medium to High Risk on the Site are associated with minor topographic depressions which infill during rainfall events.</p>	Very Low to Low
Cottam 3b	<p>The EA 'Flood Risk from Surface Water' map (Figure 2) indicates that the Site is largely at Very Low risk (<0.1% annual probability) of surface water flooding. However, there are some small areas throughout the Site which are at Low to High risk (0.1 - ≥ 3.3% annual probability) of surface water flooding; these areas are generally confined to the north-east and south-western extents</p>	Very Low to High

Area	Flood Risk Summary	Likelihood of Impact
Cottam Substation	The proposed substations and energy storage will generate increased surface water runoff when compared to the current use of the Application Site. This could potentially increase localised pluvial flooding on the Application Site.	Medium

- 7.8.49 While there is potential for some of Cottam to have increased chance of flooding as a result of the effects of Climate Change, the layout of the scheme can be designed in such a way as to minimise development of areas which are more at risk of flooding.

7.9 Additional Mitigation and Enhancement Measures

- 7.9.1 The GHG assessment has identified that the greatest source of tCO₂e during the construction phase is from embodied carbon from products. While this is to be finalised in the ES following completion of the EPD, the final product selection should seek to use products with the lowest embodied carbon wherever possible.
- 7.9.2 While worse case assumptions have been made for the purpose of the GHG vehicle type around use of HGVs for transport of construction materials, wherever possible vehicles with lower carbon emissions should be used.
- 7.9.3 Climate Change mitigation forms part of the embedded mitigation as part of the scheme as its primary purpose is to deliver clean renewable energy. The scheme will contribute to the UKs Carbon Target of Net Zero by 2050.

7.10 Residual Effects

- 7.10.1 During the different stages of the Scheme (construction, operation, and decommissioning), inevitable GHG emissions will be generated with associated transport, energy, and fuel-use.
- 7.10.2 Overall, the Scheme itself will provide major beneficial impacts and a net reduction in GHG.
- 7.10.3 The design has accounted for Climate Resilience through the design avoiding any potential flood risk zones, though there remains uncertainty to the extent of which severe weather events will affect the UK. While some panels may be placed in flood risk zones this will only be where predicted flooding is not deep enough to affect them. Other more sensitive electrical equipment will not be placed in flood risk zones.

7.11 Cumulative Effects

- 7.11.1 Cumulative GHG emissions are likely to arise due to the prevalence of other planned developments that fall within the zone of influence around the location of the Scheme. With two of these planned developments being Nationally Significant Infrastructure Projects (NSIPs); it is anticipated that a cumulative effects assessment on GHG emissions will need to be undertaken and included in the ES.
- 7.11.2 Although the Scheme will provide major beneficial impacts; it's important to consider other developments as the GHG emissions produced in conjunction may exceed >1% of the applicable carbon budget.
- 7.11.3 The Scheme is being developed in tandem alongside the nearby West Burton Solar Project. It is considered that there would be positive cumulative effects should both developments construction periods overlap as this would allow for consolidation of vehicle trips which would lead to less GHG emissions than if the construction periods were staggered. At this stage, it is unknown what these potential savings would be, and the cumulative effect is based on both schemes operating in isolation.
- 7.11.4 The cumulative effect of Construction emissions from the construction phase of West Burton Solar Project and the Cottam scheme has been calculated as part of this PEIR. The combined tCO₂e shown below.

Table 7.20: Cumulative Construction GHG Emissions

Relevant UK Carbon Budget	Annualised UK Carbon Budget (tCO ₂ e)	Cumulative Annual Construction Emissions During Carbon Budget Period from Cottam and West Burton(tCO ₂ e)	Cumulative Construction Emissions as a Proportion of Carbon Budget
4th Carbon Budget (2023 to 2027)	390,000,000	781,304	0.2003%

- 7.11.5 The cumulative effect of both construction periods concurrently would not result in an exceedance of 1% of the Carbon budget. The cumulative effect is not considered significant.
- 7.11.6 The Gate Burton Energy Park has also been considered as part of the cumulative assessment. The cumulative effect of the construction phases of the scheme is not likely to be >1% of the 4th Carbon Budget but this will be confirmed following publication and review of the ES for that scheme. While there may be some cumulative effects from combined GHG emissions during the construction phase, it

is considered that, as with the Scheme, the offset from reduced emissions over the operational phase of the development would ultimately result in a beneficial cumulative effect with regards to Climate Change.

7.12 References

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8 Landscape and Visual Impact

8.1 Introduction

8.1.1 This chapter of the PEIR describes the existing environment in relation to the landscape and visual resource and the assessment work that has been undertaken to date. The main objective is to provide as much relevant information about the Scheme and highlight the key and significant likely environmental effects anticipated sufficient to allow the consultation bodies to provide an informed view on the proposals. The Scheme and Sites are described in **Chapters 3** and **4** of the PEIR. Proposed mitigation measures are set out, and a discussion of the residual impacts is provided where significant impacts are identified.

8.1.2 The Landscape and Visual Impact Assessment (LVIA) chapter is supported by the following appendices and figures:

- **Appendix 8.1** LVIA Methodology
- **Appendix 8.2** Landscape Character Tables
- **Appendix 8.3** Viewpoint Analysis Tables
- **Appendix 8.4** Consultation
- **Appendix 8.5** Figures
 - Figure 8.1 Site Location and Study Area
 - Figure 8.2 Aerial Photography
 - Figure 8.3 Landform
 - Figure 8.4 Landscape Character – National
 - Figure 8.5 Landscape Character – Regional
 - Figure 8.6 Landscape Receptors
 - Figure 8.7 Visual Receptors
 - Figure 8.8 Cottam 1 Bare Earth ZTV
 - Figure 8.9 Cottam 2 Bare Earth ZTV
 - Figure 8.10 Cottam 3 Bare Earth ZTV
 - Figure 8.11 Cottam 1 Augmented ZTV (including viewpoint locations)

- Figure 8.12 Cottam 2 Augmented ZTV (including viewpoint locations)
- Figure 8.13 Cottam 3 Augmented ZTV (including viewpoint locations)
- Figure 8.14 Cottam Viewpoint Verified Photography
- Figure 8.15 Cottam Cumulative Developments
- Figure 8.16 Cottam Strategic Landscape Mitigation Measures

8.1.3 The Landscape and Visual Impact Assessment (LVIA) chapter is supported by the following tables:

- Table 8.1 Compliance with Planning Policy
- Table 8.2 Consultation and Responses Timeline
- Table 8.3 Current Cumulative Developments
- Table 8.4 Key Information Sources
- Table 8.5 Landscape Character Types & Areas
- Table 8.6 Potential Cumulative Developments
- Table 8.7 Summary Matters

8.1.4 This chapter was prepared by Wendy Wright Associate Director and Chartered Landscape Architect of Lanpro Services Ltd, Landscape Architecture. The LVIA Methodology is based on recognized national guidelines and is outlined in the following sections. A full methodology is included in **Appendix 8.1**.

8.2 Planning Policy Context and Guidance

8.2.1 For Nationally Significant Infrastructure Projects (NSIP), a Landscape and Visual Impact Assessment (LVIA) is required to be undertaken as part of an Environmental Impact Assessment. As part of the decision-making process for solar NSIPs, the Secretary of State must have regard to important and relevant matters, including the relevant National Planning Statement (NPS) and applicants should therefore ensure that their applications, and any accompanying planning documents demonstrate that the scheme in question is compliant with the policy tests set out in any relevant NPS.

National Planning Policy Statements (NPS)

8.2.2 At the time of writing, there is no designated NPS which specifically deals with ground mounted solar developments. However, there are aspects of three of the

designated energy NPSs which are relevant to decision making of the Secretary of State and are likely to be deemed important and relevant considerations in any examination of a ground mounted solar farm DCO (to the extent they have not been superseded by the time this application is being examined). The LVIA will therefore have regard to:

- NPS EN-1 Energy (emerging³ and adopted)⁴
- NPS EN3 Renewable Energy Infrastructure (⁵emerging and adopted)⁶
- NPS EN-5 Electricity Networks (⁷emerging and adopted)⁸

8.2.3 The Department for Business, Energy and Industrial Strategy is currently undertaking a review of the six NPSs for energy infrastructure. Consultation on the revised draft NPSs closed on 29 November 2021. As drafted NPS EN3 on renewable energy has been expanded to provide policy on solar development. Currently there is no timescale in place for when the draft NPS (as amended) will be adopted. The revised EN3 addresses a range of matters including:

- Design Flexibility;
- Temporary nature of solar farms;
- Site Selection;
- Irradiance and Site topography and capacity of Site;
- Proximity of a Site to dwellings;
- Grid Connection;
- Accessibility;
- Agricultural Land Quality;
- Site Layout and appearance;
- Landscape and Arboriculture;

³ Department for Business, Energy & Industrial Strategy, November 2021, *Planning for New Energy Infrastructure (EN-1)*.

⁴ Department for Business, Energy & Industrial Strategy, September 2021, *Draft Overarching National Policy Statement for Energy (EN-1)*.

⁵ Department for Business, Energy & Industrial Strategy, November 2021, *Planning for New Energy Infrastructure (EN-3)*.

⁶ Department of Energy & Climate Change, July 2011, *National Planning Policy Statement for Renewable Energy Infrastructure (EN-3)*.

⁷ Department for Business, Energy & Industrial Strategy, November 2021, *Planning for New Energy Infrastructure (EN-5)*.

⁸ Department of Energy & Climate Change, July 2011, *National Planning Policy Statement for Electricity Networks (EN-5)*.

- Ecology and Biodiversity;
- Built heritage and archaeology;
- Flood risk and drainage;
- Highways and Access; and
- Glint and Glare.

National Planning Policy Framework (NPPF), 2021⁹

8.2.4 The following paragraphs are relevant:

- Paragraph 100 in respect of protecting and enhancing public rights of way (PRoW);

Planning policies and decisions should protect and enhance public rights of way and access, including taking opportunities to provide better facilities for users, for example by adding links to existing rights of way networks including National Trails.¹⁰

- Paragraph 130 which requires development to be sympathetic to local character and setting;

c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities)¹¹

- Paragraph 131 in respect of making sure that appropriate measures are in place for the planting of new trees;

Trees make an important contribution to the character and quality of urban environments, and can also help mitigate and adapt to climate change. Planning policies and decisions should ensure that new streets are tree-lined, that opportunities are taken to incorporate trees elsewhere in developments (such as parks and community orchards), that appropriate measures are in place to secure the long-term maintenance of newly-planted trees, and that existing trees are retained wherever possible. Applicants and local planning authorities should work with highways officers and tree officers to ensure that the right trees are planted in the right places, and solutions are found that are compatible with highways standards and the needs of different users.¹²

⁹ Ministry of Housing, Communities & Local Government, 2021, *National Planning Policy Framework*.

¹⁰ Ministry of Housing, Communities & Local Government, 2021, *National Planning Policy Framework*. Para 100

¹¹ Ministry of Housing, Communities & Local Government, 2021, *National Planning Policy Framework*. Para 130

¹² Ministry of Housing, Communities & Local Government, 2021, *National Planning Policy Framework*. Para 131

- Paragraph 174. Planning policies and decisions should contribute to and enhance the natural and local environment by;

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);¹³

- Paragraph 180c in relation to siting development that is appropriate for its location alongside ancient/veteran trees.

When determining planning applications, local planning authorities should apply the following principles: c) development resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused, unless there are wholly exceptional reasons and a suitable compensation strategy exists¹⁴

Planning Practice Guidance (PPG)¹⁵

8.2.5 The guidance on the Natural Environment is relevant and explains key issues in implementing policy to protect and enhance the natural environment, including local requirements. Relevant topics are:

- Green Infrastructure
- Biodiversity, geodiversity and ecosystems
- Landscape

Local Planning Policy

Central Lincolnshire Local Plan (Adopted April 2017)¹⁶

8.2.6 The following local planning policy is relevant:

- Policy LP17: Landscape, Townscape and Views
- Policy LP18: Climate Change and Low Carbon Living
- Policy LP19: Renewable Energy Proposals
- Policy LP20: Green Infrastructure Network

¹³ Ministry of Housing, Communities & Local Government, 2021, *National Planning Policy Framework*. Para 174

¹⁴ Ministry of Housing, Communities & Local Government, 2021, *National Planning Policy Framework*. Para 180C

¹⁵ Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 21 July 2019, *Planning Practice Guidance Natural Environment*.

¹⁶ Central Lincolnshire, Adopted April 2017, *Central Lincolnshire Local Plan 2012-2036*.

- Policy LP21: Biodiversity and Geodiversity
- Policy LP25: The Historic Environment
- Policy LP26: Design and Amenity
- Policy LP38: Protecting Gainsborough's Setting and Character
- Policy LP55: Development in the Countryside

West Lindsey Local Plan First Review (June 2006)¹⁷

8.2.7 The West Lindsey Local Plan (First Review) was adopted on 19 June 2006 and formally replaced by the Central Lincolnshire Local Plan on 24 April 2017. The following policies are saved:

- Policy NBE 8 – Historic Parks and Gardens
- Policy NBE 10 – Protection of Landscape Character in Development Proposals

Bassetlaw District Local Development Framework (2011)

8.2.8 The Core Strategy, with its Development Control policies and Proposals Map, was adopted by Bassetlaw District Council on 22 December 2011. It identifies the settlements to which new development will be directed and the amount of new housing and employment land that will be provided in these areas up to 2028. The following policies are deemed to be relevant to this assessment:

- POLICY DM8: The Historic Environment
- POLICY DM9: Green Infrastructure; Biodiversity & Geodiversity; Landscape; Open Space & Sports Facilities
- POLICY DM10: Renewable and Low Carbon Energy

8.2.9 The draft Bassetlaw Local Plan 2020-2037 (published August 2021) has been reviewed for relevant policies and it has been determined that the following are relevant to the LVIA assessment:

- POLICY ST37: Landscape Character
- POLICY ST39: Green and Blue Infrastructure
- POLICY ST40: Biodiversity and Geodiversity

¹⁷ West Lindsey District Council, *West Lindsey Local Plan First Review June 2006*.

- POLICY 41: Trees, woodlands and hedgerows
- POLICY ST42: The Historic Environment
- POLICY 43: Designated and Non-Designated Heritage Assets
- POLICY ST50: Reducing Carbon Emissions, Climate Change Mitigation and Adaptation
- POLICY ST51: Renewable and Low Carbon Energy Generation

Gainsborough Town Neighbourhood Plan (2020-2036)¹⁸

8.2.10 Gainsborough Neighbourhood Plan was formally adopted by West Lindsey District Council on the 28 June 2021. The Plan now forms part of the development plan in helping determine future planning applications within the Plan area. The following policies are deemed to be relevant to this assessment:

- NPP 1 Sustainable Development
- NPP 2 Protecting the Natural Environment and Enhancing Biodiversity
- NPP 5 Protecting the Landscape Character
- NPP 6 Ensuring High Quality Design
- NPP 7 Ensuring High Quality Design in each Character Area

Gainsborough Heritage and Character Assessment (28 February 2018)¹⁹

8.2.11 The report was prepared by consultants AECOM on behalf of Locality, working closely with the Gainsborough Town Council and presents a summary of the history and character of Gainsborough carried out through desk study and fieldwork.

Green Infrastructure Study for Central Lincolnshire (December 2011)²⁰

8.2.12 The study aims to provide a strategic framework for guiding the planning and delivery of Green Infrastructure across Central Lincolnshire. The findings of the Study are presented as two volumes:

- Volume 1 – Green Infrastructure Strategy
- Volume 2 – Green Infrastructure Audit and Assessment

¹⁸ Gainsborough Town Council, *Gainsborough Town Neighbourhood Plan 2020-2036*.

¹⁹ AECOM, 2018, *Gainsborough Heritage and Character Assessment*

²⁰ Chris Blandford Associates, December 2011, *Green Infrastructure Study for Central Lincolnshire*

Biodiversity Opportunity Mapping Study for Central Lincolnshire (October 2013)²¹

- 8.2.13 The study aims to provide an evidence base for the combined Local Plan. The Biodiversity Opportunity Mapping was a follow-on study from the Green Infrastructure Study of 2011.

8.3 Compliance with Planning Policy

- 8.3.1 The Scheme will be assessed against relevant planning policy and guidance identified in **Section 8.2** of this chapter and in **Table 8.1 below**.

Table 8.1: Compliance with Planning Policy

Policy/guidance	Compliance commentary
National Planning Policy Statements (NPS)	
EN-1: Undertake LVIA for Nationally Significant Infrastructure Projects. (section 5.9)	The Scheme complies with the landscape-related criteria of EN-1 through the provision of an LVIA chapter within the PEIR and ES.
Draft EN-1: All proposals for projects that are subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) must be accompanied by an Environmental Statement (ES) (Section 4.2). The applicant should carry out a landscape and visual assessment and report it in the ES (Section 5.10.5). Section 4.6 Criteria for "Good Design" for Energy Infrastructure.	The Scheme complies with the landscape-related criteria of Draft EN-1 through the provision of an LVIA chapter within the PEIR and ES. The Scheme complies with the landscape-related criteria of section 4.6 since consideration has been given from the outset to development layout, massing and colouring. However, the Scheme is extensive such that there are limitations to the range of practical measures that can be adopted.
EN-3: Paragraph 2.5.50. Good design that contributes positively to the character and quality of the area will go some	The Scheme complies with the landscape-related criteria of EN-3 since consideration has been given from the outset to development layout, massing and colouring. Landscape mitigation measures include the retention and enhancement of existing landscape features and the

²¹ Chris Blandford Associates, October 2013, *Biodiversity Opportunity Mapping Study for Central Lincolnshire*

way to mitigate adverse landscape/visual effects.	introduction of new areas of planting. Native species will be selected, and the planting will be designed to give softening and screening where appropriate whilst reinforcing local landscape character and biodiversity.
EN-3: Paragraph 2.5.51. Mitigation is achieved primarily through aesthetic aspects of the site layout and building design including size and external finish and colour of the generating station to minimise intrusive appearance on the landscape as far as engineering requirements permit.	The Scheme complies with the landscape-related criteria of EN-3 since consideration has been given at the outset to development layout, massing and colouring. However, the Scheme is extensive such that there are limitations to the range of practical measures that can be adopted.
Draft EN-3: Section 2.51 Solar photovoltaic generation impacts: landscape, visual and residential amenity.	The Scheme complies with the landscape-related criteria of Draft EN-3, Section 2.51 through the provision of an LVIA chapter within the PEIR and ES as well as having regards to both the design layout of the solar farm, and future maintenance plans. The proposals have considered the potential to mitigate landscape and visual impacts through extensive landscape mitigation.
EN-5: Paragraph 2.8.2. New substations, sealing end compounds and other above ground installations that form connection, switching and voltage transformation points on the electricity network can also give rise to landscape and visual impacts.	The Scheme complies with the landscape-related criteria of EN-5 in that mitigation measures include, where possible, the retention and reinforcement of existing woodland, scrub, and hedgerow areas. The location of the Scheme within a strong landscape framework also provides layering by intervening hedgerows and tree cover that contributes towards screening in views across the Study Area.
Draft EN-5: Section 2.11 landscape and Visual.	The Scheme complies with the landscape-related criteria of Draft EN-5 in that the Scheme includes for undergrounding of the cable routes. The Scheme also provides an LVIA chapter within the PEIR and ES as well as having regards to both the design layout of the solar farm, mitigation strategy and future maintenance plans.
National Planning Policy Framework (2021):	
Paragraph 98: Access to a network of high-quality open spaces and opportunities for sport	The Scheme complies with the landscape-related criteria of paragraph 98 of the NPPF in that consideration is given to the enhancement of the network of open spaces, footpaths, and bridleways. The Scheme avoids impacts on

and physical activity is important for the health and well-being of communities and can deliver wider benefits for nature and support efforts to address climate change.	the rights of way network and where users of these routes are close to the Site, mitigation measures would look to provide effective screening and softening of views where effects are predicted.
Paragraph 127: Well-designed places that have effective landscaping and are sympathetic to local setting/character.	The Scheme complies with the landscape-related criteria of paragraph 127 of the NPPF in that mitigation measures would provide effective landscaping, and this would be sympathetic to local character and landscape setting.
Paragraph 131: Trees make an important contribution to the character and quality of urban environments and can also help mitigate and adapt to climate change.	The Scheme complies with the landscape-related criteria of paragraph 131 of the NPPF in that mitigation would ensure existing trees are retained where possible. Opportunities will be explored to incorporate new trees elsewhere. Appropriate measures will also be in place to secure the long-term maintenance and management of both existing and proposed trees. Management and maintenance measures will be set out within the Landscape Environmental Management Plan (LEMP).
Paragraph 174: Protecting valued landscapes, recognising the intrinsic character and beauty of the countryside and the benefits of natural capital including trees and woodlands.	<p>The Scheme complies with the landscape-related criteria of paragraph 170 of the NPPF in that it would recognise the intrinsic character and beauty of locally designated Sites and their benefits to the landscape character and visual amenity of the area.</p> <p>There are Sites of locally designated landscape value within the Study Area.</p> <p>The proposals respond to the value of the existing vegetation features across the Site and landscape mitigation measures would enable the retention, management and reinforcement of those features wherever possible.</p> <p>The Scheme avoids impacts on locally valued landscapes and recognises and reinforces the benefits derived from existing hedgerows, trees and woodlands.</p>
Paragraph 180c: Developments resulting in the loss or deterioration of irreplaceable habitats (such as ancient woodland and ancient or veteran trees) should be refused.	The Scheme complies with the landscape-related criteria of paragraph 180c of the NPPF in that areas of ancient woodland and ancient or veteran trees, would not be affected.
Planning Practice Guidance (PPG):	

Green Infrastructure: Green Infrastructure is a natural capital asset that provides multiple benefits, at a range of scales.	The Scheme complies with the landscape-related criteria of the PPG in that mitigation measures would look to retain and enhance areas of open space, woodlands, hedgerows and sustainable drainage features. Blue infrastructure such as streams, ponds, canals and other water bodies would be retained and protected.
Biodiversity, Geodiversity Ecosystems: The need to consider the opportunities that individual development proposals may provide to conserve and enhance biodiversity and geodiversity and contribute to habitat connectivity in the wider area.	The Scheme complies with the landscape-related criteria of the PPG in that mitigation measures would look to secure the long-term maintenance and management of both existing and proposed trees. Management and maintenance measures are set out within the Landscape Environmental Management Plan (LEMP).
Landscape: Use of landscape character assessment in the planning process.	The Scheme complies with the landscape-related criteria of the PPG in that landscape character assessment is used as a tool to inform the LVIA process and mitigation strategy. The process will identify where landscapes and their particular characteristics have a particular local value. The assessment will take into account the evidence that supports the special characteristics and will set out mitigation measures, such as appropriate design and visual screening, where necessary.
Central Lincolnshire Local Plan (Adopted April 2017)	
Policy LP17: Landscape, Townscape and Views. Central Lincolnshire is predominantly a rural landscape interspersed by the City of Lincoln and smaller settlements and characterised by its contrasting chalk and limestone uplands, low lying vales and fenland landscapes.	The Scheme complies with the criteria of the LP17 in that the environmental quality, character and diversity of the landscape will be protected and, where possible enhanced.
Policy LP17: Landscape, Townscape and Views. Character and Setting	Landscape mitigation measures will look to address the intrinsic value of the landscape and townscape, including the setting of settlements. The Scheme will have particular regard to maintaining and responding positively to any natural and man-made features within the landscape and townscape which positively contribute to the character of the area. Measures will respond to historic buildings and monuments, other landmark buildings, topography, trees and woodland, hedgerows, walls, water features, field

	patterns and intervisibility between rural historic settlements.
<p>Policy LP17: Landscape, Townscape and Views.</p> <p>Creating and Protecting Views</p>	<p>Landscape mitigation measures will look to address key views within the landscape, and in to and out of settlements. Measures will also take into consideration views and vistas that are valued by the local community and views that define the local identity of a place or assist in way finding. Opportunities to create new public views will also be explored where possible and particular consideration will be given to views of significant buildings. Views within landscapes which are more sensitive to change due to their open, exposed nature and extensive visibility from various viewpoints will also be taken into account.</p>
<p>Policy LP17: Landscape, Townscape and Views.</p> <p>The Lincolnshire Wolds, Lincoln's historic skyline and Areas of Great Landscape Value</p>	<p>Landscape mitigation measures will look to address where the Development Proposal is likely to impact upon the Areas of Great Landscape Value (as identified on the policies map) and upon Lincoln's historic skyline.</p>
<p>Policy LP17: Landscape, Townscape and Views.</p> <p>Cumulative Impacts</p>	<p>Landscape mitigation measures will look to address the cumulative impacts as well as the individual impacts.</p>
<p>Policy LP18: Climate Change and Low Carbon Living. Reducing greenhouse gas emissions is a key part of limiting climate change, and will require concerted action at all levels, from international to local.</p> <p>Carbon Off-setting</p>	<p>The Scheme complies with the landscape-related criteria of Policy LP18 in that mitigation measures would look to secure well-designed areas of woodland and tree cover. These measures would include management and maintenance measures set out within a Landscape Environmental Management Plan (LEMP). The Central Lincolnshire Biodiversity Opportunity Mapping (or subsequent relevant document) would be used to guide the most suitable habitat in a particular area.</p>
<p>Policy LP19: Renewable Energy Proposals. Proposals for non-wind renewable technology will be assessed on their merits, with the impacts, both individual and cumulative, considered against the benefits of the scheme.</p>	<p>The Scheme complies with the landscape-related criteria of Policy LP19 in that mitigation measures would take into account the surrounding landscape and townscape. Other mitigation considerations would include ecology and biodiversity and residential and visual amenity. The mitigation measures would look to outweigh the harm caused as far as is reasonable possible.</p>

Proposals for non-wind renewable energy development	
Policy LP20: Green Infrastructure Network. Green Infrastructure is a strategic network of multifunctional green and blue spaces, and the connections between them, in both urban and rural areas, which is capable of delivering a range of environmental, economic, health and quality of life benefits for local communities.	The Scheme complies with the criteria of Policy LP20 in that mitigation measures would target the highlighted areas of the Central Lincolnshire Green Infrastructure Study 2011 of existing habitats and areas where there are deficiencies in green infrastructure at the strategic level across Central Lincolnshire and identified opportunities to enhance the network. The network priority areas include: <ul style="list-style-type: none"> • Strategic Green Corridors • Strategic Green Access Links • Urban Green Grids • Green Infrastructure Zones
Policy LP21: Biodiversity and Geodiversity. Central Lincolnshire has many areas which are noted for their natural beauty and biodiversity value. These areas also support a wide variety of species and habitats and form an important part of the network of biodiversity Sites within the wider environment.	The Scheme complies with the landscape-related criteria of Policy LP20 in that mitigation measures would target the known areas of opportunity for local landscape-scale habitat improvement. This mitigation would adopt a landscape scale approach to the planning, design and management of connected Green Infrastructure assets. This would in turn provide the framework within which species migration can more readily occur in response to environmental pressures such as climate change.
Policy LP25: The Historic Environment. Central Lincolnshire as a rich historic environment. The rural countryside and historic towns and villages are attractive aspects of Central Lincolnshire as a whole, while within Lincoln's historic core are aspects of national and wider importance.	The Scheme complies with the criteria of the LP25 in that the environmental quality, character and diversity of the historic environment will be protected and, where possible enhanced.
Policy LP26: The Historic Environment. Listed Buildings	Landscape mitigation measures will look to address the setting of a Listed Building which may be affected by the Scheme. Measures would take into account the architectural, historic or archaeological interest, the special character and views and vistas both from and towards the asset.

Policy LP26: The Historic Environment. Conservation Areas	Landscape mitigation measures will look to address the character and appearance of the Conservation Area, including the spaces around and within the boundary and historic street patterns. Measures would also take into consideration any impacts the Scheme may have on the skyline and surrounding landscape.
Policy LP38: Protecting Gainsborough's Setting and Character. Gainsborough is located on the eastern banks of the River Trent, extending its urban area eastwards into an undulating and often wooded landscape. Gainsborough's historic core is protected by three conservation areas.	The Scheme complies with the landscape-related criteria of the LP38 in that the environmental quality, character and diversity of Gainsborough's character and setting will be protected and, where possible enhanced. Landscape mitigation measures will look to address the protection of important views from both within and outside the town. Measures will also look to protect and enhance the landscape character of the setting of the town to maintain the setting and integrity of the surrounding villages.
Policy LP55: Development in the Countryside. The significant rural population means that it is important to maintain and enhance the services and features of the rural area in order to sustain the vibrancy of rural settlements and the quality of life experienced by those living in such areas.	The Scheme complies with the landscape-related criteria of the LP55 in that the Scheme will deliver a sustainable use and the location is suitable in terms of accessibility.
West Lindsey Local Plan	
The West Lindsey Local Plan (First Review) was adopted on 19 June 2006 and formally replaced by the Central Lincolnshire Local Plan on 24 April 2017. The Central Lincolnshire Local Plan replaced all the existing or 'saved' policies in the West Lindsey Local Plan (adopted 2006). Policy compliance therefore will not be considered further.	
Bassetlaw District Local Development Framework (2011)	
POLICY DM8: The Historic Environment	The Scheme complies with the criteria of Policy DM8 in that the environmental quality, character and diversity of the historic environment will be protected and, where possible enhanced. Proposals will consider: i. Scale; ii. Design;

	<p>iii. Materials; iv. Siting; and v. Views away from and towards the heritage asset.</p>
POLICY DM9: Green Infrastructure	<p>The Scheme complies with the green infrastructure -related criteria of Policy DM9 in that mitigation measures would support the Council's strategic approach to the delivery, protection and enhancement of multi-functional Green Infrastructure, achieved through the establishment of a network of green corridors and assets at local, sub-regional and regional levels.</p>
POLICY DM9: Biodiversity & Geodiversity	<p>The Scheme complies with the biodiversity and geodiversity-related criteria of Policy DM9 in that the development proposals provide opportunities to restore or enhance habitats and species' populations whilst demonstrating that they will not adversely affect or result in the loss of features of recognised importance.</p> <p>Mitigation measures would target the known areas of opportunity for local landscape-scale habitat improvement. This mitigation would adopt a landscape scale approach to the planning, design and management of connected Green Infrastructure assets.</p>
POLICY DM9: Landscape Character	<p>The Scheme complies with the landscape character -related criteria of Policy DM9 in that the development has been designed so as to be sensitive to its landscape setting.</p> <p>Proposals will seek to enhance the distinctive qualities of the landscape character policy zone and respond to the recommendations made in the Landscape Character Assessment by conserving, restoring, reinforcing or creating landscape forms and features accordingly.</p>
POLICY DM9: Open Space & Sports Facilities	<p>The Scheme complies with the landscape-related criteria of Policy DM9.</p>

	The Scheme will not adversely affect or result in the loss of open spaces or sports facilities.
POLICY DM10: Renewable and Low Carbon Energy Carbon Reduction	<p>The Scheme complies with the landscape-related criteria of Policy DM10, as the proposals:</p> <ul style="list-style-type: none"> i. are compatible with policies to safeguard the built and natural environment, including heritage assets and their setting, landscape character and features of recognised importance for biodiversity; ii. will not lead to the loss of or damage to high-grade agricultural land (Grades 1 & 2). Whilst there are areas of the Site that are identified within the ALC Assessment at WB4 as being BMV land, the Scheme avoids panels within these areas. Panels are proposed wholly within Grade 3 land; iii. are compatible with tourism and recreational facilities; iv. will not result in unacceptable impacts in terms of visual appearance; noise; shadow flicker; watercourse engineering and hydrological impacts; pollution; or traffic generation; and <p>will not result in an unacceptable cumulative impact in relation to the factors above.</p>
Gainsborough Town Neighbourhood Plan (2020-2036)	
Gainsborough Town Neighbourhood Plan: The Plan now forms part of the development plan in helping determine future planning applications within the Plan area.	The Scheme complies with the landscape-related criteria of the Plan in that the environmental quality, character and diversity of Gainsborough's character and setting will be protected and, where possible enhanced.
Policy NNP2: Protecting the Natural Environment and Enhancing Biodiversity. Looks protect	Landscape mitigation measures would look to support a net biodiversity gain and measures would be targeted to benefit local conservation priorities as identified in the most recent Lincolnshire Biodiversity Action Plan.

and enhance the natural environment, especially those areas identified on Maps 5 and 6.	Measures will also look to protect and enhance existing mature trees and hedgerows and blocks and belts of woodland. Measures will also look to incorporate new planting to further enhance these areas where possible.
Policy NNP3: Creating a Local Green Network. Seeks to deliver elements of the Local Green Network around the town.	Landscape mitigation measures will consider the new walking and cycling routes around the Town. Those existing routes for improvement will also be considered and connectivity between existing footpaths, roadways and cycleways will also be considered.
Policy NNP5 Protecting the Landscape Character	The mitigation measures will consider key characteristics of particular relevance within National Character Areas NCA45 and NCA48. In regard to Landscape Character at the local level, the Plan refers to the West Lindsey District Landscape Character Assessment 1999. This LCA was undertaken in August 1999 and therefore it is proposed to undertake a review to ensure extracted information is still current and relevant. The review will take into account the most sensitive parts of the landscape as ' <i>the higher land to the south and east of Gainsborough</i> '. The setting and character of Gainsborough will also form an important part of mitigation proposals including the views set out within Map 11 and Appendix C of the Plan. This will consider the ridge line that runs to south that affords views from publicly accessible locations within the town.
Gainsborough Heritage and Character Assessment (28 February 2018)	
Presents a summary of the history and character of Gainsborough carried out through desk study and fieldwork.	<p>The Scheme complies with the landscape-related criteria of the Assessment in that the environmental quality, character and diversity of Gainsborough's character and setting will be protected and, where possible enhanced.</p> <p>Landscape mitigation measures will consider, where relevant, the results of the desk study and fieldwork that divides the Town into six distinct Townscape Character Areas (TCAs) as shown on Figure 3 of the Assessment.</p>
Green Infrastructure Study for Central Lincolnshire	
Provides a strategic framework for guiding the planning and delivery of Green Infrastructure across Central Lincolnshire.	<p>The Scheme complies with the criteria of the Study in that the existing assets and attributes that contribute to the GI in Central Lincolnshire will be protected and, where possible enhanced.</p> <p>The network priority areas include:</p> <ul style="list-style-type: none"> • Strategic Green Corridors • Strategic Green Access Links • Urban Green Grids

	<ul style="list-style-type: none"> • Green Infrastructure Zones <p>Landscape mitigation would look to take account of the above priority measures within the following Sub-Area Boundaries:</p> <ul style="list-style-type: none"> • Gainsborough Area • Lincoln Area <p>The mitigation measures would also take account of the Strategic Green Infrastructure Initiatives and projects for each of the Sub-Areas. Such projects would include the Coversands Heathlands Initiative, which is a partnership involving Natural England to restore and recreate Coversands heathlands to help reserve habitat decline and fragmentation.</p>
Biodiversity Opportunity Mapping for Central Lincolnshire	
In early 2019 the Greater Lincolnshire Nature Partnership (GLNP) created a Biodiversity Opportunity Map (BOM) for North Lincolnshire Council area as part of their requirements in producing a new local plan. The expertise led Central Lincolnshire to undertake the same BOM exercise.	The Scheme complies with the landscape-related criteria of the Study in that the existing assets and attributes that contribute to the ecological network in Central Lincolnshire will be protected and, where possible enhanced.

8.4 Consultation

- 8.4.1 Consultation undertaken throughout the pre-application and scoping phase for the Scheme informed the approach to the LVIA assessment and the information provided in this chapter. A summary of the consultation of relevance to the LVIA is detailed in **Table 8.2** below.

Table 8.2: Consultation and Responses Timeline

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
Public engagement events, November 2021	Meeting to introduce the project and those involved in the design and assessment process moving forward. Discussion over the LVIA on matters relating to scoping, the assessment methodology, Study Area, landscape receptors, visual receptors and potential cumulative developments.	Correspondence from the events is provided in Appendix 8.4 . Comments received have been reviewed and considered throughout the design process.
The Planning Inspectorate, Scoping Opinion, March 2022	<i>"The proposed mitigation should be described, and any associated impacts should be assessed in the ES where significant effects are likely to occur."</i>	Proposed mitigation is shown on Figure 8.16 Cottam Strategic Landscape Mitigation Measures.
The Planning Inspectorate, Scoping Opinion, March 2022	<i>"The ES should confirm the number, type and structural set up of panels required including their proposed foundations i.e., the location and quantity of piled foundations/concrete feet (including any ballast required) foundations and whether they are tracking or fixed and the aspect they face. This should include a description and reasoning of spacing between panels to avoid ground shading effects and any buffers employed. The ES should also describe and assess a worst-case scenario in the relevant aspect chapter in relation to the type of solar panels being constructed e.g., soil compaction, traffic and transport, landscape and visual impact,"</i>	The ES will employ a maximum design scenario approach reflecting the principle of the 'Rochdale Envelope'. This approach allows for a project to be assessed on the basis of maximum project design parameters i.e., the worst-case scenario in order to provide flexibility and take advantage of technological improvements, assessing all potentially significant effects (positive or adverse) within the EIA process and reported in the ES. Table 4.1 sets out the details of the design parameters used for the PEIR.

The Planning Inspectorate, Scoping Opinion, March 2022	<i>"The ES should include West Burton A decommissioning in the cumulative assessment where there is potential for likely significant effects."</i>	<p>Proposed cumulative sites/developments are shown on Figure 8.15 and listed in Table 8.3. A summary of potential significant effects is provided in Table 8.6.</p> <p>West Burton A decommissioning is included in the cumulative assessment.</p>
The Planning Inspectorate, Scoping Opinion, March 2022	<i>"The Inspectorate considers that a 5km study area is broadly appropriate, however in the light of the extent of the Proposed Development and nature of the surrounding terrain with some elevated viewpoints, the assessment should consider the potential for landscape and visual receptors to be affected that are close to but outside the 5km buffer area."</i>	<p>The extent of the Study Area has been determined in accordance with recognised LVIA methodology to encompass all receptors that may experience significant effects. In light of the nature of the surrounding terrain with some elevated viewpoints, the assessment will consider the potential for landscape and visual receptors to be affected that are close to but outside the 5km buffer area.</p>
The Planning Inspectorate, Scoping Opinion, March 2022	<i>"The final extent of the study area and viewpoints should be determined in consultation with the relevant local authorities."</i>	<p>Correspondence with the relevant local authorities is provided in Appendix 8.4.</p> <p>The final extent of the Study Area and viewpoints is being determined in consultation with the relevant local authorities.</p> <p>Correspondence from the workshop is provided in Appendix 8.4.</p> <p>The extent of the Study Area and viewpoints have been determined in accordance with recognised LVIA methodology to encompass all receptors that may experience significant effects. The relevant local authorities have also been consulted in this process.</p>
Lincolnshire County Council, Introductory Meeting, March 2022	Meeting to introduce the project and those involved in the consultation process moving forward. Discussion over the additional matters	<p>Correspondence from the meeting is provided in Appendix 8.4.</p> <p>The final extent of the Study Area and viewpoints is being determined</p>

	on scoping and that consultation feedback will be required on the assessment methodology, Study Area, landscape receptors, visual receptors and cumulative sites/developments. Future meetings to be held in the form of workshops.	in consultation with the relevant local authorities. Correspondence with the relevant local authorities is provided in Appendix 8.4.
Near Neighbour Meetings, March 2022	Meeting to introduce the project and those involved in the design and assessment process moving forward. Discussion over the LVIA on matters relating to scoping, the assessment methodology, Study Area, landscape receptors, visual receptors and potential cumulative sites/developments.	Correspondence from the meetings is provided in Appendix 8.4.
Lincolnshire County Council, LVIA Workshop 1, March 2022	Workshop to take forward matters relating to scoping, the assessment methodology, Study Area, landscape receptors, visual receptors and potential cumulative sites/developments.	Correspondence from the workshop is provided in Appendix 8.4. Suggested adjustment to locations of viewpoints and the inclusion of additional locations.
Lincolnshire County Council, LVIA Workshop 2, April 2022	Workshop to take forward matters relating to scoping, the assessment methodology, Study Area, landscape receptors, visual receptors and potential cumulative sites/developments.	Correspondence from the workshop is provided in Appendix 8.4. Suggested adjustment to locations of viewpoints and the inclusion of additional locations.

<p>Lincolnshire County Council, LVIA Workshop, Consultee Questionnaires, April 2022</p>	<p>Distribution of workshop questionnaires to take forward matters relating to scoping, the assessment methodology, Study Area, landscape receptors, visual receptors and potential cumulative sites/developments.</p> <p>LLC returned these questionnaires with detailed and extensive feedback in addition to the previous workshop. This feedback is set out below:</p> <p>Assessment Methodology: The LVIA should be undertaken by suitably qualified personnel and carried out to the third edition of Guidelines for Landscape and Visual Impact Assessment (GLVIA3).</p> <p>Methodology generally reflects the guidance in GLVIA3.</p> <p>5km Study Area (from Site boundaries) provides a reasonable Study Area. At this stage, LCC cannot comment on, or agree the Study Area of cable runs.</p> <p>Published landscape character areas have been identified, however, to align with GLVIA3 the LVIA should include an assessment of landscape effects at a range of scales. Assessment expected to include a finer grain landscape assessment</p>	<p>Correspondence from the workshop is provided in Appendix 8.4.</p> <p>These responses have been taken on board and will form important considerations in the production of the ES.</p>
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	<p>that includes the Site and immediate area.</p> <p>Visual receptors should also include potential users of waterways (boats), leisure cyclists and train users.</p> <p>ZTV should clearly demonstrate the full extent of the Scheme stating what has been included and the ultimate height/scale.</p> <p>A full methodology of photography, photomontages and presentation should be provided that aligns with LI TGN 06/19.</p> <p>The intervisibility with each of the designated heritage assets (or groups of assets) within the Study Area be reviewed and evaluated as part of the study, and where appropriate the steps to mitigate the impact need to be set out</p> <p>Cumulative Impacts: Cumulative Landscape and Visual Impacts should be assessed, particularly in regard to the Cottam Solar Project and Gate Burton Energy Park.</p> <p>Mitigation and Layout: As this is an iterative process, and the baseline elements are still being defined, at this stage we are not providing comment on any potential mitigation or layout of the development.</p>	
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	<p>Study Area: 5km (from Site boundaries) provides a reasonable Study Area and would include more sensitive receptors in the area such as Ridge AGLV, and Gainsborough AGLV, settlements to the east along the Limestone Escarpment and the Scampton viewing area.</p> <p>LVIA should also provide a clear statement on the justification for the extent of the Study Area and confirm that receptors beyond 5km would not be affected.</p> <p>At this stage, cannot comment on, or agree the Study Area (currently proposed as 500m at para. 7.1.10 of the Scoping Report) for any offsite cable runs until the final option is selected.</p> <p>Published landscape character areas have been identified, however, to align with GLVIA3 the LVIA should include an assessment of landscape effects at a range of scales. Assessment expected to include a finer grain landscape assessment that includes the Site and immediate area.</p> <p>The LVIA should include an assessment of the potential impacts of the development on local landscape features and the local landscape character.</p>	
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	<p>By incorporating a 5km (from Site boundaries) Study Area, more sensitive components/receptors would be included such as Ridge AGLV, and Gainsborough AGLV, settlements to the east along the Limestone Escarpment and the Scampton viewing area.</p> <p>Assessment should consider the value and potential change in character to local lanes.</p> <p>Landscape Effects: LVIA should include an assessment of landscape effects at a range of scales, and we would expect the assessment to include a finer grain landscape assessment that includes the Site and immediate area and that also considers individual landscape elements.</p> <p>-</p> <p>The LVIA should include an assessment of the potential impacts of the development on local landscape features and the local landscape character.</p> <p>It would be useful to take into account the information collated as part of the Historic landscape characterisation project: The Historic Character of The County of Lincolnshire (September 2011), to ensure that the development is sensitive to the historic landscape.</p>	
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	<p>Cumulative Effects: Cumulative Landscape and Visual Effects should be assessed, particularly in regard to the Cottam Solar Project and Gate Burton Energy Park.</p> <p>The document: LVIA Workshop Questionnaire D-Cumulative developments – WB, has been forwarded to West Lindsey District Council for review and comment.</p>	
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8.5 Assessment Methodology

Landscape and Visual Impact Assessment Methodology

8.5.1 The methodology for the LVIA is based on the general recommendations set out in Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, LI IEMA, 2013²². The guidelines are not prescriptive and set out a general approach that should be tailored to specific circumstances of the project that is being assessed. The methodology adopted for this assessment is set out in **Appendix 8.1**. Briefly, the assessment process comprises the following stages:

- A desk study to assess the landscape and visual baseline including a review of published landscape character assessments identified in Section 8.6. This process would be supported by a suite of landscape figures similar to those listed in the appendices. This process helps to identify the landscape and visual receptors to be assessed. These landscape and visual receptors would be finalised following LPA approval;
- Detailed fieldwork to confirm aspects of the desk study and to ground truth proposed viewpoint locations;

²² Landscape Institute and Institute of Environmental Management and Assessment, 2013, *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition, Routledge, London.

- An assessment of the sensitivity (nature of the receptor) of landscape and visual receptors. This is defined through a combination of their value and susceptibility to change;
- An assessment of the magnitude of impact (nature of effect) of the Scheme during the construction period (winter), operation at year 1 (winter) and operation at year 15 summer) and at decommissioning phase (winter). The magnitude of impact will be assessed in relation to the size, scale, duration and reversibility of the effect;
- An assessment of the significance of the effect to the landscape and visual receptors for the three stages of the Scheme (construction, operation and decommissioning). This process systematically and transparently assesses the likely significant effects identified;
- Mitigation proposals would be set out to prevent/avoid, reduce, and where possible offset or/compensate for any significant adverse landscape and visual effects;
- Re-evaluation of the significance of effect based on the mitigation proposed, to identify any residual landscape and visual effects; and
- Preparation of a Landscape and Biodiversity Management Plan which would prescribe how the mitigation measures identified and proposed would be implemented and managed to ensure the effectiveness and certainty in achieving the objectives of the mitigation strategy. This stage would be undertaken in conjunction with the ecology and arboricultural consultants.

8.5.2 Landscape effects and visual effects are considered separately in this assessment. Landscape effects relate to both direct physical effects of the Scheme (for example loss of existing trees) and effects on wider landscape character, including perceptual effects. Visual effects relate to the effect on views and visual amenity experienced by various receptors including residents, users of PRow, road users and recreational users. Views from conservation areas, listed buildings and scheduled monuments are also considered where these features include recognised viewpoints, e.g., used by tourists or other receptors. It should be noted that the LVIA address effects on recognised views from cultural heritage resources; effects on 'setting' are not considered in this assessment and are presented in the Chapter 13 Cultural Heritage.

8.5.3 Effects are identified as being either reversible or irreversible and the duration of effects is also considered. Effects are described as being either beneficial or adverse depending on whether they are considered to have a positive or negative respective effect on the landscape or within views.

- 8.5.4 Impact assessment and any proposed development is an iterative process, with the overall aim being to avoid environmental impacts or, where impacts cannot be avoided completely, reducing identified impacts to acceptable levels. Based on the findings of this assessment, landscape and visual mitigation measures are designed to help integrate the Scheme into its landscape setting and mitigate any specific visual or physical impacts that are identified. The LVIA considers the effects of mitigation measures being in place and identified residual impacts.
- 8.5.5 The extent of the Study Area adopted for this assessment is derived from a combination of desktop study, Site investigation and of Zone of Theoretical Visibility (ZTV) analysis. The extent of the Study Area is shown on **Figure 8.1**. Significant effects are not expected beyond a 2km zone from the Site boundary, therefore the 2km Study Area is used when identifying receptors. However, high sensitivity receptors could be identified within the wider landscape and in such cases, the 5km Study Area is used to consider these high sensitivity receptors.
- 8.5.6 The significance of predicted landscape and visual effects has been considered with findings based on the work undertaken to date. In identifying these effects, consideration has been given to both effects on the landscape as a resource and the effects on views. At this stage, the findings do not set out a series of thresholds for different levels of significance (for example a four-point scale), but instead distinguish clearly between what are considered to be the significant and non-significant effects. The consideration of the effects on the landscape resource is based on the landscape receptors (**Figure 8.6**) and the visual resource is based on a series of 'representative and specific viewpoints' (**Figures 8.11 to 8.13**) and verified photography (**Figure 8.14**). These viewpoints have been selected to represent the experience of different types of visual receptor, including users of PRoW, residential properties, transport routes, heritage and recreational sites. Selected viewpoints may include specific locations that are popular vantage points or tourist destinations. Viewpoints have also been selected to illustrate landscape character effects or likely cumulative effects of the Scheme.
- 8.5.7 Landscape and visual effects identified as being moderate, moderate major and major are considered to be significant effects are to be taken into account during the decision-making process for the DCO application.

Cumulative Impact Assessment

- 8.5.8 Cumulative landscape and visual effects are defined as the additional changes caused by a proposed development in conjunction with other similar developments, or as a combined effect of a set of developments taken together. Cumulative visual effects can be caused where an observer is able to see two or more developments from one viewpoint and/or sequential effects which occur when the observer must move to another viewpoint to see different developments.

8.5.9 **Table 8.3** below provides a summary of relevant cumulative developments. An overview of potential cumulative effects is summarised at the end of this chapter.

Table 8.3: Current Cumulative Developments

Scheme	Status	Distance from the Scheme
West Burton Solar Project	DCO Same timescales as Scheme	1.5km south of Cottam 1
West Burton Cable Route Construction	DCO Same timescales as Scheme	Location yet unknown
Low Carbon Gate Burton 500MW Solar and Energy Storage (Battery)	DCO Scoping opinion issued 20.12.21 Likely DCO application submission Q4 2022	1km west of Cottam 1
Decommissioning of West Burton A	Awaiting confirmation of what activities are involved with decommissioning as no planning applications have been submitted	Potential 200m to WB Sub (depending on exact location yet unknown)
Demolition of Cottam Power Station	Approved on 02.03.22	2.9km southwest of West Burton
Cottam Power Station Proposed Redevelopment. Comprehensive Masterplan and design code to be prepared.	Emerging local plan policy ST6: Cottam Priority Regeneration Area.	2.5km west of West Burton 3.
Heckington Fen solar generation exceeding 50MW with energy storage	DCO Scoping opinion issued 17.02.2022 Likely submission Q1 2023. The land at Heckington is related to a different point of connection and the developers of this project have taken up grid offers, but the project might not come forward	41km southeast of West Burton 2
Automotive Research and Development Centre, including garaging, circuit viewing facilities, 2 no wind turbines and ground mounted solar panels. Land	Application approved 03.03.2022	Immediately north of Cottam

at Blyton Park Driving Centre.		
Site Allocation Strategic Policy LP8 Employment Site Land at Lincolnshire Showground (Central Lincolnshire Local Plan 2017)	LDO/Masterplan – no details in public domain or approved	5.1km southeast from Cottam 1
Sustainable Urban Extension Policy 48 Gainsborough Northern Neighbourhood SUE Allocation (Central Lincolnshire Local Plan 2017)	128.8 ha 2,500 total dwellings and 750 dwellings in plan period 2012-2036.	3.5km west from Cottam 2

Transboundary Impact Assessment

- 8.5.10 Transboundary Impact Assessment has not been undertaken for the Scheme as it is not relevant to this chapter. This is because no cross-boundary LVIA effects have been identified at this stage of the consultation process.

Residential Visual Amenity Assessment

- 8.5.11 Current guidance on Residential Visual Amenity Assessment (RVAA) is contained within the Landscape Institute's Technical Guidance Note (TGN) 2/19.
- 8.5.12 Steps 1-3 of RVAA guidance align with the standard LVIA based approach defined in GLVIA3. The guidance recommends that the effects on residential amenity should be assessed as follows:
- Step 1 – Definition of Study Area and scope of the assessment
 - Step 2 – Evaluation of Baseline Visual Amenity
 - Step 3 – Assessment of likely change to visual amenity of properties
 - Step 4 – Forming the RVAA judgement
- 8.5.13 Stage 4 of the RVAA is defined as being required as follows:
- "In this final step, and only for those properties where the largest magnitude of effect has been identified, a further judgement is required."*
- 8.5.14 It is therefore proposed to undertake steps 1-3 as part of the LVIA for the Scheme and if following assessment of affects upon residential properties at year 15 there remain significant effects at the highest magnitude of significance (major) then a full RVAA would be undertaken for those properties affected.

Glint and Glare

- 8.5.15 This Chapter has taken into account the preliminary conclusions presented in the PEIR Glint & Glare Assessment. The LVIA undertaken for the ES will consider the conclusions of the Glint and Glare Assessment in association with an assessment of the magnitude of landscape and visual impacts using the methodology prescribed in detail in **Appendix 8.1**.

Lighting

- 8.5.16 The LVIA undertaken for the ES will clearly explain the construction, operational and decommissioning lighting strategy for the Scheme and will include details of directionality, intermittent lighting, and an assessment of associated effects. It will also describe any measures necessary to avoid or mitigate lighting effects.

Cultural Heritage

- 8.5.17 The LVIA undertaken for the ES will focus on likely significant effects of views from heritage assets but would not comment upon the setting of such assets. This would be undertaken as part of the cultural heritage chapter of the ES. Consultation has been undertaken with the cultural heritage consultant through the LVIA process to help inform landscape character and the details are set out in **Appendix 8.4** Consultation.

Arboriculture

- 8.5.18 The LVIA undertaken for the ES will consider the findings of any tree surveys undertaken and review any effects upon landscape and visual receptors should vegetation removal be required as part of the Scheme. Due to the nature of the Scheme, it is considered that existing vegetation on Site would be retained and any removal to accommodate elements associated with construction or access would be subject to a BS5837:2012 tree survey and associated Arboricultural Impact Assessment which would inform the LVIA and design process. Mitigation associated with any such tree loss associated with the Scheme would be included in the landscape mitigation plans forming part of the LVIA. The Applicant and its LVIA consultants would work closely with the arboricultural consultant throughout the application process to ensure local arboreal assets and character inform the LVIA and associated mitigation plans. All work associated with the Scheme is proposed to be undertaken in line with BS5837:12.

Ecology

- 8.5.19 The LVIA undertaken for the ES will consider the findings of the ecological reports and close liaison with the ecology consultant would form a key part of the LVIA mitigation strategy. Whilst ecological effects would be dealt with wholly in the

ecological and biodiversity chapter of the ES (**Chapter 9**) this approach ensures that the landscape mitigation proposed for landscape and visual requirements is considered holistically with ecological requirements to maximise the benefits of the Scheme in terms of green infrastructure scale interventions in line with the Biodiversity Opportunity Mapping Study undertaken by the Greater Lincolnshire Nature Partnership Central in order to maximise habitat creation and ecological mitigation as well as landscape and visual mitigation

8.6 Scope

8.6.1 The preliminary LVIA assessment has been undertaken with reference to six key data information sources, as detailed in **Table 8.4** below.

Table 8.4: Key Information Sources

Data Source	Reference
Landscape Institute and Institute of Environmental Management and Assessment	Guidelines for Landscape and Visual Impact Assessment, 3 rd Edition (2013) ²³
Natural England	An Approach to Landscape Character Assessment (October 2014) ²⁴
Landscape Institute	Visual Representation of Development Proposals ²⁵
Landscape Institute	Technical Guidance Note 02/19, Residential Visual Amenity Assessment (RVAA) (March 2019) ²⁶
Landscape Institute	Technical Guidance Note 02/21, Assessing landscape value outside national designations (May 2021) ²⁷
Ordnance Survey	Ordnance Survey 1-25000 digital and raster mapping
Ordnance Survey	Terrain 5 Digital Terrain Model data
Natural England	National Character Area Profile: 45 Northern Lincolnshire Edge with Coversands (NE554)
Natural England	National Character Area Profile: 48 Trent and Belvoir Vales (NE429)
Natural England	National Character Area Profile: 39 Humberhead Levels (NE339)

²³ Landscape Institute and Institute of Environmental Management and Assessment, Guidelines for Landscape and Visual Impact Assessment, Third Edition 2013 (GLVIA) (2013)

²⁴ Natural England, An Approach to Landscape Character Assessment, October 2014, by Christine Tudor, Available at: [landscape-character-assessment.pdf](https://publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/368812/landscape-character-assessment.pdf) (publishing.service.gov.uk)

²⁵ Landscape Institute, Visual Representation of Development Proposals, Technical Guidance Note 06/1, 17 September 2019

²⁶ Landscape Institute Technical Guidance Note 02/19, Residential Visual Amenity Assessment (RVAA) (March 2019). Available at: [Residential Visual Amenity Assessment | Landscape Institute](https://www.landscapeinstitute.org/technical-guidance/02-19-residential-visual-amenity-assessment/)

²⁷ Guidance Note 02/21, Assessing landscape value outside national designations (May 2021), Available at: [tgn-02-21-assessing-landscape-value-outside-national-designations.pdf](https://www.landscapeinstitute.org/technical-guidance/02-21-assessing-landscape-value-outside-national-designations/) (windows.net)

East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 2b Planned and Drained Fens and Carrlands
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 3a Floodplain Valleys
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 3b Sandland Farmlands
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 4a Unwooded Vales
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 4b Wooded Vales
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 5b Wooded Village Farmlands
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 6a Limestone Scarps and Dipslopes
East Midlands Landscape Partnership	East Midlands Regional Landscape Character Area Assessment Profile: 10b Sandstone Forests and Heaths
Historic England online resource	Register of Historic Parks and Gardens

Assumptions and Limitations

- 8.6.2 ZTV mapping uses LIDAR Composite Digital Terrain Model (DTM) 2019 2m data as the basis for the DTM.
- 8.6.3 Woodland and other significant areas of vegetation were incorporated into the DTM using online aerial mapping and observation at the Sites. Buildings were incorporated into the DTM model using OS data. Heights used for both vegetation and building modelling were generic heights that are considered to be conservative estimates. ZTV mapping cannot incorporate the matrix of varying features and heights of those features. Mapping is assumed to present a 'worst case' scenario and is used as a *guide only* for Site-based survey to enable the selection of representative viewpoint locations and determine the possible extent of landscape areas affected.
- 8.6.4 ZTV mapping is based on analysis points set to the tops of tallest proposed structures. Mapping does not therefore differentiate between the full extent of a proposed structure being visible or only the top section being visible.
- 8.6.5 Site assessment was undertaken at each of the Sites by a qualified landscape architect using publicly accessible viewpoints. Assessment of residential property and other non-accessible receptors was estimated based on effects identified from the closest publicly accessible areas. No Site assessment of the substation has been undertaken as the location is yet to be determined as per section 8.8.7 to 8.8.8

however, landscape and visual advice will inform the final substation location as part of the iterative design process. Given the small scale nature of the sub-station, significant effects are unlikely. As per sections 8.83 to 8.86, the cable route is subject to refinement and the final cable corridor would be assessed as part of the ES chapter. Given the underground nature of the cable corridor and that construction impacts would only be temporary, significant effects are unlikely.

- 8.6.6 Arboreal constraints associated with the cable route would be dealt with in the Landscape and Environmental Management Plan (LEMP) and as an arboricultural method statement to prescribe how construction along the cable route would be undertaken alongside the retention of existing trees.
- 8.6.7 The assessment of visual effects for all residential receptors is based on views from ground floor areas, including gardens for residential property.

8.7 Existing Baseline

- 8.7.1 This section of the assessment describes the baseline landscape and visual conditions for the Sites and their surroundings, against which the potential impacts of the Scheme would be identified. The potential impacts of the Scheme include the cable route corridors, which have been reduced and altered from the version submitted at scoping stage, as further environmental assessments have been completed. There is still on-going assessment work in relation to the cable route which will inform the final corridor to be proposed in the DCO application. The existing baseline is set within the following areas:

- Cottam 1, which is located across a series of fifteen field parcels surrounding the small hamlet of Coates and covers an area of approximately 894 ha;
- Cottam 2, which is located across a single land parcel and covers an area of approximately 132 ha; and
- Cottam 3, which is located across a series of five field parcels to the west, northwest and southwest of the village of Blyton and covers an area of approximately 244 ha.

Landscape Resource

- 8.7.2 This section describes the landscape around the Sites and sets out the information that has been collected to determine the baseline conditions at this stage in the EIA. The main objective is to provide as much relevant information about the Sites and the surroundings of the Scheme and to set out the assessment parameters that will underpin the final detailed assessment of any likely significant environmental effects that will be undertaken to inform the ES.

8.7.3 The baseline conditions are described under the following sub-headings and illustrated on figure 8.6:

- Land use
- Topography and watercourses
- Communications and infrastructure
- Settlements, industry, commerce, and leisure
- Public rights of way and access
- National and Locally Designated landscape
- Scheduled Monuments, Listed Buildings, Conservation Areas and Registered Parks and Gardens; and
- Ancient woodland and natural designations.

Land use

8.7.4 **Cottam 1:** Land within the Study Area, features include geometric shaped shelterbelts and woodland plantations consisting of predominantly native species with large polar specimens in shelterbelts to the east of the Site. The landscape is also punctuated by small roads running in a predominantly east west orientation across the landscape.

8.7.5 The Site comprises fields separated by hedgerows with trees, and drainage ditches that feed into the River Till.

8.7.6 **Cottam 2:** Land within the Study Area, the landscape consists primarily of arable land use with small to medium sized fields separated by hedgerows with some trees, and drainage ditches that feed into the wider drainage network of the River Till. The landscape is typified by arable fields, hedgerows and watercourses, which is synonymous with the Site. Small woodlands are located to the northeast identified as coverts and are broadly rectangular or angular shaped by field pattern. Wharton Wood and Birch Wood are large areas of woodland to the west with Wharton being the largest and part of which is ancient woodland. These woodland forms part of a wider structure of woodlands across the area.

8.7.7 The Site comprises a series of agricultural field parcels that follow the surrounding field patterns and consist of predominantly arable and grazing land use. The hedgerows are generally uniform and gappy in places with very few hedgerow trees and some small areas of scrub.

- 8.7.8 **Cottam 3:** Land within the Study Area, there is open agricultural land with small pockets of woodland with Laughton Woods approximately 2km to the northwest of the Site. This forms a prominent feature in the landscape running to the west into Laughton Common and Owlet Plantation. There are also woodlands within and adjacent to the Site.
- 8.7.9 The Site comprises predominantly open fields with boundaries and structures associated with the former airfield and current uses for motor racing and carting. The Site boundaries are enclosed to the south, east and west by hedgerows with trees, and drainage ditches leading to Northorpe Beck in the northeast.

Topography and Watercourses

- 8.7.10 **Cottam 1:** Land within the Study Area, the landscape is generally flat or gently sloping, with levels ranging from approximately 10m AOD to the southwestern boundary and rising to approximately 20m AOD to the north-eastern boundary towards the village of Fillingham.
- 8.7.11 A notable topographical feature lies to the east where the landform rises to create a distinctive sloping ridge forming a prominent landform. Along this landform lie a linear line of small villages. In the east the road arrangement formalises and changes to a linear north to south alignment called Middle Street Road.
- 8.7.12 The River Till runs through and borders a number of the western Site parcels as it meanders through the landscape.
- 8.7.13 The Site shows some typical characteristics and a more organic pattern where fields are bound in some places by both rectilinear and informal drains.
- 8.7.14 **Cottam 2:** Land within the Study Area, the landscape is generally flat, with levels of approximately 20m AOD across the Site. Ditches feed into the wider drainage network of the River Till. Corringham Beck forms a larger watercourse and bounds the north-eastern boundary of the land parcel.
- 8.7.15 A notable topographical feature lies to the east where the land rises to form a distinctive sloping ridge forming a prominent landform. The ridgeline is a distinctive feature in the surrounding landscape and prevalent across all field parcels. Along this ridgeline lie a linear arrangement of small villages some of which are listed above. In the east the road alignment curves through the landscape in a broadly north-south alignment of the A1398.
- 8.7.16 The road alignment formalises further east by the A15 following a linear and former Roam Road. To the south of Cottam 2 lies the A631 running a southeast-east to northwest-west orientation approximately 44m from the Site boundary.

- 8.7.17 The Site shows some typical characteristics and comprises a series of agricultural fields in a compact single land parcel with two residential steadings located towards the centre, namely, Corringham Grange Farm and The Cottage.
- 8.7.18 **Cottam 3:** Land within the Study Area, the landscape is generally flat, with topography varying only very slightly in elevation, typically with levels of approximately 20m AOD similar to Cottam 2 although there are some minor undulations of landform to the northeast and east of the Site at Cottam 3.
- 8.7.19 A notable topographical feature is located to the east, the land rises to form a distinctive sloping ridge, which is a dominant landform where a series of small villages follow the ridgeline.
- 8.7.20 Man-made, rectilinear drains are a characteristic of the area to the north of the railway line with an absence of natural, meandering watercourses. To the south of the railway line, the primary watercourse comprises the River Eau with a number of tributaries including Aisby Beck that cuts across the Study Area in the south and meets with Cottam 2. Other substantial drainage features include Laughton Drain, Highfield Drain, Northorpe Beck and Corringham Beck.
- 8.7.21 The Site shows some typical characteristics to the south of the railway line where the fields are bounded by drains that are regular. Beyond the Site to the south the pattern becomes more irregular.

Communications and Infrastructure

- 8.7.22 **Cottam 1:** Land within the Study Area, the landscape is reinforced to the east by the A15 following a strong linear alignment and former Roman Road. To the southwest lies the A1500 a linear road again following the alignment of a former Roman Road and orientated in a roughly northwest to southeast alignment running diagonally across the landscape. In contrast, the adjoining Gainsborough Road (A156) follows a more organic and informal alignment across the landscape.
- 8.7.23 The Site is crossed by a number of roads that cross east to west, these roads are Glentworth Road, Gillingham Lane and Ingham Road.
- 8.7.24 **Cottam 2:** Land within the Study Area, there are small roads running in a predominantly east west and north south orientation across the landscape.
- 8.7.25 The Site has residential properties towards the centre, and these are accessed by a narrow road in a broadly north-northwest to south-southeast arrangement. Two metalled access tracks lead off the main access road running perpendicular to the access road and defining field parcels in a geometric form.
- 8.7.26 **Cottam 3:** Land within the Study Area, a wind turbine is located near to the entrance to the airfield, near the parcel's southern boundary and this forms the only other

significant vertical element in the local landscape. The surrounding landscape is punctuated by small roads linking villages, with the B1025 defining the southern boundary and running in a predominantly east to west orientation across the landscape turning to a broadly north to south alignment for a short section to the east before returning to the main east to west alignment.

- 8.7.27 The A159 is located to the west of the Site running through Blyton and northward before turning northeast towards the village of Scotter. A main line railway runs between two of the larger land parcels with Sites located to the north and south of the railway line. The line serpentine through and around Gainsborough and cuts through the landscape surrounding the Site in a linear form and orientated southwest-west to northeast-east before turning to a southwest to northeast orientation towards the edge of Kirton in Lindsey. Land to the south of the railway line is more rural in character with pasture surrounded and divided by hedgerows and trees.
- 8.7.28 In the east, the road arrangements formalise and change to a linear north to south alignment called Grayingham Low Road. This is reinforced further to the east by the B1398 and the A15 further east following a linear and former Roman Road.
- 8.7.29 The Site has overhead powerlines which run across the western portion in a northeast to southwest alignment defining the largest vertical elements on Site and in the wider landscape.

Settlements, Industry, Commerce, and Leisure

- 8.7.30 **Cottam 1:** Land within the Study Area shows a series of rural villages include Fillingham (approximately 1km); Ingham (approximately 1.6km); and Cammeringham (approximately 1.5km) to the east of the Site. Thorpe in the Fallows (approximately 100m); Sturton by Stow (approximately 1.15km); and Bransby (approximately 1.9km) lie to the south and southwest of the Site. Stow (approximately 840m); Normanby by Stow (adjacent); and Willingham by Stow (approximately 960m) lie to the west of the Site, and Kexby lies approximately 1.6km to the northwest of the Site. Cottam 1 is located roughly between the city of Lincoln (approximately 10km to the southeast of the Site, and the town of the town of Gainsborough is the primary settlement located approximately 8.7km to the northwest of the Site.
- 8.7.31 With the exception of the villages/hamlets mentioned above, the area is relatively sparsely populated with isolated residential properties and farmsteads dotted throughout the surrounding countryside.
- 8.7.32 The Site lies within the parishes of Fillingham, Cameringham, Thornton in the Fallows, Sturton by Stow, Stow and Willingham.

- 8.7.33 **Cottam 2:** Land within the Study Area shows the closest settlements to Cottam 2 include the settlements of Corringham located approximately 600m to the southwest. Pilham is located approximately 2.2km to the northwest, Blyton is located approximately 3.6km to the northwest, beyond which lies Laughton all outside the Study Area. Northorpe is located approximately 590m to the east of the Site, Willoughton is located approximately 4km to the northeast, Hemswell is located approximately 4km to the southeast, Harpswell is located approximately 5km to the southeast all outside the Study Area, Springthorpe is located approximately 1.9km to the south with Heapham and Upton located beyond Springthorpe to the southeast.
- 8.7.34 With the exception of the villages/hamlets mentioned above the area is relatively sparsely populated with isolated residential properties and farmsteads dotted throughout the surrounding countryside.
- 8.7.35 The Site lies wholly within the Parish of Corringham which is surrounded by the parishes of Pilham, Blyton, Northorpe, Blyborough, Willoughton, Hemswell, Harpswell, Springthorpe, Upton, Lea, Gainsborough and Thornock. It is located roughly between the town of Gainsborough (approximately 6.5km) to the southwest and the village of Willoughton (approximately 4km) to the northeast of the Site and outside of the Study Area.
- 8.7.36 **Cottam 3:** Land within the Study Area shows a series of rural villages are located across the landscape with the closest being Blyton located approximately 970m to the southwest. Laughton is located approximately 1.7km to the northwest, and Scotton and Scotter are located approximately 2.5km and 4km respectively to the northeast outside the Study Area. Northorpe is located approximately 2km to the east and Willoughton is located approximately 5km to the southeast outside the Study Area, with Pilham located approximately 470m to the southeast.
- 8.7.37 The main Sites are located on the former Blyton airfield site and adjoining arable land to the northeast and west. The airfield is interspersed with arable land use and a series of concrete roads and large open concrete areas are found throughout the Site.
- 8.7.38 With the exception of the villages/hamlets mentioned above the area is relatively sparsely populated with isolated individual residential properties and farmsteads distributed along lanes throughout the surrounding countryside. The landscape to the south of the railway line is well-contained and similar in character to Cottam 2. To the north of the railway line the landscape is heavily influenced by the airfield and to the northeast of the Site, the landscape is more open and less vegetated responding closely to subtle landform, open field boundaries and irregular field Patterns.

- 8.7.39 Land within the wider Study Area shows the landscape is also influenced by existing and redundant airfields at Sturgate and Scampton and the redundant airfield on Site at Cottam 3. Cottam and West Burton Power Stations are also located within the wider landscape to the west forming visible landmarks in the wider landscape within and outside the 2km and 5km Study Areas.
- 8.7.40 The Site lies within the parishes of Laughton, Blyton and a small section within the parish of Pilham and also lies in immediate proximity to the boundary of Northorpe Parish. Cottam 3 is located approximately 6.7km to the northeast of the town of Gainsborough, which is the primary settlement in the area.

Public Rights of Way and Access

- 8.7.41 **Cottam 1:** Land within the Study Area shows the PRoW network is concentrated along field boundaries and aligned with the road network. The network is intermittent with few landscape features to help form continuous links and is particularly sporadic in the landscape to the west. There are no named long-distance routes or national cycle routes.
- 8.7.42 The Site is bordered by the footpath network with some footpaths passing along the boundaries and passing across east to west. As a general observation, footpaths appear well used with observations of pedestrian activity. Because the network is sporadic the local lanes are also used to supplement the network.
- 8.7.43 **Cottam 2:** Land within the Study Area, shows the PRoW network is concentrated within the western landscape, elsewhere the network is sparse.
- 8.7.44 The Site is not bordered by the footpath network and there are no footpaths crossing the land parcel.
- 8.7.45 **Cottam 3:** Land within the Study Area shows the PRoW network is generally concentrated around settlements and along field boundaries and drainage features. The landscape to the west has a higher number of footpaths and bridleways in contrast to the landscape to the east.
- 8.7.46 The Site to the south of the railway line is crossed by a footpath in contrast to the former airfield to the north which supports no footpaths.

National and Locally Designated landscape

- 8.7.47 West Lindsey District contains a local landscape designation, the West Lindsey Area of Great Landscape Value (AGLV) which comprises different and disparate parts. These different parts are not named, therefore for clarity, in the descriptions below the areas are named as follows (and shown on **Figure 8.6** Landscape Receptors):
- AGLV1 – The Ridge

- AGLV2 – Gainsborough
- AGLV3 – Laughton Wood

8.7.48 **Cottam 1:** The Site does not include nationally designated landscape or AGLV as shown on **Figure 8.6**.

8.7.49 Land within the Study Area shows there are locally designated landscapes comprising the AGLV centred around Gainsborough [Gainsborough AGLV] to the west and around Fillingham and Ingham [Ridge AGLV] to the east. These AGLV run in a north south direction and are associated with the distinct landform ridge. These AGLV cover a considerable distance and extend from the villages of Grayingham in the north to South Carlton in the south. The Ridge AGLV lies at the closest proximity at 200m from the Site boundary near the village of Fillingham. The Gainsborough AGLV is located approximately 3.1km west of the Site.

8.7.50 **Cottam 2:** The Site does not include nationally designated landscape or AGLV as shown on **Figure 8.6**.

8.7.51 Land within the Study Area shows there are locally designated landscapes comprising the AGLV centred around Gainsborough [Gainsborough AGLV] to the west and around Grayingham and Blyborough [Ridge AGLV] to the east. The Ridge AGLV is located approximately 3.7km to the east of the Site and runs in a north to south orientation from Gainsborough down to Marton. The Gainsborough AGLV is located approximately 2.3km west of the Site and the Laughton Wood AGLV is located approximately 4.7km northwest.

8.7.52 **Cottam 3:** The Site does not include nationally designated landscape or AGLV as shown on **Figure 8.6**.

8.7.53 Land within the Study Area shows there are locally designated landscapes comprising the AGLV centred around Gainsborough to the west [Gainsborough AGLV], around Grayingham and Blyborough [Ridge AGLV] to the east and Laughton [Laughton AGLV] to the northwest. The Ridge AGLV is located approximately 4.8km to the east of the Site. The Laughton Wood AGLV covers an extensive area of woodland surrounding Laughton and is located to the north of the Site. The Gainsborough AGLV is located approximately 1.9km southwest of the Site.

[Scheduled Monuments, Listed Buildings, Conservation Areas and Registered Parks and Gardens](#)

8.7.54 **Cottam 1:** There are two Scheduled Monuments on the Site within the red line boundary.

8.7.55 The hamlet of Coates also lies to the centre of Cottam 1 within the red line boundary and contains two areas of defined Scheduled Monuments, Land within the 2km

Study Area shows the closest Scheduled Monument to the centre is Thorpe Medieval Settlement (List Entry Number: 1016978) in Thorpe the Fallows hamlet which borders the Site to the south. Coates Medieval Settlement and Moated Site (List Entry Number 1016979) located approximately 560m from the Site boundary. There is a further Scheduled Monument outside the Site in the village of Brattleby called Cross on St Cuthbert's Churchyard (List Entry Number: 1018288) just within 2km of the boundary.

- 8.7.56 Land within the 5km Study Area shows there are a number of scheduled monuments including Sites at Harpswell to the west of Fillingham, Broxholme, Ingleby, between Sturton by Stow and Marton, Knaith Park and Springthorpe.
- 8.7.57 There are no Listed Buildings on Site.
- 8.7.58 The closest listed building in proximity to the Site is located at Thorpe in the Fallows which is Thorpe in the Fallows Farmhouse (List Entry Number: 1308921). The Grade I listed Church of St Edith (List Entry Number: 1146742) lies in the hamlet of Coates at the centre of Cottam 1. There are further number Listed Buildings within 2km of the Site and these are found predominantly within local villages and settlements.
- 8.7.59 Land within the 5km Study Area shows there are a number of listed buildings in the Hemswell, Harpswell, Hemswell Cliff, Aisthorpe, Scrampton, Broxholme, Ingleby, Brampton, Marton, Gate Burton, Upton and Heapam, together with a number of isolated and grouped buildings outside of settlements.
- 8.7.60 There are no Conservation Areas on Site.
- 8.7.61 Land within the 2km Study Area shows there are a number of Conservation Areas including Glentworth, Fillingham, Ingham, and Brattleby. These are all located on rising ground to the east of the Site at the base of the prominent landform running north to south.
- 8.7.62 Land within the 5km Study Area shows there are Conservation Areas at Hemswell and South Carlton.
- 8.7.63 There are no Registered Parks and Gardens on Site.
- 8.7.64 The closest Registered Park and Garden lies just on the outer eastern Study Area within 2km and comprises the Grade II listed Fillingham Castle (List Entry Number: 100097).
- 8.7.65 **Cottam 2:** There are no Scheduled Monuments on the Site.
- 8.7.66 Land within the 2km Study Area shows the closest scheduled monument is Gilby Medieval Settlement and Cultivation Remains (List Entry Number: 1016795) which lies approximately 1.3km to the northwest of the Site. The Deserted Village of

Dunstall (List Entry Number: 1004996) lies approximately 0.75km to the northeast of the Site boundary.

- 8.7.67 Land within the 5km Study Area shows there are sites at Willoughton, Springthorpe and Harpswell.
- 8.7.68 There are no Listed Buildings on the Site.
- 8.7.69 Two isolated listed buildings are located in close proximity to the Site boundary, including the Grade II Old Hall (List Entry Number: 1165535) lies 400m to the west of the Site, and Grade II Corringham Windmill (List Entry Number: 135941) lies 580m to the south. There are further Listed Buildings within the villages of Corringham and Springthorpe.
- 8.7.70 There are no Conservation Areas on the Site.
- 8.7.71 There is only one Conservation Area at Springthorpe within 2km.
- 8.7.72 There are no Registered Parks and Gardens on Site or within 2km of the boundary.
- 8.7.73 **Cottam 3:** There are no Scheduled Monuments on the Site.
- 8.7.74 Land within the 2km Study Area shows Southorpe Medieval Settlement and Cultivation Remains (List Entry Number: 1016794) lies approximately 1.35km to the east of the boundary northeast of the Site. There is a further Scheduled Monument namely the Cross in St Martin's Churchyard (List Entry Number: 1018291) which lies approximately 940m to the southwest of the Site boundary.
- 8.7.75 Land within the 5km Study Area shows there is a site at Willoughton on the south-eastern outer limits.
- 8.7.76 There are no Listed Buildings on the Site.
- 8.7.77 The closest listed building in proximity to the boundary is the Grade II listed Old Railway Station (List Entry Number: 1359454) located 0.32km to the west of the lowest field parcel to the south of the railway line. There are a number of Listed Buildings in the surrounding landscape including at Pilham which are predominantly Grade II listed with the Grade II* listed Church of All Saints (List Entry Number: 131137). Blyton contains a number of Listed Buildings including the Grade I listed Church of St Martin (List Entry Number: 1064159) located 660m to the southwest of the Site. There are further Listed Buildings at Laughton include the Grade I listed Church of All Saints (List Entry Number: 131208) located approximately 1.66km from the boundary. The Grade II Mount Pleasant Farmhouse (List Entry Number: 131186) lies to the north of the Site approximately 600m north of the boundary. There are further Listed Buildings at Northorpe including the Grade I Church of St John the Baptist (List Entry Number: 1165812).

8.7.78 There are no Conservation Areas on the Site.

8.7.79 There is only one Conservation Area at Springthorpe within 2km.

8.7.80 There are no Registered Parks and Gardens on Site or within 2km of the boundary.

Ancient woodlands and Natural Designations

8.7.81 Ancient Woodland and Natural Designations include National Parks and AONBs. In addition to these there are further national and international statutory environmental designations which contribute to England's natural environment and make a major contribution to national and regional character. These include the following:

- Sites of Special Scientific Interest (SSSI)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Ramsar Sites
- National Nature Reserves (NNR)
- Local Nature Reserves (LNR)
- Marine Protected Areas (MPA) - including a Marine Nature Reserve at Lundy

8.7.82 **Cottam 1:** There are no areas of Ancient Woodland on the Site or within 2km of the boundary.

8.7.83 There are no Local Nature Reserves, Local Wildlife Sites or Sites of Special Scientific Interest on Site or within 2km of the boundary.

8.7.84 **Cottam 2:** There are no areas of Ancient Woodland on the Site or within the 2km of the boundary.

8.7.85 There are no Local Nature Reserves, Local Wildlife Sites or Sites of Special Scientific Interest on the Site.

8.7.86 Land within 2km of the boundary shows there is Scotton Beck Fields Site of Special Scientific Interest (SSSI) and Scotton Common SSSI approximately 1.5km to the north of the boundary.

8.7.87 **Cottam 3:** There are no areas of Ancient Woodland on the Site or within 2km of the boundary.

8.7.88 There are no Local Nature Reserves, Local Wildlife Sites or Sites of Special Scientific Interest on the Site.

8.7.89 Land within 2km Laughton Common SSSI lies to the northwest of the boundary.

National Landscape Character

8.7.90 Land within the Study Area shows there are the following National Character Area (NCA's) as identified by Natural England in the England-wide mapping of landscape character at a broad, national scale.

8.7.91 **Cottam 1:** The Site and land within the Study Area fall within National Character Area (NCA) 48²⁸ Trent and Belvoir Vales and NCA 45 Northern Lincolnshire Edge.

8.7.92 **Cottam 2:** The Site and land within the Study Area fall within National Character Area (NCA) 39²⁹ Humberhead Levels, NCA 48 Trent and Belvoir Vales and NCA 45 Northern Lincolnshire Edge.

8.7.93 **Cottam 3:** The Site and land within Study Area fall within National Character Area (NCA) 39 Humberhead Levels, NCA 48 Trent and Belvoir Vales and NCA 45 Northern Lincolnshire Edge.

8.7.94 The key characteristics, forces for change and sensitivities identified for the NCAs that are relevant to the LVIA are set out in **Appendix 8.2** Landscape Receptor Analysis Tables.

Regional Scale Landscape Character

8.7.95 Land within the Study Area shows there are four Landscape Character Groups (LCG's)³⁰ that are subdivided into five Landscape Character Types (LCT's) as detailed in **Table 8.5** below.

Table 8.5: Landscape Character Types & Areas

Landscape Character Groups:	Landscape Character Types:
Group 2: Fenland and Fenland Margins	2b: Planned and Drained Fen and Carrlands
Group 3: River Valley Floodplains	3a: Floodplain Valleys
Group 4: Lowland Vales	4b: Wooded Vales 4b: Unwooded Vales

²⁸ Natural England, 8 April 2013, *National Character Area profile: 48 Trent and Belvoir Vales (NE429)* Available online at: <http://publications.naturalengland.org.uk/publication/7030006#:~:text=NCA%20Profile%3A%2048%3A%20Trent%20and%20Belvoir%20Vales%20%28NE429%29,predominantly%20arable%20farmland%2C%20centred%20on%20the%20River%20Trent.?msclid=6e059cd3cf9e11ec87d997fd87101149> (Accessed 09/05/2022).

²⁹ Natural England, 8 April 2013, *National Character Area profile: 39 Humberhead Levels (NE339)* Available online at: <http://publications.naturalengland.org.uk/publication/1843305?category=587130&msclid=28838fcdcf9d11ec80e67518fa16df71> (Accessed 09/05/2022).

³⁰ East Midlands Landscape Partnership, April 2010, *East Midlands Regional Landscape Character Assessment*

Group 6: Limestone Farmlands	6a: Limestone Scarps and Dipslopes
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8.7.96 Within the Sites, at the regional scale, landscape character is assessed within the East Midlands Regional Landscape Character Assessment and as defined in **Figure 8.5**, the Sites are located within RLCT Profile: 4a Unwooded Vales.

8.7.97 Based upon Site observation and professional judgement, it was clear that the Scheme would incur no significant effects upon landscape character within the remaining LCT's due to a combination of Distance from the Application Site and/or general lack of intervisibility. As such those remaining LCA's are not discussed further in the LVIA.

8.7.98 Land within the Study Area also contains areas defined as 'Built Up Area' which is associated with the primary settlement of Gainsborough and other settlements including Blyton, Scotter, Scampton, Saxilby and Sturton by Stow, and the main highway corridors including the A1500 (Tillbridge Road), A15 (Ermine Road), A631 (Harpswell Lane), and the A59 (Gainsborough Road). Cottam 3 includes two Sites to the west that are located within this 'Built Up Area'.

8.7.99 The key characteristics, forces for change and sensitivity identified for the LCTs that are relevant for the LVIA are set out in **Appendix 8.2** Landscape Receptor Analysis Tables.

Local Scale Landscape Character

8.7.100 The Sites are located within a Local Landscape Character Area (LLCA's) as defined by the West Lindsey Landscape Character Assessment³¹ within Profile LLCA 3 Till Vale.

8.7.101 Land within the Study Area shows there are further LLCA's as follows:

- LLCA 1 Laughton Woods
- LLCA 2 Trent Valley; and
- LLCA 4 The Cliff.

8.7.102 The LCA was undertaken in August 1999 and therefore it is proposed to undertake a review of the West Lindsey Landscape Character Assessment to ensure extracted information is used where still current and relevant.

³¹ Environmental Resources Management, August 1999, *West Lindsey Landscape Character Assessment*

Visual Resource

- 8.7.103 This section describes the visual resource around the Sites and sets out the information that has been collected to determine the baseline conditions at this stage in the EIA. The main objective is to provide as much relevant information about the Sites and the surroundings of the Scheme and to set out the assessment parameters that will underpin the final detailed assessment of any likely significant environmental effects that will be undertaken to inform the ES.
- 8.7.104 A suite of viewpoints have been identified through desk studies which have been confirmed through fieldwork in February and March 2022. Their locations have been subject to consultation with the relevant planning authorities and other stakeholders where some additional viewpoints have been included and photography undertaken as set out within **Table 8.2**. Viewpoint selection has followed good practice and in particular paragraphs 6.18 to 6.20 of GLVIA3. The viewpoints proposed will be used to aid the description of effects on both landscape and visual resources and would be utilised for assessment purposes.
- 8.7.105 The selection of viewpoints was made on the basis of the following types of publicly accessible viewpoints, as follows:
- Representative viewpoints (representative of views from a particular PRow)
 - Specific viewpoints (such as key views from a specific visitor attraction)
 - Illustrative viewpoints (chosen to demonstrate a particular effect/specific issue)
 - Any important sequential view, for example, along key recreational or transport routes; and
 - Any additional agreed viewpoints that have been requested by consultees and the relevant planning authorities.
- 8.7.106 For the purposes of the LVIA, all the viewpoints are taken from publicly accessible land and photography undertaken in both summer and winter to ensure a worst-case scenario is assessed and illustrated.
- 8.7.107 The viewpoints are set out within **Appendix 8.3** Viewpoint Analysis Tables.
- 8.7.108 The viewpoint photography and photography methodology is illustrated in **Figure 8.14** Viewpoint Verified Photography and was undertaken in winter.
- 8.7.109 In order to assist with viewpoint selection and to appreciate the potential influence of the Scheme on the wider landscape, preliminary ZTV figures are used to illustrate the area from where it may be theoretically possible to view all, or part of the

Scheme. The ZTVs produced are both Bare Earth (landform only) to illustrate a worst-case scenario and Augmented ZTV figures which illustrate the effects of landform, built form and vegetation in both summer and winter.

- 8.7.110 The ZTV's provide a starting point in the assessment process and therefore provide a 'worst case' illustration of theoretical visibility and assume that if any of the Scheme is visible it will be shown on the ZTV.
- 8.7.111 Further ZTV's would be undertaken through the iterative design process to help understand the impacts of evolution to the design process. The ZTV is produced using ArcGIS Pro 2.1 software, and the calculations are based on the Scheme at 4.5m above ground level (AOD).
- 8.7.112 Augmented ZTVs would also be produced through the iterative design process to illustrate with greater accuracy the theoretical visibility of the Scheme. A further Augmented ZTV would also be run to illustrate the screening effects of vegetation at year 15 (summer) should this be requested by the relevant planning authorities.
- 8.7.113 Further to the viewpoints, a series of photomontages are proposed to be produced to show the effects of the Scheme at the locations where significant effects may be possible. At these locations it is proposed to undertake photomontages to AVR (Actual Visual Representation). Following PEIR, Type 4 Photomontage (survey/scale verifiable) will be prepared for the ES in both winter and summer months. This ensures that both the effects of reduced vegetation and where the colours of the panels change with the light at different times of the year (winter/summer) are illustrated. Such montages are also proposed to be utilised if required at the time of assessment for cumulative photography where the effects of the Scheme would be seen in combination with another scheme. At present no cumulative photography has been defined. This will be agreed with the LPAs prior to submission of the DCO application.

8.8 Proposed Structures and Mitigation Measures

Proposed Structures

- 8.8.1 A detailed description of the Scheme is provided in **Chapter 4 Development Proposal**. The Scheme comprises above ground and below ground built development, namely, solar panels, sub-stations and energy storage, cables and associated apparatus.
- 8.8.2 For the purpose of the LVIA process, each of the smaller Sites are considered independently of each other as separate Study Areas. These areas are illustrated on **Figure 8.1** and described as:

- Cottam 1: Size 894ha. Is made up of a number of Sites/fields clustered within an area of countryside centred around the village of Coates in the District of West Lindsey.
- Cottam 2: Size 132ha. Sits to the north of Cottam 1 and is located to the east of the village of Corringham.
- Cottam 3: Size 244ha. Sits to the north of Cottam 2 and is split into two distinct areas:
- Cottam 3a, to the north-east and south-east of the village of Blyton; and
- Cottam 3b, to the east of Pilham.

Cable Route Corridors

- 8.8.3 The electricity generated by the Scheme will be imported and exported via new underground cables to the National Grid at a substation at Cottam Power Station. The cable route corridors are identified as 'search areas' at this stage for a potential cable route. Only a narrow width within these corridors will be required for the cable route and its construction. The cable route corridors are connecting the land parcels together and then to the grid connection point. The Applicant is in the process of seeking to refine this corridor, which will progress alongside the design process.
- 8.8.4 The cable corridor as shown in the PEIR is mostly around 100m in width with some wider sections to allow for specific constraints such as ecology and archaeology. The corridor shown is wider than is required but it is still subject to on-going assessment work which will be used to refine the cable route which will inform the route proposed in the DCO submission.
- 8.8.5 The voltage of the cables and the number of circuits will affect the width of cable trenches required. The range of typical cable trench widths is from 0.32m (for 1 circuit) to 3.38m (for 4 circuits). However, the width and spacing of the cable trenches may differ depending on environmental constraints, engineering requirements or if crossing third party apparatus (e.g., railway lines). In addition to the trenches, land will be required in the corridor for access and soil and cable 'lay down'. Construction compounds along this route will also be required. Any existing overhead power lines will be retained, and no new overhead lines will be required.
- 8.8.6 Mitigation measures, if required, will be developed for the cable route once the design and route has been developed further. However, initial principles are set out below:
- **Primary Mitigation** – Route designed to avoid landscape features such as trees, hedgerows, ditches, woodland etc.

- **Secondary mitigation** – where crossing such features becomes unavoidable, utilise directional drilling.

Sub Stations and Energy Storage

- 8.8.7 Substations and energy storage form part of the Scheme design. The applicant is in the process of seeking to refine the location for the substations, which will progress alongside the design process. Mitigation measures will be developed for the substations once the design is known. On the Cottam 2 and 3 Sites there are proposed to be 132kV substations and each substation will take in the region of 12 months to construct. The 400kV substation on the Cottam 1 Site will take in the region of 18-24 months to construct and there will be a connection from the substation to the existing Cottam Power Station.
- 8.8.8 Mitigation measures will be developed for the substation and energy storage once the design has been developed further. However, initial principles would be consistent with the Mitigation Buffer Zones (MBZs) approach undertaken for CO1-3 Sites set out below.

Mitigation Relating to the Scheme

- 8.8.9 The potential mitigation measures which are being explored as part of the LVIA process are reported in this section, prior to the following **Section 8.8** Landscape and Visual Effects.
- 8.8.10 The mitigation measures set out in this section are those that are may be established for Year 15 of the Proposed Development (during the operational period). This is because impacts at Year 15 of the Development are considered as most relevant to all other stages of mitigation under review because they are the most inherent in the context of the landscape character and visual amenity of the Development. This position of 'Year 15' relevance is judged in terms of the effectiveness of maturation of planting and the 'time depth' of the receiving landscape.
- 8.8.11 The assessment process includes iterative design and re-assessment of any remaining, residual effects that could not otherwise be mitigated or 'designed out'. The type of effect is also considered and may be direct or indirect; temporary or permanent (reversible); cumulative. The LVIA involves a combination of both quantitative and qualitative assessment and wherever possible a consensus of professional opinion is sought through consultation as set out within **Table 8.2** Consultation Responses Timeline and **Appendix 8.4** Consultation.
- 8.8.12 In terms of mitigation and the landscape baseline and landscape character measures associated with the Scheme, the LVIA would look to address the landscape sensitivities and forces for change. Each of the character areas are set out within **Appendix 8.2** Landscape Character Tables.

- 8.8.13 The full extent of the built elements of the Scheme within the Sites is not yet known and is being developed through the LVIA assessment in an iterative way in line with GLVIA3. Measures illustrated on **Figure 8.16** Strategic Landscape Mitigation Measures are therefore preliminary and will be finalised in the Environmental Statement.
- 8.8.14 As set out within GLVIA3 at paragraph 4.21, mitigation measures are described as:
- "In accordance with the EIA Regulations, measures to prevent/avoid, reduce and where possible offset or remedy (or compensate for) any significant adverse landscape and visual effects should be described."*
- 8.8.15 Within the guidance, these mitigation measures are now generally considered to fall into three categories and the LVIA will consider them as being:
- *Primary Mitigation:* Measures that are embedded within the design of the Scheme at the outset and which depend on the preliminary findings of the LVIA process. The measures are iterative and essentially look to modify the scale and layout of the Scheme and also strive to achieve to raise the bar of acceptability in terms of planning policy compliance. These measures aim to ensure a reasonable balance of viability and to meet with policy expectations.
 - *Secondary Mitigation:* Measures that are integrated as part of the evolution of the design and which depend on the interim findings of the LVIA process. The measures are iterative and essentially will look to include planting enhancement at the source of the Scheme and within the redline boundary. These measures will look to add inherent value to the landscape character and visual amenity of the Site and its environs and to exceed planning policy expectations; and
 - *Tertiary Mitigation:* These are offsite measures that could be considered as a wider commitment under legal obligation outside the redline boundary. The measures are iterative but also look to fulfil wider planning policy objectives such as green infrastructure interventions and planning for social and community initiative. The achievement of tertiary mitigation can be dependent upon a number of factors and some outside the control of an applicant.
- 8.8.16 These mitigation measures are explored within **Figure 8.16** Cottam Strategic Mitigation Plan and the assessment of effects of these 'high level' measures are set out within the following **Section 8.8**. The LVIA at this PEIR stage takes into account potential mitigation measures at the construction, operation and decommissioning stages of the Scheme:
- Construction – Assessment would be based on the construction of the solar panels and associated infrastructure including energy storage, substation and

cable corridor options and would be undertaken in winter to assess a worst-case scenario. Primary mitigation would look at measures to reduce the construction effects, in particular the siting, design and layout of the construction activities. Secondary mitigation measures such as planting would not be taken into account at this stage. Tertiary mitigation would be considered at this stage if required to reduce the effects of construction such as temporary changes to hedgerow management within the wider land ownership to reduce views of the Scheme.

- Operation (Year 1) – Assessment would be based on the presence of the solar panels and associated infrastructure including the energy storage, substation and cable corridor being operational and would be undertaken in winter to assess a worst-case scenario. Primary mitigation would look at measures to reduce the operational effects, in particular the siting, design and layout of the solar panels and associated infrastructure including energy storage, substation and cable corridor. Secondary mitigation measures such as planting would be taken into account at this stage. Tertiary mitigation would also be considered at this stage if required to reduce the effects of construction such as temporary changes to hedgerow management within the wider land ownership to reduce views of the Scheme.
- Operation (Year 15) – Assessment would be based on the solar panels and associated infrastructure including the energy storage, substation(s) being operational at the time and assessed in summer with vegetation in leaf offering maximum screening potential. Primary mitigation would assume a uniform growth of trees, shelterbelts and woodland planting of 5m since operation at Year 1, representing uniform growth of 1m every 3 years for proposed trees, shelterbelts and woodland. This would also assume a uniform growth of hedgerow mitigation planting of 4m since operation at Year 1 representing uniform growth of 1m every 3.75 years. Existing hedgerows would be assumed to have reached their prescribed management height by Year 15 of between 3-5m. Secondary mitigation would include management and maintenance of the primary aspects of mitigation. Tertiary mitigation would form part of the management and maintenance objectives.
- Decommissioning – Assessment would be based on a similar process to that of construction, but with the Scheme being no longer operational. It would assess the Site in winter but would assume retention of existing vegetation and build upon the proposed primary and secondary mitigation that had been established as the future baseline.

8.8.17 The following ZTV's have been produced (**Figures 8.8 to 8.13**):

- Bare Earth ZTV: Year 1 of operation. 5km Study Area

- Augmented ZTV: Year 1 of operation. 2km Study Area.

Updated ZTV studies are intended to be produced as part of the iterative design stages within the mitigation process:

- Augmented ZTV: Year 15 of operation. 2km Study Area. With mitigation.

8.8.18 At year 15 we would undertake a re-evaluation of the Scheme to identify any residual landscape and visual effects. Adaptive management and maintenance measures would be bought forward via a Landscape and Environmental Management Plan (LEMP).

8.8.19 The Scheme is designed to incorporate landscape and visual mitigation measures. These measures take into account potential landscape and visual impacts identified at an early stage in the LVIA process. The following considerations (as set out in **Figure 8.16** Cottam Strategic Landscape Mitigation Measures) are in place to reduce potential impacts of the Scheme:

- *Context:* Location of the Scheme within a relatively flat lower-lying landscape. To the east, the existing landform that forms the ridgeline at Hemswell Cliff which provides containment of the Scheme from this direction.
- *Location:* The location of the solar panels set back from the Site boundary.
- *Design:* Change in resting angle of the panels.
- *Features:* The colour palette for the solar panels to reduce their prominence when seen within the landscape backdrop or seen against the sky.
- *Existing Vegetation:* Retention and reinforcement of existing woodland/scrub and hedgerow cover. This existing vegetation provides a strong visual framework and potentially screens or substantially filters at ground level towards the solar panels.
- *Reinforcement:* Existing woodland/scrub and hedgerow cover may also be reinforced by the introduction of new planting providing long term screening and structural benefits to the landscape.
- *New Planting and Wider Visual Amenity:* The establishment of planting along the margins of the solar panel parcels to increase the elevation, robustness and efficacy of the planting as screening becomes more effective in the integration with the surrounding landscape.
- *New Planting and Inherent Visual Amenity:* Planting within the Sites supporting the solar panels to provide screening and habitat connectivity, particularly where transport routes and footpaths and bridleways cross the Site.

- *New Planting and Time Depth:* Planting to reflect landscape character and policy expectations using a palette of native tree and shrub species that are appropriate to the location. Faster growing species would be used to provide quicker screening/filtering effects.
- *New Planting and Landscape Character:* Proposed woodland planting would not be effective in all locations, but some areas would be selected to ensure the long-term presence of woodland where it is accordance with landscape character.
- *New Planting and Recreational Users:* Planting would screen certain views such as users of the PROWs, the bridleway network and local roads.
- *New Planting and Green Infrastructure:* Measures to enhance the landscape framework in keeping with landscape character would also be explored to soften and continue to provide the 'filtering' effect of vegetation that is characteristic of the local landscape.
- *Planting Management and Maintenance:* Preparation of a Landscape Environmental Management Plan (LEMP), which would prescribe how the mitigation measures identified and proposed can be implemented and managed to ensure the effectiveness and certainty in achieving the objectives of the mitigation strategy. This stage would be undertaken in conjunction with the ecology and arboricultural consultant.
- *Cumulative Impacts:* Landscape mitigation measures will look to address the cumulative impacts as well as the individual impacts.

Mitigation Buffer Zones

8.8.20 At this stage, a Mitigation Buffer Zone (MBZ) approach is suggested to mitigate impacts on those areas considered to be of landscape, biodiversity and residential amenity sensitivity. These MBZs currently apply an equal distance on all sides of the area of sensitivity from the Scheme; however, as the design continues to evolve, these distances will be fine-tuned to take account of a number of factors, including:

- Intervening vegetation;
- Surrounding land use;
- Prevailing landform;
- Green Infrastructure and wildlife connectivity; and
- The attributes that contribute to the visual and physical connectivity of the landscape.

- 8.8.21 This is the preliminary position, which is guided by the information known at this stage. The MBZ distances are equal for each sensitivity type and therefore define a worst-case scenario. Later iterations of the MBZ approach outlined in this section will look to build upon the initial baseline position to include more detail that takes into account the factors set out above.
- 8.8.22 Moving forward within the LVIA process, consideration will be given to development layout, massing and colouring. Landscape mitigation measures will also include the retention and reinforcement of existing landscape features and the introduction of new areas of planting. Native species will be selected, and the planting will be designed to give softening and screening where appropriate whilst reinforcing local landscape character and biodiversity of the area.
- 8.8.23 The initial MBZ baseline position is shown on the Landscape Mitigation Plan and Illustrative Sections within **Figure 8.16**. The proposed distances are set from the outer edge of the sensitive areas as follows:
- Existing Hedgerows - 5m to outer edge boundary fence line;
 - Existing Trees - Varies between 8-20 m (depending on Bat Roost Potential);
 - Existing Major Watercourses - 20m to outer edge of solar panel;
 - Existing Woodland - 20m to outer edge of solar panel;
 - Badger Setts - 20m to outer edge of solar panel;
 - Residential Properties - 50m (min) to outer edge of solar panel;
 - PRoW - 15m to outer edge of solar panel; and
 - New Woodland and Shelterbelts - 5m to boundary fence line.

8.9 Landscape and Visual Effects

- 8.9.1 This section describes the landscape analysis, iterative design work and mitigation measures known at this stage of the EIA. The main objective is to provide as much relevant information about the Scheme and highlight the assessment parameters that will underpin judgements regarding any significant likely environmental effects to be taken forward into the ES. The purposes of the PEIR is to provide preliminary information on the likely significant effects of the Scheme. The possibility of potential significant landscape effects are identified within **Appendix 8.2** Landscape Character Tables.

Landscape Value

- 8.9.2 The findings on landscape value are not known at this stage of the EIA, but the list of factors that could be considered when identifying landscape value is set out within **Appendix 8.2** Landscape Character Tables.
- 8.9.3 GLVIA3 indicates at paragraph 5.45 that:
- 8.9.4 *"...the value of landscape receptors will to some degree reflect landscape designations and the level of importance which they signify, although there should be no over-reliance on designations as the sole indicator of value."*

Landscape Susceptibility to Change

- 8.9.5 The susceptibility of the landscape resource to change is not known at this stage of the EIA, but meaning is discussed in paragraph 5.40 of GLVIA:
- 8.9.6 "This means the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular landscape type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed facility without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies."

Landscape Sensitivity

- 8.9.7 The findings on the sensitivity are not known at this stage of the EIA, but the list of factors that could be considered when identifying landscape sensitivity will be taken forward into the ES.

Landscape Analysis

- 8.9.8 The significance of the landscape and visual effects on the baseline conditions during the construction, operational and decommissioning stages of the Scheme have therefore yet to be determined. Any findings will be determined by professional judgement, based on the sensitivity of the receptor, combined with the magnitude of effect.

Land use

- 8.9.9 **Cottam 1:** Within the Study Area, shelterbelts and woodland plantations are the key vertical features that punctuate the landscape. The Site comprises fields separated by hedgerows with trees, and drainage ditches that feed into the River Till.
- 8.9.10 *Primary Mitigation:* Ditches would be protected and enhanced where possible and solar panels would be set back to provide sufficient buffers for ecological mitigation.

For example, the panels would be set back 20m from the existing woodland at Larch Plantation just south of Willingham Road.

- 8.9.11 *Secondary Mitigation:* The pattern of hedgerows to the east of Normanby Road and each side of the River Till are particularly distinctive on the Site and mitigation would look to retain all trees and enhance hedgerows with new planting where possible. For example, an offset of 5m from these hedgerows to the outer edge of the boundary fence line is proposed as mitigation.
- 8.9.12 **Cottam 2:** Land within the Study Area shows how the landscape consists primarily of arable land use with small to medium sized fields separated by hedgerows with some trees, and drainage ditches that feed into the wider drainage network of the River Till. Wharton Wood and Birch Wood are large areas of woodland to the west with Wharton Wood being the largest part of which is ancient woodland.
- 8.9.13 *Primary Mitigation:* The field boundary hedgerows are distinctive in the vicinity of Corringham Grange and The Cottage and mitigation would look to preserve this pattern of hedgerows. The solar panels would be set back with a 5m offset at the boundaries.
- 8.9.14 *Secondary Mitigation:* Where hedgerows are gappy in places they would be enhanced with new planting. There are very few hedgerow trees and only small areas of scrub and the Scheme would look to bring forward more hedgerow trees and areas of scrub. For example, the hedgerow along the western boundary of the Site is intermittent and would benefit from new planting to infill this section.
- 8.9.15 **Cottam 3:** Land within the Study Area, shows there is an open agricultural land use. There are also small pockets of woodland with Laughton Woods approximately 2km to the northwest of the Site. This woodland forms a prominent feature in the landscape running towards the west into Laughton Common and Owlet Plantation. There are also woodlands within and adjacent to the Site and the solar arrays would be set back between 8-20 metres depending on areas of bat roost potential.
- 8.9.16 *Primary Mitigation:* The mitigation would look to set the panels back from the field boundaries to the south of the railway line, particularly where there are hedgerow trees. In this location, the offset would vary between 8-20 metres depending on bat roost potential.
- 8.9.17 *Secondary Mitigation:* The mitigation would look to establish a network of hedgerows on the land associated with the former airfield similar to the areas to south, east and west where hedgerows with trees, and drainage ditches are more commonplace.

Topography and Watercourses

- 8.9.18 **Cottam 1:** Land within the Study Area shows the landscape is generally made up of flat or gently sloping landform, and then rising to the north-eastern boundary towards the village of Fillingham. A notable topographical feature lies to the east where the landform rises to create a distinctive sloping ridge.
- 8.9.19 *Primary Mitigation:* The River Till meander through the landscape and borders a number of the western most Site parcels. The solar panels would be set back from this location to retain appropriate landscape and ecology buffers. Additionally, the existing network of drains across the Site would look to achieve an offset by at least 8m to the outer edge of each ditch or drain.
- 8.9.20 *Secondary Mitigation:* The landscape shows some typical topography and watercourse characteristics with a more organic pattern in parts and the planting framework would look to draw out this feature. For example, the network of drains to the north of Thorpe le Fallows would look to achieve offsets at least 8m from the edge of the ditch or drain.
- 8.9.21 **Cottam 2:** Land within the Study Area shows the landscape is generally flat with a gentle slope towards the River Till, where ditches feed into the wider drainage network of the river. Corringham Beck forms a larger watercourse. Along this ridgeline lie a linear arrangement of small villages. The solar arrays would be set back from this location outside of the flood zones.
- 8.9.22 *Primary Mitigation:* The mitigation would ensure the solar panels are set back from road corridors to protect their rural character. For example, the panels would be set back from Mill Mere Road along the southwest boundary of the Site with an offset of 5m to protect the rural character of this lane.
- 8.9.23 *Secondary Mitigation:* The Site comprises a series of fields in a single compact land parcel with opportunities to enhance the setting of the residential steadings. For example, there could be planting towards the centre of the Site around Corringham Grange Farm.
- 8.9.24 **Cottam 3:** Land within the Study Area shows the landscape is generally flat, with topography varying only very slightly in elevation, although there are some minor undulations of landform to the northeast and east. Laughton Drain, Highfield Drain, Northorpe Beck and Corringham Beck are key drainage features.
- 8.9.25 *Primary Mitigation:* The mitigation would look to set the solar panels back from substantial drainage features to ensure landscape and ecology buffers are retained. For example, there could be offsets of 5m from the series of ditches and drains that are located to the south of the railway line.

- 8.9.26 *Secondary Mitigation:* Rectilinear drains are a characteristic of the area to the north of the railway line with an absence of natural, meandering watercourses. For example, look to introduce planting that softens the formality of the landscape around Kirkton Road.

Communications and Infrastructure

- 8.9.27 **Cottam 1:** Land within the Study Area, shows the landscape is reinforced to the east by the A15 following a strong linear alignment and former Roman Road. To the southwest lies the A1500 a linear road again. The landscape is also crossed by a number of roads including Glentworth Road, Gillingham Lane and Ingham Road.
- 8.9.28 *Primary Mitigation:* The area is crossed by a number of roads east to west, including Glentworth Road, Gillingham Lane and Ingham Road. For example, look to ensure the solar panels are set back from road corridors where landscape character or visual effects are likely, particularly along Thorpe Lane.
- 8.9.29 *Secondary Mitigation:* The adjoining Gainsborough Road (A156) follows a more organic and informal alignment across the landscape. For example, utilise planting to draw out the organic alignment of roads, particularly along Willingham Road.
- 8.9.30 **Cottam 2:** Land within the Study Area shows there are small roads running in a predominantly east west and north south orientation across the landscape. Two metalled access tracks lead off the main access road running perpendicular to the access road and defining field parcels in a geometric form
- 8.9.31 *Primary Mitigation:* The Site has residential properties at Corringham Grange Farm and The Cottage towards the centre, and these are accessed by a narrow road. Solar panels would be set back with a buffer of at least 5m from these roads to preserve the residential visual amenity.
- 8.9.32 *Secondary Mitigation:* Field parcels forming the Site have a geometric form. The mitigation would look to utilise planting at field corners to soften the formality of the geometric landscape. For example, field corners could be planted to the south-eastern part of the Site around Brown's Holt and Yawthorpe Beck to enhance the landscape character.
- 8.9.33 **Cottam 3:** The Study Area is punctuated by small roads linking villages, with the B1025 defining the southern boundary. A main line railway runs between two of the larger Sites.
- 8.9.34 *Primary Mitigation:* Land to the south of the railway line is more rural in character with pasture surrounded and divided by hedgerows and trees. Solar panels could be set back with a buffer of at least 5m from hedgerows and 8-20m from existing trees (depending on bat roost potential) to provide landscape and ecological buffers.

- 8.9.35 *Secondary Mitigation:* The railway line serpentine through and around Gainsborough and then cuts through the landscape in a linear form. The mitigation measures would look to utilise planting to soften the presence of the line in the landscape.

Settlements, Industry, Commerce, and Leisure

- 8.9.36 **Cottam 1:** Land within the Study Area shows there are a series of rural villages including Fillingham Ingham and Cammeringham. The town of Gainsborough is the primary settlement located to the northwest of the Site.
- 8.9.37 *Primary Mitigation:* The area is relatively sparsely populated with isolated residential properties and farmsteads. The mitigation measures would look to ensure that solar panels are set back to retain rural character in sensitive locations.
- 8.9.38 *Secondary Mitigation:* The mitigation measures would look to use planting to enhance views towards the villages and hamlets. For example, views towards the church spires at Willingham and Willingham by Stow are key features in views to the east of the area.
- 8.9.39 **Cottam 2:** Land within the Study Area shows that settlements include Corringham, Pilham, Blyton, Laughton, Northorpe, Willoughton, Hemswell and Harpswell. The town of Gainsborough is the main settlement to the southwest and the village of Willoughton is located to the northeast of the Site.
- 8.9.40 *Primary Mitigation:* Isolated residential properties and farmsteads are distributed along lanes, which help impart a distinctive rural character. Mitigation measures would look to ensure that solar panels are set back from the edges of the Site to retain rural character in sensitive locations such as Mill Mere Road.
- 8.9.41 *Secondary Mitigation:* Mitigation measures would look to utilise planting to enhance views towards the villages and hamlets. For example, views towards Corringham are distinctive.
- 8.9.42 **Cottam 3:** Land within the Study Area shows there are a series of rural villages located across the landscape with the closest being Blyton located approximately 970m to the southwest. Other settlements include Laughton, Scotton, Scotter, Northorpe, Willoughton and Pilham. Gainsborough is the primary settlement.
- 8.9.43 To the north of the railway line the landscape is heavily influenced by the airfield and to the northeast of the Site, the landscape is more open and less vegetated responding closely to subtle landform, open field boundaries and irregular field patterns. The Site lies within the parishes of Laughton, Blyton and a small section within the parish of Pilham and also lies in immediate proximity to the boundary of

Northorpe Parish. Cottam 3 is located approximately 6.7km to the northeast of the town of Gainsborough, which is the primary settlement.

8.9.44 *Primary Mitigation:* Blyton Airfield is interspersed with a series of concrete roads and large open concrete areas and the mitigation measures would look to utilise these areas for the solar panels and as access where possible.

8.9.45 *Secondary Mitigation:* The landscape to the south of the railway line is well-contained and supports a strong landscape structure. The landscape mitigation measures would look to enhance the landscape to the north of the railway line with reinforcements to hedgerows, scrub and areas of existing woodland.

Public Rights of Way and Access

8.9.46 Land within the Study Area shows the public rights of way network is concentrated along field boundaries and aligned with the road network. As a general observation, footpaths appear well used pedestrian activity has been observed. Because the network is sporadic the local lanes are also used to supplement the network in places.

8.9.47 **Cottam 1:** *Primary Mitigation:* The Site is bordered by the footpath network with some footpaths passing along the boundaries and passing across east to west. The mitigation measures would look for opportunities to set back the solar panels with a buffer of 15m where the footpath network may be affected between Kexby Road and Willingham Road for example.

8.9.48 *Secondary Mitigation:* The PRow network is intermittent with few landscape features to help form continuous links and is particularly sporadic in the landscape to the west of the Site. The mitigation measures would look for opportunities to enhance the existing footpath network where associated with the Site between Grange Farm and Long Lane for example.

8.9.49 **Cottam 2:** Land within the Study Area shows that the PRow network is concentrated within the western part, whereas elsewhere the network is sparse. The Site is not bordered by the footpath network and there are no footpaths crossing over the land in any direction.

8.9.50 *Primary Mitigation:* The Site is bordered by local lanes which serve as connections for local recreation. The mitigation measures would look for opportunities to set back the solar panels where views or amenity may be affected along Mill Mere Road for example.

8.9.51 *Secondary Mitigation:* Although the Site is not bordered by footpaths there may be opportunities to enhance the linkages that the local lanes offer. Mill Mere Road provides opportunities for recreation and access for example.

8.9.52 **Cottam 3:** Land within the Study Area shows the public rights of way network is generally concentrated around settlements and along field boundaries and drainage features. The landscape to the west has a higher number of footpaths and bridleways in contrast to the landscape to the east.

8.9.53 *Primary Mitigation:* The Site to the south of the railway line is crossed by a footpath. The mitigation measures would look for opportunities to set back the solar panels with a buffer of 15m where views or amenity may be affected. The location between viewpoints VP56 and VP58 is a typical location where solar panels would be set back.

8.9.54 *Secondary Mitigation:* The Site to the south of the railway line is crossed by a footpath in contrast to the former airfield to the north which supports no footpaths. The mitigation measures would look for opportunities to enhance this footpath network on the former airfield for example.

National and Locally Designated landscape

8.9.55 West Lindsey District contains a local landscape designation, the West Lindsey Area of Great Landscape Value (AGLV) which comprises different and disparate parts. These different parts are not named, therefore for clarity, in the descriptions below the areas as follows:

- AGLV1 – The Ridge
- AGLV2 – Gainsborough
- AGLV3 – Laughton Wood

8.9.56 **Cottam 1:** The Site does not include nationally designated landscape or AGLV. These AGLV run in a north south direction and are associated with the distinct landform ridge outside the Site.

8.9.57 *Primary Mitigation:* Land within the Study Area shows there are locally designated landscapes comprising the AGLV centred around Gainsborough [Gainsborough AGLV] to the west and around Fillingham and Ingham [Ridge AGLV] to the east. Mitigation measures would look for opportunities to review the siting, design and layout of the solar panels where intervisibility with the AGLV may be an issue such as those areas bordering the east boundary of the Site.

8.9.58 *Secondary Mitigation:* The Ridge AGLV lies at the closest proximity at 200m from the Site boundary near the village of Fillingham. The mitigation measures would look to ensure that planting along this section of the Site addresses the proximity to the AGLV in contrast to the Gainsborough AGLV, which is located approximately 3.1km west of the Site and outside of the Study Area.

- 8.9.59 **Cottam 2:** The Site does not include nationally designated landscape or AGLV. The Ridge AGLV is located approximately 3.7km to the east of the Site and runs in a north to south orientation from Gainsborough down to Marton.
- 8.9.60 *Primary Mitigation:* Land within the Study Area shows there are locally designated landscapes comprising the AGLV centred around Gainsborough [Gainsborough to the west and around Grayingham and Blyborough [Ridge AGLV] to the east. The mitigation would look for opportunities to review the siting, design and layout of the solar panels where intervisibility may be an issue particularly along the east boundary of the Site.
- 8.9.61 *Secondary Mitigation:* The Gainsborough AGLV is located approximately 2.3km west of the Site and the Laughton Wood AGLV is located approximately 4.7km northwest. The mitigation measures would explore the opportunity to address proximity to these AGLVs.
- 8.9.62 **Cottam 3:** The Site does not include nationally designated landscape or AGLV. The Ridge AGLV is located approximately 4.8km to the east of the Site.
- 8.9.63 *Primary Mitigation:* Land within the Study Area shows there are locally designated landscapes comprising the AGLV centred around Gainsborough to the west [Gainsborough AGLV], around Grayingham and Blyborough [Ridge AGLV] to the east and Laughton [Laughton AGLV] to the northwest. Opportunities will be considered to review the siting, design and layout of the solar panels where intervisibility may be an issue, particularly along the eastern boundary of the Site.
- 8.9.64 *Secondary Mitigation:* The Laughton Wood AGLV covers an extensive area of woodland surrounding Laughton and is located to the north of the Site. The Gainsborough AGLV is located approximately 1.9km south-west of the Site. Opportunities will be considered to address proximity to these AGLV through landscape mitigation along the Site boundary.
- [Scheduled Monuments, Listed Buildings, Conservation Areas and Registered Parks and Gardens](#)
- 8.9.65 There are a number of Scheduled Monuments, Listed Buildings, Conservation Areas and Registered Parks and Gardens within the Study Area.
- 8.9.66 **Cottam 1:** There are no Listed Buildings, Conservation Areas or Registered Parks and Gardens on the Site. There are two Scheduled Monuments on the Site within the red line boundary.
- 8.9.67 *Primary Mitigation:* The hamlet of Coates lies to the centre of the Site within the red line boundary, which includes two Scheduled Monuments. Opportunities will be

considered to review the siting, design and layout of the solar panels where intervisibility with the hamlet of Coates may be an issue.

- 8.9.68 *Secondary Mitigation:* The closest Registered Park and Garden (RPG) lies just on the outer eastern Study Area within 2km and comprises the Grade II listed Fillingham Castle. Opportunities will be considered to enhance the views towards the wider setting of the RPG with the use of planting mitigation.
- 8.9.69 **Cottam 2:** There are no Scheduled Monuments, Listed Buildings, Conservation Areas or Registered Parks and Gardens on the Site.
- 8.9.70 *Primary Mitigation:* The closest Scheduled Monument is Gilby Medieval Settlement and Cultivation Remains which lies approximately 1.3km to the northwest of the Site. The Deserted Village of Dunstall also lies approximately 0.75km to the northeast. Opportunities will be considered to review the siting, design and layout of the solar panels where intervisibility may be an issue with these Scheduled Monuments.
- 8.9.71 *Secondary Mitigation:* There are no Registered Parks and Gardens within the 2km Study Area, but there are listed buildings in close proximity, including the Grade II Old Hall to the west and Grade II Corringham Windmill to the south. Opportunities will be considered to enhance the landscape setting and views towards these features where possible.
- 8.9.72 **Cottam 3:** the 2km Study Area, only one Conservation Area at Springthorpe within 2km.
- 8.9.73 *Primary Mitigation:* The closest Scheduled Monument is Southorpe Medieval Settlement and Cultivation Remains which lies to the northeast of the Site. Opportunities will be considered to review the siting, design and layout of the solar panels where intervisibility may be an issue with these scheduled monuments.
- 8.9.74 *Secondary Mitigation:* The closest listed building is the Grade II listed Old Railway Station to the south of the railway line. Opportunities will be considered to enhance the landscape setting and views towards this building and bring forward heritage interpretation of other heritage assets where applicable.

Ancient Woodland and Natural Designations

- 8.9.75 There are areas of Ancient Woodland or Natural Designations within 2km of the boundary.
- 8.9.76 **Cottam 1:** There are no Local Nature Reserves, Local Wildlife Sites or Sites of Special Scientific Interest or Ancient Woodland on Site or within 2km of the boundary.

- 8.9.77 *Primary Mitigation:* Opportunities to review the siting, design and layout of the solar panels will be considered where intervisibility may be an issue with ecological features with wildlife and nature conservation potential.
- 8.9.78 *Secondary Mitigation:* Opportunities will be considered to enhance the landscape where ecological features provide opportunities for wildlife and nature conservation within identified buffer areas.
- 8.9.79 **Cottam 2:** There are no Local Nature Reserves, Local Wildlife Sites or Sites of Special Scientific Interest on the Site. There are no areas of Ancient Woodland on the Site or within the 2km of the boundary.
- 8.9.80 *Primary Mitigation:* Opportunities will be considered to review the siting, design and layout of the solar panels where intervisibility may be an issue with any ecological features with wildlife and nature conservation potential.
- 8.9.81 *Secondary Mitigation:* Within 2km of the boundary there is Scotton Beck Fields Site of Special Scientific Interest (SSSI) and Scotton Common SSSI approximately 1.5km to the north of the boundary. Opportunities will be considered to provide landscape character improvements to wildlife corridors in close proximity.
- 8.9.82 **Cottam 3:** There are no areas of Ancient Woodland on the Site or within 2km of the boundary. There are no Local Nature Reserves, Local Wildlife Sites or Sites of Special Scientific Interest on the Site.
- 8.9.83 *Primary Mitigation:* Opportunities will be considered to review the siting, design and layout of the solar panels where intervisibility may be an issue with ecological features with wildlife and nature conservation potential.
- 8.9.84 *Secondary Mitigation:* Within the 2km Study Area the Laughton Common SSSI lies to the northwest of the boundary. Opportunities will be considered to provide landscape character enhancement and improvements to wildlife corridors in close proximity to the SSSI.

Visual Analysis

- 8.9.85 This section describes the visual analysis, iterative design work and proposed mitigation measures known at this stage of the EIA. The main objective is to provide as much relevant information about the Scheme and highlight the assessment parameters that will underpin any significant likely environmental effects to be taken forward into the ES. The purposes of the PEIR is to provide preliminary information on the likely significant effects of the Scheme. The possibility of potential significant visual effects is identified within **Appendix 8.3** Viewpoint Analysis Tables.

Visual Value

- 8.9.86 The findings on visual value are not known at this stage of the EIA, but the list of factors that could be considered when identifying visual value is set out within **Appendix 8.3** Viewpoint Analysis Tables.

Visual Susceptibility to Change

- 8.9.87 The susceptibility of the visual resource to change is not known at this stage of the EIA, but the meaning is discussed in paragraph 6.32 of GLVIA3:
- 8.9.88 “The susceptibility of different visual receptors to changes in views and visual amenity is mainly a function of:
- The occupation or activity of people experiencing the view at particular locations; and
 - The extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations.”

Sensitivity of Visual Receptors

- 8.9.89 The findings on the sensitivity are not known at this stage of the EIA, but the list of factors that could be considered when identifying visual sensitivity will be taken forward into the ES.

Visual Analysis

- 8.9.90 The potential visual effects will be assessed from a series of viewpoints located within the ZTV (see **Figures 8.11 to 8.13** Augmented ZTV (Including Viewpoint Locations)). These locations are currently being agreed in consultation with Lincolnshire County Council and other stakeholders (see **Appendix 8.4** Consultation). The consultation has included workshops and discussions on how the assessment findings from these viewpoints will be used to identify effects on specific receptors. This discussion will also form the basis for making professional judgement of the potential effects upon other receptors in similar geographical locations to the relevant viewpoint.
- 8.9.91 Visual findings to date are summarised below in general terms and for each viewpoint views are discussed based on the information at this stage of the EIA (see **Appendix 8.3** Viewpoint Analysis Tables). Photomontages will be taken forward into the ES in Consultation with Lincolnshire County Council and other stakeholders.
- 8.9.92 Within the overall Study Area, the combination of the low-lying landscape, the layering of the intervening hedgerows and the lack of significant vintage points limits the overall extent of views. Other intervening features such as treed field boundaries

and intervening settlements further influence the nature and extent of the views. A sense of enclosure and intimacy is experienced in some parts of the Study Area, and this contrasts with open horizons in some parts where the local elevations in landform and limited hedgerow and tree cover create a more open horizon. These contrasts in the visual baseline for each Site are set out below:

- 8.9.93 **Cottam 1:** *Close range* views towards the Site are obtained from the footpath and bridleway system to the east, and which connect between Ingham in the south towards Glentworth in the north. Views are available from locations immediately adjacent to the Site from the bridleway network at locations VP32 and VP36.
- 8.9.94 In more *mid-range* views from this footpath and bridleway network, the intervening hedgerows provide screening and layering in views towards the Site from typical locations such as VP28 just to the north of the village of Ingham and VP 31 just to the south of the hamlet of Fillingham.
- 8.9.95 There are some high sensitivity *residential receptors* in close proximity to the Site. To the north this includes North Farm, Turpin's Bungalow, Turpin Farm and Side Farm. To the south, properties include Blackthorn Hill, The Grange and Cold Harbour. To the west residential receptors within the villages of Willingham by Stow and Stow are in close proximity to the Site. Residential receptors to the east include Greystones Farm and Fillingham Grange.
- 8.9.96 Views from transport receptors include Gypsy Lane where it meets with Fillingham Lane to the northeast of the Site where views are experienced adjacent to the Site boundary at VP37. Kexby Road meets with Glentworth Road and Gypsy Lane where VP41 is set away from the Site boundary and where views are likely to be screened by intervening hedgerows and tree cover. Middle Street is located to the east of the Site and runs in a north to south direction and views from VP24, VP25, VP27, VP29 and VP30 may yield sequential cumulative effects from this route. Likewise, from Thorpe Lane in the south, there may be sequential cumulative effects from viewpoints VP4, VP7 and VP9.
- 8.9.97 Views are more open from the outlying areas to the east along the ridgeline where the settlements of Brattleby, Ingham, Fillingham and Glentworth may be experienced in the context of a more panoramic view due to the raised landform. Views are characterised by the open agricultural landscape in the foreground. In contrast, views towards the Site from the west are curtailed by the settlements of Sturton by Stow, Stow, Willingham by Stow and Upton. The lack of elevated vantage points to the north and south of the Site also curtail views from this direction.
- 8.9.98 There are a limited number of visual detractors within the Study Area, however due to the low-lying landscape the large-scale agricultural buildings are incongruous and occasional lines of shelterbelt plantings stands out in the landscape. The network of

roads also provides interruptions in some parts, otherwise the visual character is generally intact and cohesive.

- 8.9.99 **Cottam 2:** *Close range* views towards the Site are obtained from the footpath and bridleway network and system of local lanes to the west, which pass in a north south direction heading from Springthorpe in the south, via Corringham, Aisby, Pilham and Blyton. Views are available from locations immediately adjacent to the Site from the bridleway network at location VP49. Other locations along the footpath network include views from a footpath that passes via Corringham at location VP53.
- 8.9.100 In more *mid-range* views, the intervening hedgerows provide screening and layering in views towards the Site but locations at VP44 just to the north of the hamlet of Springthorpe may give rise to some visibility. Station Road to the west may also reveal mid-range views from locations at the village of Corringham and just to the west of Aisby.
- 8.9.101 There are some high sensitivity *residential receptors* in close proximity to the Site, which includes Corringham Grange Farm and The Cottage within the southwest part of the Site. To the south, residential properties are scarce. To the west residential receptors within the villages of Corringham and Aisby are in close proximity to the Site. Residential receptors to the east include a collection of steadings at Ancliff Farm, Home Farm and Taskers Farm. Residential properties to the north include Bonsdale Farm, Aisby House Farm and Moscar Farm.
- 8.9.102 Views from transport receptors include Mill Mere Road where it meets with Corringham Beck Drain to the west of the Site where views are experienced adjacent to the edge of the settlement at VP48. Corringham Road (A631) to the south is set away from the Site boundary and where views are likely to be screened by intervening hedgerows and tree cover, however locations VP45 and VP46 may yield some visibility. The railway line is located to the north of the Site and runs in an east to west direction and views from VP59, at the Blyton Level Crossing may yield effects from this viewpoint. From Pilham Lane to the west there may be sequential cumulative effects from locations at VP52 and VP47.
- 8.9.103 Views are more open from the outlying areas to the east towards the ridgeline where the settlements of Hemswell, Harpswell and Blyborough are situated and where visibility may be experienced in the context of more panoramic views due to the raised landform. Views are characterised by the open agricultural landscape in the foreground. In contrast, views towards the Site from the west are curtailed by the settlements of Corringham, Pilham and Aisby. The lack of elevated vantage points to the north and south of the Site also curtail views from this direction.
- 8.9.104 There are a limited number of visual detractors within the Study Area, however due to the low-lying landscape the large-scale agricultural buildings are incongruous and occasional lines of shelterbelt plantings stand out in the landscape. The network of

roads also provides interruptions in some parts, otherwise the visual character is generally intact and cohesive.

- 8.9.105 **Cottam 3:** *Close range* views towards the Site are obtained from the local road network including the system of local lanes to the south, which pass in an east to west direction heading from Blyton in the west towards Northorpe in the east. Views are available from receptors immediately adjacent to the Site to the north of the railway line at locations VP60, VP61 and VP62. To the south of the railway, receptors immediately adjacent to the Site include VP56, VP58 and VP59. Other locations along the footpath and bridleway network do not yield visibility at close-range to the Site.
- 8.9.106 In more *mid-range* views, the intervening hedgerows provide screening and layering in views towards the Site but locations at VP53 and VP54 just to the north of the hamlet of Corringham may give rise to some visibility. Pilham Lane to the southwest may also reveal mid-range views from locations northeast of Corringham Scroggs at location VP52.
- 8.9.107 There are some high sensitivity *residential receptors* in close proximity to the Site, but these are mostly located to the south of the railway line and include Bonsdale Farm and a property known as Glebe. To the north of the railway line, residential properties are scarce due to the former airfield land use. To the west residential receptors within the villages of Blyton and Laughton are in close proximity to the Site. Residential receptors to the east include Grange Farm, Southorpe Farm and Blenheim Farm. Residential properties to the south include Chapel Yard at Dunstall, Aisby House Farm and Moscar Farm.
- 8.9.108 Views from transport receptors include Green Lane to the south of the railway line near to Bonsdale Farm where views are experienced away from the edge of the Site at location VP57. Other locations at this intersection include locations VP58, which is right at the Site boundary. Kirton Road to the north of the railway line follows the boundary of the disused airfield where views over intervening hedgerows and tree cover may yield some visibility at locations VP60 and VP62. The railway line is located to the north of the Site and runs in an almost east to west direction and views from VP59, at the Blyton Level Crossing may yield effects from this viewpoint. From Laughton Road (A159) to the northwest and the north of the railway line there may be sequential cumulative effects from locations at VP63 right at the Site boundary and then further north at VP64.
- 8.9.109 Views are more open from the outlying areas to the east towards the ridgeline where the settlements of Scotton and Northorpe are situated and where visibility may be experienced in the context of more panoramic views due to the raised landform. Views are characterised by the former airfield use in the foreground and where the agricultural landscape is only evident to the south of the railway line. In contrast, views towards the Site from the west are curtailed by the settlements of Laughton

and Blyton. The lack of elevated vantage points to the north and south of the Site also curtail views from this direction.

- 8.9.110 There are a limited number of visual detractors within the Study Area, however due to the low-lying landscape the former airfield use is incongruous, and the railway line cuts across the landscape. There are also occasional lines of shelterbelt plantings that stand out in the landscape. The network of roads also provides interruptions in some parts, otherwise the visual character is generally intact and cohesive.

8.10 Cumulative Impacts

- 8.10.1 This section provides an overview of potential cumulative landscape and visual effects. The methodology adopted for this cumulative assessment is set out in **Appendix 8.1**. Briefly, the cumulative assessment process comprises the following considerations:

- **Cumulative Effects** as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together' (Scottish National Heritage (SNH), 2012, 4)
- **Cumulative Landscape Effects** as effects that 'can impact on either the physical fabric or character of the landscape, or any special values attached to it' (SNH, 2012:10)
- **Cumulative Visual Effects** as effects that 'can be caused by combined visibility, which occurs where the observer is able to see two or more developments from one viewpoint and/or sequential effects which occur when the observer has to move to another viewpoint to see different developments' (SNH 2012:11)

- 8.10.2 Cumulative landscape effects are likely to include effects:

- *on the fabric of the landscape as a result of removal of or changes in individual elements or features of the landscape and/or the introduction of new elements or features;*
- *on the aesthetic aspects of the landscape – for example its scale, sense of enclosure, diversity, pattern and colour, and/or on its perceptual or experiential attributes, such as a sense of naturalness, remoteness or tranquillity;*
- *on the overall character of the landscape as a result of changes in the landscape fabric and/or in aesthetic or perceptual aspects, leading to modification of key*

characteristics and possible creation of new landscape character if the changes are substantial enough.³²

8.10.3 Cumulative visual effects are likely to include both types of experience combined and sequential. This should be guided by the same principles and consider the following criteria:

- *“the susceptibility of the visual receptors that have been assessed to changes in views and visual amenity;*
- *the value attached to the views they experience;*
- *the size or scale of the cumulative visual effects identified;*
- *the geographical extent of the cumulative visual effects identified;*
- *the duration of the cumulative visual effects, including the timescales relating to both the project being assessed and the other projects being considered, and the extent to which the cumulative effects may be considered reversible.”³³*

8.10.4 The overview of the potential cumulative developments is set out in **Table 8.6** below.

Table 8.6: Potential Cumulative Developments

Scheme	Status	Potential cumulative landscape/visual effects
West Burton Solar Project	1.5km south of Cottam 1	DCO Same timescales as Cottam Solar Project. Due to the proximity of the project, there is potential for sequential and combined visual effects with the project. This may affect receptors to the south and southwest of Cottam 1 using public rights of way and the transport networks. There are also residential receptors at the villages of Gate Burton, Willingham by Stow, Normanby by Stow, Stow, Sturton by Stow, Thorpe in the Fallows, Bransby, Broxholme, Ingleby, Saxilby, Fenton, Torksey, Brampton and Marton. At close-range, views between the Sites are likely to be seen in succession (the observer must turn to see the Sites). With more distant views, views between the Sites are likely to be seen in combination, particularly to the north of

³² Landscape Institute and Institute of Environmental Management and Assessment, 2013, *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition, Routledge, London. P124.

³³ Landscape Institute and Institute of Environmental Management and Assessment, 2013, *Guidelines for Landscape and Visual Impact Assessment*, 3rd Edition, Routledge, London. P132.

		Broxholme around Thorpe in the Fallows, Sturton by Stow and Bransby. Both cumulative landscape character and visual effects would be experienced.
West Burton Cable Route Construction	DCO Same timescales as Cottam Solar Project	Due to the proximity of the project, there is potential for sequential and combined visual effects with the project.
Low Carbon Gate Burton 500MW Solar and Energy Storage (Battery)	1km west of Cottam 1	DCO Scoping opinion issued 20.12.21 Likely submission Q4 2022. Due to the proximity of the project, there is potential for sequential and combined visual effects with the project. This may affect receptors to the west of Cottam 1 using public rights of way and the transport networks. There are also residential receptors at the villages of Heapham, Upton, Kexby, Willingham by Stow, Normanby by Stow, Stow, Sturton by Stow, Gate Burton and Marton. At close-range, views between the Sites are likely to be seen in succession (the observer must turn to see the Sites). With more distant views, views between the Site are likely to be seen in combination, particularly around Willingham by Stow, Kexby, Normanby by Stow, Stow, Marton and Gate Burton. Both cumulative landscape character and visual effects would be experienced.
Decommissioning of West Burton A	Exact location as yet unknown)	Awaiting confirmation of what activities are involved with decommissioning as no planning applications have been submitted. Potential intervisibility unlikely, given the proximity of the two Sites. Cumulative combined visual effects would be experienced in succession, but with negligible overall magnitude of change in views. There are not anticipated to be any cumulative landscape character effects.
Demolition of Cottam Power Station	Approved on 02.03.22	Similar timescales as West Burton and Cottam Solar Project. The Station was closed in 2019 and is awaiting demolition. Due to the proximity of the project, there is potential for sequential and combined visual effects with the project,
Heckington Fen solar generation exceeding 50MW	Southeast of Cottam	DCO Scoping opinion issued 17.02.2022 Likely submission Q1 2023. Potential intervisibility unlikely, given the proximity of the two Sites. Combined visual effects would be in

with energy storage		succession with negligible overall magnitude of change in views. There are not anticipated to be any cumulative landscape character effects.
Automotive Research and Development Centre, including garaging, circuit viewing facilities, 2 no wind turbines and ground mounted solar panels. Land at Blyton Park Driving Centre	Immediately north of Cottam	Application approved 03.03.2022. Due to the proximity of the project, there is potential for sequential and combined visual effects with the project. This may affect receptors to the north and northwest of Cottam 3 using public rights of way and the transport networks. There are also residential receptors at the villages of Laughton, Blyton and Pilham. At close-range, views between the Sites are likely to be seen in succession (the observer must turn to see the Sites). With more distant views, views between the Sites are likely to be seen in combination, particularly around Laughton and Pilham. Only limited cumulative landscape character effects and visual effects are likely to be experienced.
Site Allocation Strategic Policy LP8 Employment Site Land at Lincolnshire Showground (Central Lincolnshire Local Plan 2017)	5.1km southeast from Cottam 1	LDO/Masterplan – no details in public domain or approved. Potential intervisibility unlikely, given the proximity of the two Sites. Cumulative combined visual effects would be experienced in succession, but with negligible overall magnitude of change in views. There are not anticipated to be any cumulative landscape character effects.
Sustainable Urban Extension Policy 48 Gainsborough Northern Neighbourhood SUE Allocation (Central Lincolnshire Local Plan 2017)	3.5km west from Cottam 2	128.8 ha 2,500 total dwellings and 750 dwellings in plan period 2012-2036. This may affect receptors to the west of Cottam 2 and the southwest of Cottam 3 using public rights of way and the transport networks. There are also residential receptors at the villages of Blyton, Pilham, Corringham, Springthorpe and Heapham. At close-range, views between the Sites are likely to be seen in succession (the observer must turn to see the Sites). With more distant views, views between the Sites are likely to be seen in combination, particularly around Pilham, Corringham and Springthorpe. Both cumulative landscape character and visual effects would be experienced, but they are unlikely to be significant.

8.10.5 Due to a combination of overall distance, and/or intervisibility between the Sites included in the cumulative list at this stage there is likely to be some significant landscape and visual effects predicted. Based on the information known at this time the following Sites are potential cumulative developments that are likely to yield significant effects:

- West Burton Solar Project
- West Burton Cable Route Construction
- Low Carbon, Gate Burton 500MW Solar and Energy Storage (Battery)
- Demolition of Cottam Power Station; and
- Automotive Research and Development Centre, including garaging, circuit viewing facilities, 2 no wind turbines and ground mounted solar panels. Land at Blyton Park Driving Centre.

8.11 Summary and Conclusions

8.11.1 This chapter of the PEIR has identified the existing environment in relation to the landscape and visual resource and the assessment work that has been undertaken to date. The main objective is to provide as much relevant information at this stage in the project. Preliminary mitigation measures that are being explored have been described, and there is discussion of the residual impacts, however it is not possible at this stage to identify all the significant likely environmental effects of the Scheme.

8.11.2 The chapter sets out sufficient information to allow the relevant consultation authority to provide an informed view on the proposals at this stage in the project based on the information known at this time. The summary matters relating to the landscape and visual resource are set out within **Table 8.7** below.

Table 8.7: Summary Matters

Summary Matter	Description	Consulting Local Planning Authority Position
LVIA Process	Necessary to meet the requirements for the NSIP process as part of an ES.	Satisfied that an LVIA is being undertaken and that it is prepared by a relevant chartered professional.
LVIA Methodology	This is set out within Appendix 8.1 . The LVIA methodology follows best practice guidance in accordance with the approach within GLVIA3.	Satisfied that the LVIA Methodology is in accordance with best practice guidance. See Local Planning Authority comments (Appendix 8.4).
Policy Context	This is set out within Section 8.2 and Table 8.1 . The IPC must decide an application for energy infrastructure in accordance with the relevant National Planning Statement (NPS).	Satisfied that the landscape-related planning policy is appropriate within the context of the NPS.
Cumulative Developments	This is set out within Figure 8.15, Table 8.3 and Table 8.6 . There are seven cumulative sites/developments where landscape and visual effects may be caused by a proposed development in conjunction with other similar developments, or as a combined effect of a set of developments taken together. Three of these cumulative sites/developments are proposed to be taken forward into the LVIA as part of the ES.	Satisfied with the initial identification of cumulative developments. Yet to reach final agreement on the list cumulative sites/developments to be taken forward into the LVIA as part of the ES. See Local Planning Authority comments (Appendix 8.4).
Landscape Character	This is set out within Appendix 8.2 and Table 8.4 . The baseline is covered by three-character areas at the national level Located as identified within the Natural England National Character Areas (NCA) Profiles. At the regional level, there are three-character areas as identified within the East Midlands Regional Landscape Character Assessment (EMRLCA).	Yet to reach agreement that the context of the landscape resource is appropriate. Yet to reach agreement that the overall landscape character sensitivity is appropriate to the context of the landscape resource. Comments received by LCC requests to include a finer grain landscape assessment that includes the Site and immediate area and that also considers individual landscape elements.

Landscape Receptors	<p>The baseline conditions within the Site and Study Area are broadly considered under the following sub-headings:</p> <p>Land use</p> <ul style="list-style-type: none"> • Topography and watercourses • Communications and infrastructure • Settlements, industry, commerce and leisure • Public rights of way and access • Nationally and locally designated landscape • Scheduled monuments, listed buildings, conservation areas and registered parks and gardens; and • Ancient woodland and natural designations. 	<p>Yet to reach agreement that the broad consideration of the landscape receptors is appropriate.</p> <p>Comments received by LCC requests to include a finer grain landscape assessment that comprises the Site and immediate area and that also considers individual landscape elements.</p>
Visual Resource	<p>This is set out within Appendix 8.3. A suite of viewpoints has been identified through desk studies which have been ground truthed through fieldwork in February and March 2022. Their locations have been subject to consultation with the relevant planning authorities and other stakeholders where some additional viewpoints have been included and photography undertaken. Viewpoint selection would follow good practice and in particular paragraphs 6.18 to 6.20 of GLVIA3. The viewpoints proposed will be used to aid the description of effects on both landscape and visual resources and would be utilised for assessment purposes</p>	<p>LCC generally satisfied that the consideration of the visual receptors is appropriate. See appendix 8.4 for details of additional requests and considerations.</p> <p>Satisfied with viewpoint locations. Yet to reach agreement with the presentation of the photography. LCC have requested a full methodology of photography, photomontages and presentation should be provided that aligns with LI TGN 06/19. This should include full details of the elements that have been modelled (Solar Arrays, substation etc.)</p>
Landscape Mitigation	<p>This is set out within Figure 8.16. The Scheme incorporates specific landscape mitigation measures. These include the</p>	<p>LCC recognise that the approach to landscape mitigation is an iterative process, and the baseline elements are still being defined. As such at</p>

	enhancement of hedgerows and new planting where gapping up is required. Existing planting within the Site will be retained where possible and enhanced by additional planting, including trees is select locations to improve screening.	this stage commentary on any potential mitigation or layout of the development is not being provided.
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9 Ecology and Biodiversity

9.1 Introduction

- 9.1.1 The Ecology and Biodiversity chapter of the PEIR sets out the baseline information available at the time of writing and provides a preliminary consideration of the likely effects of the Scheme on ecological features during its construction, operation and decommissioning phases.
- 9.1.2 Ecological features which will form the basis of the assessment will include:
- Statutory and non-statutory sites designated for nature conservation at international, national and local levels;
 - Habitats and species of principal importance for the conservation of biodiversity; and
 - Other legally protected, red-listed or notable species of conservation interest.
- 9.1.3 This chapter will describe the currently available ecological baseline derived from extensive site and desk-based surveys and assess the possible level of effects likely to arise, together with any avoidance, mitigation and compensation measures likely or capable of being adopted to reduce these in accordance with nature conservation legislation and planning policy. Proposals for ecological enhancement to contribute to local conservation priorities and achievement of Biodiversity Net Gain (BNG) in line with the Environment Act 2021 (if applicable) and national and local policies will also be presented.
- 9.1.4 Where Scheme designs and details are either not yet known or incomplete at this stage, either assumptions have been made based on professional judgment, or, in the event that it is not possible to make any assumptions, no attempt at a full assessment has been made. This assessment is an iterative process and will be both expanded and made more specific as survey data is collected, analysed and reported on, and designs are further developed. This process will be carried out in conjunction with relevant consultees and third parties as necessary to achieve the most robust outcome.

Appendices and Figures

- 9.1.5 This chapter is supported by the following appendices:
- **Appendix 9.1** Preliminary Ecological Appraisal, Cottam Solar Project – Clarkson and Woods, August 2021.
 - **Appendix 9.2** Extended Phase 1 Habitat Survey Maps, Cottam Solar Project – Clarkson and Woods, August 2021.

- **Appendix 9.3** Cable Route Desk Study
- **Appendix 9.4** Consultation Responses
- **Appendix 9.5** Summary of Bat Survey Results to Date
- **Appendix 9.6** Summary of Otter and Water Vole Survey Results
- **Appendix 9.7** Schedule of Protective Ecological Buffers

Legal and Policy Context

9.1.6 Key legislation relevant to biodiversity and nature conservation which will inform the assessment process includes:

- The Environment Act 2021;
- The Conservation of Habitats and Species Regulations 2017 (as amended) ('The Habitats Regulations');
- The Wildlife and Countryside Act 1981 (as amended);
- The Natural Environment and Rural Communities (NERC) Act 2006, specifically the 'Section 41 lists' of Species and Habitats of Principal Importance which are capable of being material consideration within the planning process;
- The Countryside Rights of Way Act 2000;
- The Protection of Badgers Act 1992; and
- The Hedgerows Regulations 1997.

9.1.7 Key planning policy relevant to biodiversity and nature conservation which will inform the assessment process includes:

- Adopted National Policy Statement (NPS) EN-1: Energy and the draft revised NPS EN-1;
- Draft revised NPS EN-3 Renewable Energy Infrastructure;
- The National Planning Policy Framework Section 15;
- Central Lincolnshire's Local Plan (adopted 2017). Specific policies:
 - Policy LP19: Renewable Energy Proposals
 - Policy LP20: Green Infrastructure Network

- Policy LP21: Biodiversity and Geodiversity
- Bassetlaw Core Strategy (adopted 2011);
- Neighbourhood Plans listed at section 6.5 of the PEIR.

9.1.8 Key guidance relevant to biodiversity and nature conservation which will inform the assessment process includes:

- Natural England Standing Advice regarding Protected Species
- Biodiversity 2020: A strategy for England's wildlife and ecosystem services
- Lincolnshire Biodiversity Action Plan
- Nottinghamshire Biodiversity Action Plan
- Biodiversity Opportunities Mapping for Lincolnshire
- Nature Recovery Strategy for Lincolnshire
- Defra's Biodiversity Metric v3.1
- British Standard BS42020: Biodiversity: a Code of Practice for Planning and Development
- BRE (2014) Biodiversity Guidance for Solar Developments. Eds G E Parker and L Greene
- Natural England Technical Information Note TIN101 (2011) Solar Parks: Maximising Environmental Benefits. Natural England
- Natural England (2017) Evidence Review of the Impact of Solar Farms on Birds, Bats and General Ecology (NEER012) 1st Edition
- Montag H, Parker G and Clarkson T (2016) The Effect of Solar Farms on Local Biodiversity: A Comparative Study. Clarkson and Woods and Wychwood Biodiversity
- Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and Win I. 2021. The status of our bird populations: the fifth Birds of Conservation Concern in the United Kingdom, Channel Islands and Isle of Man and second IUCN Red List assessment of extinction risk for Great Britain. British Birds 114: 723-747

- Wray, S., Wells, D., Long, E. and Mitchell-Jones, T. (2010). Valuing Bats in Ecological Impact Assessment. In Practice, December 2010. Chartered Institute of Ecology and Environmental Management

9.2 Consultation

- 9.2.1 The preparation of this document has been informed through consultation with relevant parties, as summarised in Table 9.1 below. Consultation responses can be found compiled in **Appendix 9.4**.

Table 9.1: Chronological Summary of Consultation

Consultee, Enquiry and Dates	Summary of Response	Action or Outcome
RSPB 23/08/21 Applicant ecologist contacted RSPB Adviser to request consultation advice on scheme. Response received 13/09/21.	RSPB Conservation officer for The Wash and North Norfolk Coast responded to confirm that the RSPB do not have advisers working in the geographical region of the Scheme and therefore are unable to resource any consultation in this instance.	No further action taken.
Nottinghamshire Wildlife Trust (NWT) Pre-application advice received from Senior Conservation Officer dated 29/10/21.	NWT provided high-level advice on the expectations for avoidance and mitigation of impact and assessment of baseline conditions. Advice based on Preliminary Ecological Appraisals (PEAs) and generic design information. This document forms part of the consultation package submitted to PINS during the EIA scoping process.	Advice has been noted with a view to being acted upon throughout the baseline data collection, design, mitigation and assessment processes.
NWT Applicant ecologist contacted Senior Conservation Officer on 25/11/21 request meeting to discuss progress on Scheme and approach to baseline assessment. Meeting took place 01/12/21.	Discussion took place to provide background on ecological survey scope, identify potential ecological impacts and outline the avoidance and mitigation measures which might be incorporated. Officer broadly satisfied with progress and no amendment to previously-supplied pre-application advice was considered necessary.	No action required as a result of the meeting.

<p>NWT Applicant ecologist contacted Senior Conservation Officer on 14/04/22 to request meeting to discuss progress on Scheme and approach to baseline assessment of the cable routes. Meeting took place 21/04/22. Written response received 22/04/22.</p>	<p>Officer acknowledged all documents provided on the layout of cable routes and detailed proposed approach to ecological survey scope. Officer was satisfied with all provided information in relation to survey scope. Officer recommended cabling operations to be undertaken via a Precautionary Method of Working/Ecological Clerk of Works arrangement. MS recommended stronger wording in relation to the avoidance of impacts on Local Wildlife Sites, including opportunities for their enhancement.</p>	<p>All advice noted and will be incorporated into the proposed Outline Construction Environmental Management Plan (CEMP) and Landscape Ecological Management Plan Outline (LEMP) as necessary, as well as the design of the Scheme.</p>
<p>Lincolnshire Wildlife Trust (LWT) Applicants ecologist contacted LWT on 25/11/21 to request meeting to discuss progress on Scheme and approach to baseline assessment. No meeting took place but written response received from– Conservation Officer dated 15/12/21.</p>	<p>Conservation Officer provided high-level advice on the expectations for avoidance and mitigation of impact and assessment of baseline conditions. Advice based on Preliminary Ecological Appraisals (PEAs) and generic design information. This document forms part of the consultation package submitted to PINS during the EIA scoping process.</p>	<p>Recommendations for observance of: Biodiversity Opportunities Mapping, mitigation for skylark and yellow wagtail, grassland management practicalities, roadside nature reserves, fencing permeability, lighting impacts, local parish policies, BNG, post-construction ecological monitoring and habitat management objectives were noted and will be factored into the Scheme design.</p>
<p>Lincolnshire Wildlife Trust (LWT) Applicants ecologist Head of Conservation (HoS) on 14/04/22 to discuss progress on Scheme and approach to baseline assessment of the cable routes. Meeting took place 22/04/22. Awaiting written response.</p>	<p>HoS broadly satisfied with approach to ecological survey and assessment both in relation to array sites and the cable routes. HoS advised that resources were limited at LWT at the current time but would endeavour to put a response in writing in due course.</p>	<p>No action required as a result of the meeting.</p>

<p>Natural England (NE) Applicants ecologist requested opening a Discretionary Advice Service (DAS) contract which was signed on 14/02/22. Kick off meeting took place 05/04/22 and advice requested.</p>	<p>Applicants ecologist requested advice concerning various aspects including species survey scope, identification of sources of potential impact, identification of potential avoidance techniques and mitigation measures and impacts upon protected sites. Advice received confirmed general acceptability of approach to survey for several species (bats, great crested newt, otters and water voles) and lack of impacts on Humber Estuary and Scotton Common and Laughton Woods SSSI complex.</p>	<p>Advice received is referred to as appropriate within this document and will form basis of future assessment. DAS is an ongoing process and dialogue with NE will be progressed to confirm further points in relation to cable installation works and mitigation proposals.</p>
<p>Sturton by Stow Parish Council (SSPC) Pre-application consultation received 14/02/22</p>	<p>SSPC referred to the presence of the River Till ecological restoration corridor as an opportunity for BNG. The local presence of golden plover, lapwing, swans and great burnet were also noted.</p>	<p>All points noted and have been and will be considered in the assessment, mitigation and habitat management process as appropriate.</p>
<p>Planning Inspectorate (PINS) EIA Scoping Opinion received 09/03/22.</p>	<p>PINS recommended polecat and fish should be scoped in to the assessment and agreed with scoping out dormice. PINS also recommend further information on mitigation for skylark, yellow wagtail, lapwing and birds breeding in boundary features. Potential lighting impacts should be identified and assessed. A 30km data search radius to be used for designated sites with bat or bird features. Further badger survey information to be collected. Confidential annexes to be used in the ES concerning sensitive ecological information.</p>	<p>Polecat and freshwater fish remain part of this assessment. Further requested information on bird mitigation and lighting will be incorporated into this assessment when available. 30km search radius used as requested. Further information of badger setts has been collected and will be summarised in the confidential appendix for the ES.</p>

<p>NE EIA scoping consultation received 09/03/22 (dated 25/02/22).</p>	<p>NE advise that impacts upon four SSSIs associated with Scotton Common and Laughton Woods should be considered (proximity to Cottam 3). NE recommend that cumulative impacts from three other solar projects (not including West Burton Solar Project) should be factored in. Further information on BNG and connectivity with the Nature Recovery Network is recommended. Information on decommissioning impacts and aftercare is also advised.</p>	<p>SSSI advice has been superseded by DAS advice received since. Cumulative effects of the mentioned sites is incorporated into this assessment, as are decommissioning effects. BNG is discussed, albeit in advance of a full assessment being possible at this stage. Enhancements are proposed in this assessment which contribute to the aims of the Nature Recovery Networks.</p>
<p>Bassetlaw District Council (BDC) EIA scoping consultation received 09/03/22 (dated 24/02/22).</p>	<p>BDC highlight the need for sensitivity in potential impacts on the River Trent 'main green corridor' and Cottam Power Station Local Wildlife Site, provision of BNG and the need to understand potential for lighting impacts on ecology.</p>	<p>Comments noted and will be incorporated into future iterations of this assessment as the preferred cable route has not yet been finalised so detailed impacts cannot be assessed. The intention is to remediate and enhance following any impacts upon notable habitats associated with the River Trent.</p>
<p>West Lindsey District Council (WLDC) EIA scoping consultation received 09/03/22 (dated 25/02/22).</p>	<p>WLDC recommend further information regarding impacts of fencing on mammal movements is provided.</p>	<p>Noted and incorporated as appropriate into this document.</p>
<p>Canal and Rivers Trust (CRT) EIA scoping consultation received 09/03/22 (dated 14/02/22)</p>	<p>CRT note that directional drilling was proposed for cable installation beneath the River Trent and that this process risks release of sediments and contaminants into the water. The CRT also draw attention to the potential impacts of construction lighting on river wildlife.</p>	<p>Comments noted and discussion on river disturbance and lighting incorporated as appropriate into this document.</p>

Environment Agency (EA) EIA scoping consultation received 09/03/22 (dated 24/02/22)	EA highlight opportunities for enhancement of watercourses within the Scheme and point out the opportunities for Natural Flood Management. EA recommend an assessment of invasive species across the Site.	As per response to comments from BDC above. Additionally, opportunities for Natural Flood Management will be explored.
Defence Infrastructure Organisation (DIO) EIA scoping consultation received 09/03/22 (dated 23/02/22).	Due to the presence of the aerodrome at RAF Scampton, some 5km from Cottam 1, the DIO recommend further consultation in relation to any part of the Scheme which might attract large and/or flocking birds and so increase the risk of birdstrike.	It is considered highly unlikely that the Scheme will attract flocking birds within proximity of RAF Scampton.

9.3 Assessment Methodology

9.3.1 The baseline conditions are derived from several in-progress and some complete desk and field based studies, the methodologies of which are given separately in Section 9.4. The following section describes the method for the assessment of effects of the Scheme on these baseline conditions. The standard approach applied in the UK to Ecological Impact Assessment (EcIA) is that developed by the Chartered Institute of Ecology and Environmental Management (CIEEM) in 2018 and revised in 2019³⁴. This will be used to evaluate existing conditions, and to assess the significance of likely effects on ecological features that may arise during construction, operation and decommissioning of the Scheme. This involves determining the relative importance of each ecological feature and undertaking an impact assessment pre and post-implementation of mitigation measures. From this, any residual effects likely to occur can be identified along with an appreciation of their significance.

Assessment of Ecological Importance

9.3.2 When evaluating the baseline biodiversity importance of natural features found on the site (those listed in 9.1.2), the following characteristics are considered:

- Animal or plant species which are rare or uncommon, either internationally, nationally or more locally;
- Ecosystems which provide the habitats required by the above species;

³⁴ CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. CIEEM, Winchester.

- Species that are afforded legal protection;
- Endemic or locally distinct sub-populations of a species;
- Habitat diversity, connectivity and/ or other synergistic associations;
- Priority Species and Habitats under the Natural Environment and Rural Communities (NERC) Act, 2006;
- Notably large populations or concentrations of animals considered uncommon or threatened in a wider context;
- Plant communities that are considered to be typical of valued natural/ semi-natural vegetation types;
- Species at the edge of their range; and
- Species-rich assemblages of plants or animals.

9.3.3 Habitats, species and sites identified in the baseline conditions will all be attributed with an ecological importance. The importance or potential importance of an ecological feature will be described in a geographical context (i.e. International, National, Regional, County, District and Local importance). Furthermore, a category of 'Site' importance will be applied to a feature which is present or potentially present at the site, but where the importance to nature conservation of the feature is of relatively low value in the context of the wider landscape. A further 'Negligible' category will be assigned to features of no particular intrinsic nature conservation importance.

9.3.4 In line with the guidelines set out by CIEEM, the impacts of the proposed development will only be assessed on those Important Ecological Features (IEFs) with importance equal to, or higher than Local level, or where mitigation is required for non-IEFs where it is necessary to ensure legal compliance. Habitats or species which are present for which there may be a potential breach of legislation will be considered to be IEFs, even if the feature itself is not considered to be of significant intrinsic nature conservation importance. Non-statutory designated sites will also be identified as IEFs where these lie within the Zone of Influence of the project.

9.3.5 Published selection criteria, contained within the selection of Biological Sites of Special Scientific Interest (SSSI), can also be referred to aid the assessment of importance. Where significant habitats, such as Ancient Woodland, do not carry a designation, these are nevertheless considered at a specified geographic level.

Characterisation of Impacts

- 9.3.6 When assessing the impact of the development and impacts on baseline conditions, predictions will be made which focus solely on the Zone of Influence for each IEF in the context of the lifetime of the development. The Zone of Influence will be assessed separately for each individual feature. Features considered when defining the Zone of Influence of the Scheme on each IEF include the vulnerability of sites and habitats to the effects of construction and operation of the array, the mobility of species both on and surrounding the site, the sensitivity of species to noise and disturbance, the impacts on transient or migratory species and the importance of any particular species or habitats as keystone features within local ecological networks.
- 9.3.7 Each potential impact on an IEF will be assessed at its respective geographical scale. Where appropriate, the following parameters will be used in characterising effects:
- Positive or Negative (whether the impact will have a Positive or Negative effect);
 - Magnitude (the size of the impact);
 - Extent (area over which impact occurs);
 - Duration (time impact expected to last before recovery);
 - Reversibility (an impact may be permanent or temporary); and
 - Timing and frequency (impact may be seasonal e.g. bird nesting season).
- 9.3.8 Impacts are described as being short-term, medium-term and long-term. Generally short term impacts are taken as those which are not anticipated to persist for longer than 3 years, medium-term impacts those which persist between 4 and 10 years and long-term impacts are those which are anticipated to persist over a period in excess of 10 years. It should be noted that for certain species groups, such as invertebrates, a short-term impact of two years may constitute four generations and as such may be more consistent with a medium-term impact for this species group. Where short, medium or long-term are considered to deviate from the timeframes described above this is highlighted for that particular habitat or species.

Application of The Mitigation Hierarchy and Biodiversity Net Gain

- 9.3.9 The stepwise approach of avoidance, mitigation and compensation will be followed when reducing potential impacts.
- 9.3.10 Negative impacts can be avoided through fundamental scheme design choices, such as which fields to include within the final scheme and the extent of the final

development site boundary. Avoidance of impacts can also be part of the mitigation package, such as the imposition of protective buffer zones from sensitive features kept free of all development activity. A distinction is made between avoidance undertaken in deciding the fundamental size and location of the scheme and avoidance undertaken in the mitigation process when designing the detailed scheme (such as fencing and buffer zones). Fundamental avoidance is included in the characterisation of impacts 'pre-mitigation', while all other measures are taken into consideration when characterising impacts in the light of proposed mitigation.

- 9.3.11 Mitigation measures are typically given where likely adverse impacts are identified upon the IEFs. The mitigation measures will aim to reduce the overall impact value, typically at the location at which the impact occurs. An assessment of residual effects which takes account of the proposed mitigation is then made. Due consideration is given to the reliability of mitigation measures and the likelihood that they will achieve their stated goals, using the terms defined above.
- 9.3.12 Mitigation measures are also identified for species which did not qualify as IEF but which are afforded legal protection under the Wildlife and Countryside Act (1981) or other legislation, and as such will require certain precautionary methodologies to avoid offences being committed.
- 9.3.13 Compensation measures may be appropriate for IEFs which are likely to experience significant effects once mitigation options have been exhausted. Compensation measures seek to offset these residual effects, for example through the provision of alternative habitat either elsewhere within or outside of the scheme boundary. An examination of the uncertainty in achieving successful compensation will take place. Finally, any remaining residual effects can then be assessed.
- 9.3.14 Ecological monitoring is likely to form a key role in the success of any proposed mitigation or compensation measures.
- 9.3.15 Ecological enhancement measures are those which are not expressly required in order to deliver mitigation or compensation but are included to provide further benefits for nature conservation. The Environment Act 2021 contains provisions that require that at least a 10% net gain for biodiversity be demonstrated through a Biodiversity Net Gain assessment (using Defra's Biodiversity Metric 3.1 or later). It is noted that these provisions are not currently in force for NSIPs, however, a Biodiversity Net Gain assessment will form part of the ES chapter.

Residual Effects and Assessment of Significance

- 9.3.16 Following the methodology described by CIEEM, an ecologically significant effect is defined as "an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general. Conservation objectives may be specific (e.g. for a designated site) or broad (e.g.

national/local nature conservation policy) or more wide-ranging (enhancement of biodiversity). Effects can be considered significant at a wide range of scales from international to local”.

- 9.3.17 In line with CIEEM guidance, significance of residual effects will be described as being ‘significant’ or ‘not significant’. As CIEEM guidance discourages the use of the matrix approaches to assign categories (e.g. minor, moderate, major) to residual effects, ‘significant’ residual effects will be qualified with reference to the appropriate geographical scale at which the effect is considered to be felt.

Cumulative and In-Combination Effects

- 9.3.18 In-construction, consented or emerging proposals of sufficient size, scale and development nature to cause or increase effects upon IEFs in combination with the proposed development will be examined. Cumulative effects may be additive or synergistic and result from individually non-significant but collectively significant impacts. Implications for further mitigation or compensation will be considered, as well as changes to any likely residual effects. This includes, principally, the associated proposal for the West Burton Solar Project and Gate Burton Solar Project as well as others identified through consultation and detailed accordingly. Please refer to **Chapter 2** and **Appendices 2.2 and 2.3** within this PEIR for information regarding the process for establishing which schemes will form part of this assessment.

9.4 Preliminary Baseline Conditions and Ecological Evaluation

- 9.4.1 This section aims to provide ecological background information and a summary of desk study and preliminary survey information, together with a summary of the kinds of impacts on ecological features which may arise from the proposals.

Study Area and Ecological Context

- 9.4.2 The Scheme comprises three solar array (incorporating battery energy storage) Sites, Cottam 1, 2 and 3 (comprising Cottam 3a and 3b), with an associated cable route to cover approximately 20km between the Sites and Cottam Power Station which will be the Point of Connection. Further short sections of cable will link up the disparate parcels of land which make up Cottam 1.
- 9.4.3 At present, the final cable route is yet to be determined. A red line boundary encompassing land to be examined as a candidate for the final cable route has been established. It is understood that only a narrow width within these corridors will be required for the cable route and its construction. This is referred to as the ‘Cable Route Search Area’ (CRSA) for the purposes of this ecology chapter and forms the scope of the ecological desk study for the cable route used at PEIR stage, within which ecological records (notable species and habitats and designated sites) will be searched for.

- 9.4.4 The final location of the cable route elements will be refined through use of the desk study, supported by further ecological survey and consideration of responses to statutory consultation, prior to submission of the DCO application. Therefore, the survey work undertaken for these elements to date is less advanced. This refinement process is underway but is incomplete. The process will result in a preferred cable route corridor ('PCRC' for the purposes of this ecology chapter) being determined subsequent to PEIR submission which will form the Survey Area for necessary ecological fieldwork. This corridor will comprise a 100m wide swathe of land, made up of 50m either side of the preferred cable route. The results of surveys will then be further analysed and the PCRC refined and it is this final route which will be included for submission with the DCO application.
- 9.4.5 The array sites predominantly comprise large, open and generally flat arable fields characterised by winter-sown cereal crops with some fields of permanent pasture (Cottam 1), bounded by a network of managed hedgerows and ditches with narrow field margins, where present. The Sites' habitats are very much typical of the surrounding landscapes which are dominated by arable farmland and occasional pasture grassland that is interspersed with small settlements and farmsteads linked by minor and single track roads. The landscape surrounding Cottam 1 – 3 is mostly flat but to the east of the Sites lies the 'Lincoln Cliff', a significant north-south escarpment, located 3km east of Cottam 1. The River Trent is located 5km west of Cottam 1 as it flows north towards the Humber Estuary, itself some 22km north of Cottam 3.
- 9.4.6 While no significant woodland is present within the sites, several small stands of managed and unmanaged woodland are present adjacent and in the surrounding landscape, often the result of historical game management. Permanent standing water is generally absent from the Sites and the surroundings following the in-filling of traditional livestock drinking ponds, save for a very small number of agricultural pools/pits, decoy ponds or managed recreational fishing ponds. Flowing water occurs occasionally in the form of various feeder streams for more significant local watercourses and are managed as agricultural drainage ditches within or adjacent to the Sites, many of which regularly dry out. The River Till runs adjacent to the western boundary of Cottam 1, while the Corringham and Yawthorpe Becks bound much of Cottam 2, and then Northorpe Beck forms the eastern boundary of Cottam 3.

Designated Sites

- 9.4.7 Statutory designated sites for nature conservation were identified using the Natural England/DEFRA web-based MAGIC map database (www.MAGIC.gov.uk). The Lincolnshire Environmental/ Biological Records Centre (LERC) was consulted for details of locally-designated and non-statutory sites for nature conservation. The following search criteria were used:

- 'International' designated sites (e.g. Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Ramsar sites) were searched for within 10km from each array site and the cable route. This was extended to 30km for any such sites for which migratory birds or bats are listed as a qualifying feature.
- 'National' sites (e.g. Sites of Special Scientific Interest (SSSIs)) and Local Nature Reserves (LNR) were searched for within 5km.
- Local sites (Such as Local Wildlife Sites (LWSs)) were searched for within 2km.

9.4.8 These search radii are standard distances used in ecological impact assessment for projects of this nature and scale. It is considered unlikely that the proposed development would give rise to impacts on designated sites beyond these ranges.

9.4.9 Statutory and non-statutory sites designated for nature conservation were identified within the desk study element of the PEA in **Appendix 9.1** and for the Cable Route Search Area in **Appendix 9.2**. Both appendices also provide maps showing the relationship between the designated sites and the Sites or Cable Route. This information is summarised below.

All Sites

9.4.10 The Humber Estuary SPA is situated approximately 24km from Cottam 3, 28km from Cottam 2 and 35km from Cottam 1. It is the second largest coastal plain estuary in the UK (covering over 37,600ha) and supports important numbers of geese, ducks and waders during the winter, as well as important breeding populations of bittern, marsh harrier, avocet and little tern during the summer. This site is considered to be of **International Importance**.

Cottam 1

9.4.11 Three non-statutorily designated sites were identified within 2km of Cottam 1. These were all considered to be of **County Importance** and comprise:

- Willingham to Fillingham Road Verges LWS – Adjacent to site - a length of road verge that supports a diverse range of grassland species. A walkover survey of this site was undertaken on 8th September 2021 and found the verge to be in reasonably good condition for the majority of its length, with a moderate diversity of species including abundant meadowsweet, greater burnet and black knapweed and a moderate diversity of fine grasses. The verge had been heavily mown along the western reaches close to residential properties and yellow composite were most evident here. It is noted that the verge suffers substantially from over-run due to the narrowness of the road carriageway which leads to damage from overtaking and the passage of agricultural

machinery (particularly during harvesting). At the eastern end, the verge was closely mown on the north side close to a residential track and dominated by hogweed and umbellifers on the north.

- Willingham Parish Fields LWS – 165m north west - Two adjacent fields beside Stone Pit Lane that together support a good range of neutral grassland plants, as well as a botanically-rich pond.
- Upton Grange Road Verges LWS – 1.1km north – Botanically species-rich verges with neutral grassland and adjacent hedgerows. The invertebrate diversity on these is likely to be high.

Cottam 2

9.4.12 No designated sites were identified in proximity to Cottam 2 within the desk study.

Cottam 3

9.4.13 Five SSSIs and one LNR were located at least 1.5km north of the Site. The SSSIs were components of a complex of sites within Laughton Woods and Scotton Common which are large, contiguous Forestry Commission woodland sites which contain important habitats and reserves for protected habitats (heathland, wetland, grassland and woodland) and species (reptiles, invertebrates, birds – woodlark, nightjar, and plants). Similarly, the six Local Wildlife Sites (LWSs) given are also associated with the above SSSI sites, overlapping with, or augmenting them. These sites are considered to be of **National Importance** (SSSIs) and **County Importance** (LWSs) and comprise:

- Dallison Plantation LWS – 0.9km north – Botanically important with wide variety of locally rare habitats including dry heathland, wetland and neutral grassland.
- Scotton Common SSSI – 1.5km north – Rare example of lowland heathland in Lincolnshire, supporting common lizard, adder, scarce plants and rare moths.
- Scotton Road Verges LWS – 1.5km north - A botanically diverse road verge with wet ditch containing county-rare plants and orchids.
- Scotton Beck Fields SSSI – 1.6km north – Unimproved acidic grassland and heathland botanical communities.
- Scotton Common, Loates Field LWS – 1.6km north – Diverse grassland flora.
- Laughton Forest South-east LWS – 1.6km north – Diverse beech and pine plantation with botanically rich acidic grassland and fern flora.

- Scotton Common East LWS – 1.6km northeast – Diverse neutral and unimproved acid grassland, as well as ditches and a pond.
- Laughton Forest East LWS – 1.8km north – Large areas of heathland and acid peatland supporting county rare species of flora and fauna, including breeding woodlark and nightjar, and common lizard.
- Laughton Common SSSI – 2.3km northwest – Lowland acid grassland, dune and heath.
- Scotton and Laughton Forest Ponds SSSI – 2.4km north – Peaty heathland pools with open acid grassland and botanically important mire habitats.
- Tuetoos Hill SSSI – 5.0km north – Important mosaic of dry acid grassland including dune grassland.
- Owlet LNR – 2.2km west – Birch, oak and pine woodland interspersed among open heathland. Supports important diversity of invertebrates.

Cable Route Search Area

9.4.14 As detailed and mapped within **Appendix 9.3**, five designated sites were located within the Cable Route Search Area. These comprised five LWSs as summarised below and are considered to be of County Importance. No statutory designated sites were located within the Cable Route Search Area.

- Cow Pasture Lane Drains LWS – Botanically diverse network of roadside watercourses.
- Coates Wetland LWS – Relatively large mosaic of wetland, woodland and grassland habitats enclosed within a flood bank.
- Trent Port Wetland LWS – Unmanaged area of floodplain meadow east of the River Trent, incorporating scrub and wetland habitats.
- Willingham to Fillingham Road Verges LWS – 3-3.5m wide roadside verges. Main habitats are calcareous grassland and neutral grassland (unimproved/semi-improved). Additional habitats include coarse grassland, species rich hedgerow and ditches.
- Upton Grange Road Verges LWS – Species rich neutral grassland. Additional habitats include calcareous grassland and species poor hedges. North and east verges are exceptionally species rich and notable due to isolation.

Field Survey Methodologies and Scope

9.4.15 The ecological field surveys which have been carried out across the array sites are described below along with applicable methodological notes and survey scope rationale:

- Extended Phase 1 Habitats Survey³⁵³⁶ of all land within the solar array site boundaries (completed April/May 2021). The survey comprised a thorough walkover survey of all accessible land within the array sites, and where accessible and relevant up to 30m beyond this, to collect baseline habitat inventory and condition information. The survey paid close attention to any potential Habitats of Principal Importance or local priorities, including hedgerows. The survey evaluated the habitats' potential to support notable or protected species and any signs of presence were recorded.
- Five breeding bird survey visits of all land within the solar array site boundaries (May 2021 - May 2022). Method follows British Trust for Ornithology (BTO) Common Bird Census techniques as informed by <http://birdsurveyguidelines.org>. Observations were recorded onto paper maps using BTO symbology which were later digitised for analysis using QGIS.
- One nocturnal/crepuscular bird survey visit (focus on quail and owls) of all land within the solar array site boundaries (late June to early July 2021). Method follows recommendations in Royal Society for the Protection of Birds (RSPB) Bird Monitoring Methods.
- Six wintering bird surveys of all land within site boundaries (November 2021 to February 2022). Method follows BTO Common Bird Census techniques as informed by <http://birdsurveyguidelines.org>.
- Great Crested Newt (GCN) Habitat Suitability Index (HSI)³⁷ and environmental DNA (eDNA)³⁸ of all (28) accessible ponds within the site boundaries and land within 250m under same land ownership (June 2021). Follows Natural England eDNA survey guidance.

35 JNCC (2010) Handbook for Phase 1 habitat survey – a technique for environmental audit. Joint Nature Conservation Committee, Peterborough

36 Institute of Environmental Assessment (1995). Guidelines for Baseline Ecological Assessment. E & FN Spon, London.

37 Evaluating the suitability of habitat for the great crested newt (*Triturus cristatus*) (2000) Oldham et al. Herpetological Journal 10:143-155.

38 Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.

- Monthly static bat detector surveys utilising 22 detector locations per month between June and September 2021 and April and May 2022 (six months). Informed by Bat Conservation Trust Good Practice Guidelines (2016). Locations chosen were at hedgerows and woodland edges within the centre of the proposed array sites to gain a representative sample of bat species assemblage and activity and not impede agricultural operations. Due to the hedgerow and field boundary network totalling approximately 75km and area of the Sites totalling approximately 1000ha it was considered impractical to carry out effective transect surveys and unlikely to add meaningful data over and above that which could be derived from the hundreds of detector-nights' worth of data collected from a high concentration of static detector deployments. Complementary information on potential roost locations was collected as set out below.
- Ground-based assessment of all trees within site boundaries for potential to support roosting bats (December 2021 – March 2022). Follows Bat Conservation Trust Good Practice Guidelines (2016) as informed by the Bat Tree Habitat Key³⁹.
- Daytime inspections of all buildings within the site boundaries and immediately adjacent (where accessible) for their potential to support roosting bats (March-May 2022). Follows Bat Conservation Trust Good Practice Guidelines.
- Autumn 2021 survey of all water courses and ditches within site boundaries for water vole and otters, followed by a follow-up repeat visit to all optimal, suitable and dry ditches in spring 2022. Follows guidance within Water Vole Field Signs and Habitat Assessment by Mike Dean (2020) and The Water Vole Mitigation Handbook by The Mammal Society (2016). Habitat suitability assessments were undertaken at all ditches and watercourses on site, while mammal observations and field sites were noted and mapped digitally.
- A survey of all sites for badger setts was carried out in March-April 2022, with sett locations recorded digitally and setts classified according to likely status and activity.

9.4.16 Surveys currently planned to be carried out at the Site and CRSA are:

- A GCN eDNA and HSI survey of all accessible ponds within 250m of array site boundaries on third-party land (approximately 30, pending access approval), plus a re-survey of all ponds previously found to be dry (8) (May - June 2022).

³⁹ Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals (2018)

- Extended Phase 1 Habitats Survey of a refined, 'Preferred Cable Route Corridor' (PCRC) (June-July 2022). The final cable route would be determined following the completion of this survey. A thorough walkover survey of all accessible land within the Survey Area, and where accessible and relevant up to 30m beyond this, to collect baseline habitat inventory and condition information. The survey will pay close attention to any potential Habitats of Principal Importance or local priorities, including hedgerows. The UKHAB standard and protocol will be employed in order to provide a baseline for Biodiversity Net Gain assessments.
- A qualitative assessment of habitat suitability for the following species/groups will be undertaken at the same time to identify those which may be at risk from being impacted by proposals, to inform future survey needs:
 - Badgers (setts and signs of activity to be recorded in all accessible habitats).
 - Bats (ground based, daytime inspections of trees and buildings present on or adjacent to the Survey Area for potential roost features and signs of roosting. Assessment of potential value of habitats to foraging and commuting bats).
 - Otters and water voles (brief visual inspection of ditch/watercourse habitat suitability).
 - Amphibians (to identify terrestrial and aquatic/breeding habitat of particular potential, especially GCN).
 - Breeding birds (particular focus on likely presence of Ground Nesting Birds such as skylark, yellow wagtail, quail and grey partridge, as well as Schedule 1 or priority species including barn owl, hobby, peregrine or turtle dove).
 - Terrestrial and aquatic invertebrates (to assess for the presence of habitat of potentially elevated suitability which could be revisited, if necessary, where potential impacts determined).
 - Reptiles (to assess habitat for elevated suitability).
 - A GCN eDNA and HSI survey of all accessible ponds within 250m of the PCRC (9 ponds additional to those already completed, pending access approval) (May - June 2022).

9.4.17 The survey effort and scope presented above reflects what is believed at the time of writing to be sufficient and proportionate to inform the evaluation of baseline conditions for this project based on our professional judgment, and through

consultation with Natural England, Lincolnshire Wildlife Trust and Nottinghamshire Wildlife Trust, as appropriate. As Ecological Impact Assessment is an iterative process, the scope may be extended or modified in due course as influenced by emerging survey results as well as through continued consultation.

- 9.4.18 At the present time and given the recency of the data collection, no technical reports for completed survey work have been prepared. This baseline evaluation section is based upon a summary of the findings as they stand. Technical reports will be prepared in due course and will accompany the eventual ES as appendices.

Habitats

- 9.4.19 The following section provides a summary of the extent and character of the various habitats which occur on the four array sites as derived from the fieldwork to date. Their likely ecological importance is also provided.
- 9.4.20 At the time of writing, no fieldwork in relation to the PCRC has been undertaken, although an examination of publicly-available mapping, and a desk study to search for the location of Priority Habitats has been completed (see **Appendix 9.3**) and informs this section.
- 9.4.21 This information should be read in conjunction with the Phase 1 habitat survey maps provided in **Appendix 9.2** as well as the Target Note tables given in **Appendix 9.1** which accompany them.

Woodland

- 9.4.22 Woodland cover on the proposed sites is sparse and limited to occasional broadleaved or mixed copses, spinnies and shelter belts adjacent to the red line boundaries. Lowland mixed deciduous woodland is a Habitat of Principal Importance. No stands of woodland are actually present within the red line boundaries or the footprint of development. The majority of this adjacent woodland cover is associated with Cottam 1, as its current management includes a partridge shoot and is considered a managed habitat. Relatively larger stands of woodland occur in the local area, again especially in proximity to Cottam 1, although these are still discontinuous and linked only by the local hedgerow network. Within the Cable Route Search Area, small to medium sized blocks of deciduous woodland were revealed within the desk study.
- 9.4.23 Considering the absence of woodland within the sites, being limited to adjacent to the sites only, together with the presence of relatively few woodland stands within the CRSA, woodland is considered to be of **Local Importance**.

Hedgerows and Trees

- 9.4.24 Hedgerows are a Habitat of Principal Importance and 'Hedgerows and Hedgerow Trees' is listed on the Lincolnshire Biodiversity Action Plan.
- 9.4.25 The Sites contain an extensive network of approximately 75km of managed hedgerows, roughly half of which contain occasional mature and semi-mature trees. Several hedgerows are considered species rich, although the majority are not and are dominated by blackthorn and hawthorn. A large proportion of the hedgerows also contain a drainage ditch which dries out for a portion of the year. The hedgerows were generally dominated by hawthorn and blackthorn, with sporadic field rose. Most hedgerows are frequently managed, although the hedgerows at Cottam 1 showed signs of being less frequently, and more rotationally, managed. Trees present variously comprised ash (often showing extensive signs of dieback), elder, holly, field maple, grey willow and oak.
- 9.4.26 The CRSA also appears to be characterised by a very similar hedgerow network, with occasional trees, although further survey of the preferred cable route corridor will be required to confirm this.
- 9.4.27 These hedgerow networks often comprise the most important ecological features within the Sites and provide foraging, dispersal and sheltering habitat for a variety of invertebrates, mammals, birds and other species groups. Owing to the substantial size of the hedgerow network and its listing as a priority habitat, the Sites' and the CRSA's hedgerows and hedgerow trees are considered as being of **District Importance**.

Arable Fields

- 9.4.28 The arable fields occupied the vast majority (approximately 840ha) of the Sites' areas and the CRSA, and were intensively farmed monocultures focussing on wheat, barley, linseed and some oilseed which are likely to receive periodic fertiliser and pesticide treatments. The arable fields across all Sites are therefore generally botanically poor and contained little particular ecological interest, save for their value to a relatively small number of ground-nesting bird species and arable specialists including hunting raptors (several of which are notable species of conservation concern) and brown hare, as described later in this document. No arable weeds of particular interest or potentially notable communities were noted.
- 9.4.29 The crop rotation at Cottam 3 was noted to leave several fields bare and/or uncultivated at certain points through the spring, particularly F13 and F7 (see **Appendix 9.2**), which may provide value to birds which feed on fallow or set-aside type vegetation, such as turtle dove.

- 9.4.30 As they are of negligible botanical interest, the arable fields are considered to be of **Site Importance** only.

Grassland and Arable Field Margins

- 9.4.31 Arable field margins are a Habitat of Principal Importance and listed on the Lincolnshire BAP.
- 9.4.32 The uncultivated arable field margins across the Sites are predominantly absent or very narrow (<2m wide), apart from some areas in Cottam 1 and 2 which have been purposefully left wide, in places approximately 5-7m. Generally they are species poor and poor in terms of structure, being mown most years in order to halt any scrub encroachment from hedgerows. Parcels of richer grassland habitat have been individually noted within the corresponding habitat maps (**Appendix 9.2**), although these are infrequent.
- 9.4.33 Most often, margins at Cottam 1 were dominated by perennial ryegrass, Yorkshire fog, dandelion, rough meadow-grass, with occasional cowslip, cow parsley, wood sage, teasel, yarrow, oxeye daisy, ribwort plantain, docks, meadowsweet, red clover, ground ivy, creeping thistle and cut-leaved cranesbill. However, there are a small number of species-rich grassland patches in uncultivated areas at edges of fields or at headlands close to watercourses such as the River Till.
- 9.4.34 At Cottam 2, field margins were generally narrow, although wider semi-improved grassland margins of up to 5m were present at fields F1, F4 and F9, with patches of moderately diverse semi-improved grassland present at F1 and F9, each surrounding in-field ponds which have clearly been avoided during cultivation. F8 was characterised by poor semi-improved grassland. Dominant species were cock's foot, meadow foxtail, false oat-grass with hogweed, teasel, cowslip and willowherbs.
- 9.4.35 At Cottam 3, field margins were particularly small, typically measuring 0-2m. There were no areas of notable grassland save for fragments of poor semi-improved grassland at field edges bordering features such as bunds and other made-up ground associated with either the farms or racetrack infrastructure.
- 9.4.36 Similarly, the small number of permanent pasture fields on all three sites were all considered to contain species-poor semi-improved grassland.
- 9.4.37 Arable field margins are considered to be of **Local Importance**, while semi-improved grassland and improved grassland fields are considered to be of **Site Importance**. At this stage, it is considered likely that the evaluation would apply also to the habitats within the CRSA, pending further assessment of the PCRC as planned.

Ditches and Watercourses

- 9.4.38 Rivers are a Habitat of Principal Importance while Rivers, Canals and Drains are listed on the Lincolnshire BAP. Over 60km of dry or wet ditches are present (mainly associated with hedgerows) within the Site.
- 9.4.39 The River Till runs adjacent to Cottam 1, while other minor watercourses and drains are present at Cottam 2 and 3 and were fed by various drainage ditches present at field boundaries. Most wetted ditches featured grassy banks and were approximately 2-4m deep and 2-4m wide with emergent vegetation. Water quality appeared to vary, and in many cases was relatively poor owing to the presence of agricultural run-off. The hedgerow network often contains associated ditches, some of which contain water for longer periods of time and so contribute to the hydrology and riparian habitats present on and off site. The Corringham, Yawthorpe and Northorpe Becks are located in proximity to Cottam 2 and 3, and along the CRSA.
- 9.4.40 The ditches at Cottam 1 were predominantly wet and associated with hedgerows, although many significant drainage ditches and watercourses were recorded. These measured up to 7-8m wide and 3-4m deep in places, with tussocky grassland banks colonised by ruderal and marginal wetland plant species. Generally, many of the ditches at Cottam 1 were of good quality and species diversity.
- 9.4.41 At Cottam 2, the ditch numbers which form the north western boundary (fields D7, D9, H9 and H10) are together known as the Corringham Beck which is a minor stream. Similarly, those along the north eastern boundary, predominantly D1, are known as the Yarthorpe Beck, another minor stream. These are the two most significant watercourses on Cottam 2.
- 9.4.42 At Cottam 3, Ditches are only present toward the western and eastern edges of the Site. Ditches at fields H2 and H3 form part of the Northorpe Beck. Generally, ditches are between 1.5 and 4m wide and typically feature grassy banks with some surface and emergent vegetation such as hemlock, hogweed, duckweed, water figwort and willowherbs.
- 9.4.43 Considering the extent of the ditch network and the presence of several which supported moderate botanical diversity, the ditches on Site can be attributed a **District Importance**.
- 9.4.44 For the most part, it is considered likely that this evaluation would also apply to the CRSA, however the presence of the River Trent within it elevates this to **County Importance**. Further walkover habitat assessment of the PCRC will seek to corroborate this.

Ponds

- 9.4.45 Ponds are a Habitat of Principal Importance and listed on the Lincolnshire BAP.
- 9.4.46 Waterbodies were very thinly distributed on site with no in-field ponds being present. A small number of ponds are located within boundary scrub and woodland blocks within Cottam 2, although exclusively outside of the development footprint. Most agricultural ponds will have been filled following the decline of pasture and mixed farming in favour of arable intensification. Those which remain on the Sites tend to be formed by wider, pooled sections of drainage ditches, are agricultural sumps/slurry pits, or are associated with woodland or woodland edge as shooting decoys.
- 9.4.47 Further information on the ponds on Site including a Habitat Suitability Assessment for breeding great crested newts will be provided in a separate report in due course.
- 9.4.48 Given the general absence of ponds at the Sites, those which are present are considered to be of **Local Importance**. An assessment is yet to be undertaken for the CSRA.

Protected and Notable Species

- 9.4.49 This section summarises the findings to date of the species-specific surveys relating to the array Sites, as well as the desk study, for which species records within 2km were obtained from Lincolnshire Environmental Records Centre. As surveys are either ongoing or very recently completed, no technical reports have been produced at the time of writing. Therefore, this represents only a preliminary summary of the baseline conditions at the Site.
- 9.4.50 The detailed results of the desk study and initial species surveys (Phase 1, badgers and GCN eDNA) for the array sites are contained within **Appendix 9.1** and **9.2** and for the CSRA in **Appendix 9.3**.

Badgers

- 9.4.51 Badgers, including their setts, are protected under The Protection of Badgers Act, 1992.
- 9.4.52 Numerous records of badger setts were revealed by the desk study, within 1km from each of the Sites, predominantly Cottam 1, for which 18 records within the red line boundary were returned.
- 9.4.53 Woodlands were not extensively searched for badgers during the extended Phase 1 survey as they lay outside of the red line boundary, although their peripheries were entered where accessible and/or where potential mammal pathways led into them.

Setts were noted where there was evidence, such as pathways or latrines, visible from the field edges, or within hedgerows.

- 9.4.54 A main badger sett was recorded at Cottam 1 (north), along with a further two subsidiary setts and an outlier. The majority of badger activity was located at Cottam 1 as it was adjacent to the most blocks of woodland and scrub. Two outlying setts and a subsidiary sett were each located at Cottam 2 and Cottam 3. All setts within the sites were located at field boundaries.
- 9.4.55 The Sites contain significant extents of habitat suitable for foraging by badgers, across the arable fields and the field margins. Badgers predominantly feed on soil invertebrates, particularly earthworms, but will take a wide variety of plant and animal prey items depending on availability. Arable fields have a lower earthworm abundance than grassland fields, therefore the uncultivated margins, woodlands/hedgerows and gardens are likely to be more productive for badgers.
- 9.4.56 Badgers are not a species of conservation concern but receive legal protection on account of historic and ongoing persecution. Consequently, they are considered to be of Site value in terms of conservation status. They will be included within the impact assessment nonetheless due to these legal obligations.

Bats

- 9.4.57 All bat species and their roosts are fully protected under the Habitats Regulations, are Species of Principal Importance and appear on the Lincolnshire BAP. A summary of the locations used for static detectors and the results gathered by them are given in **Appendix 9.5**.
- 9.4.58 For Cottam 1, approximately 200 records for six species were recorded within the desk study data, none of which were recorded within the red line boundary and the vast majority beyond 250m of the Site. The most commonly recorded species was common pipistrelle, followed by brown-long eared bat, Myotis bats (Natterer's and Daubenton's) and noctule bats. This represents a relatively low diversity of species, all of which can be expected to roost within buildings and/or trees in the local area. The species present in the data were generally common and widespread. Most records were made post-2000.
- 9.4.59 For Cottam 2 there were only 12 records of bats across two species (common pipistrelle and brown long-eared bat), all of which were located over 1Km from the Site boundary.
- 9.4.60 For Cottam 3, there were only 11 records of bats across two species (common pipistrelle and noctule bat), all of which were located over 700m from the Site boundary.

- 9.4.61 Initial habitat assessment determined that the quality of habitats for bats across the Sites was generally low, being dominated by monoculture arable and a simple, but extensive, network of managed hedgerows. The presence of ditches, occasional hedgerow trees, adjacent woodland blocks (Cottam 1) and larger watercourses locally elevated this value by providing relatively stronger corridors for dispersal and foraging and more opportunities for roosting.
- 9.4.62 Bat survey information was gathered through the use of an array of 22 static detectors deployed monthly for six months. To date, a total of 147,056 bat passes were recorded over 992 recording nights at 22 deployment locations. This equates to an average of 148.24 bat passes per recording night. This is considered to represent a moderate level of bat activity in comparison to other sites throughout England.
- 9.4.63 When taken individually, Cottam 3b had by the highest level of activity with an average of 305.87 passes per night, which was considered to be a high level of activity. Cottam 2 which had an average of 67.21 passes per night, which was considered to be a low level of activity. Each of the other Sites had an average of between 100 and 200 passes per night, which was considered to be a moderate level of activity.
- 9.4.64 Preliminary survey data analysis indicates that a moderate diversity of species is present across the Sites, with at least nine species recorded (not separating the *Myotis* genus). The majority of activity was made up of common and soprano pipistrelle, noctule bat and several *Myotis* species, which was expected. Brown long-eared bat is another relatively common species which featured regularly within the assemblage.
- 9.4.65 The highest levels of species richness was recorded at Cottam 1, with 9+ species being recorded at each of the distinct areas (Cottam 1 North, South and West). Cottam 2 had the lowest level of species richness with 7+ species being recorded and Cottam 3 and 3b had 8+ species recorded.
- 9.4.66 Two rarer species featured infrequently and in very low numbers, which were barbastelle and Nathusius' pipistrelle. The sites are located at the northern edge of the range for these two species. Barbastelle bats are rare and Nathusius' pipistrelle uncommon in Lincolnshire according to the Lincolnshire Biodiversity Action Plan (BAP). Strongholds for barbastelle bats are known across East Anglia and Lincolnshire contains a known population. Nathusius' pipistrelles are known to exhibit migratory behaviour and it is likely that this dispersal has been recorded here. Furthermore, several calls made by serotine bats were recorded, which is a species on the edge of its range in Lincolnshire, and its status in the county is unconfirmed. It is considered probable that roosts for all the more regularly-recorded species recorded within the dataset occur either in trees within the Sites, or in trees and buildings in the local area.

- 9.4.67 Surveys of trees were carried out to assess their potential to support roosting bats and were categorised as having high, moderate, low or negligible bat roost potential. Field boundaries were assessed in terms of the tree with the highest potential for roosting bats and, as such, only the tree with the highest level of bat roost potential within each field boundary was recorded and mapped. All in-field trees were surveyed, recorded and mapped. A total of 50 high bat roost potential trees, 67 moderate bat roost potential trees, 74 low bat roost potential and 118 negligible bat roost potential trees were recorded within the Sites. It is likely that a substantial number of bat roosts are present within trees that are located within the Sites from a range of different species.
- 9.4.68 Surveys of buildings within the Zone of Influence of the project were carried out where access was granted, to assess their potential to support roosting bats. A total of 10 buildings were inspected, all of which were located outside of but in close proximity to the Sites. A small number of bat droppings, morphologically consistent with those of pipistrelle sp. were recorded within one building and was therefore confirmed as a bat roost, no evidence of bat presence was recorded within any other building that was surveyed. Of the remaining buildings three were assessed as having high bat roost potential, five were assessed as having low bat roost potential and one was recorded as having negligible bat roost potential. It is likely that a low number of bat roosts are present within buildings that are in close proximity to the Sites.
- 9.4.69 It is considered that the general assemblage and rate of activity recorded was typical for the habitats present on the Sites. The presence of serotine in very low numbers was notable as this species has not been confirmed as resident within Lincolnshire and was therefore considered as being of potentially **County Importance**. The presence of barbastelle and Nathusius' pipistrelle is notable but not unexpected and these species can be considered as being of **District Importance** in the context of the Site. The remaining assemblage of bat species is considered to be of **Local Importance** in terms of their conservation status and activity rates.
- 9.4.70 Considering the nature of the proposals within the PCRC being confined to temporary and reversible works (i.e. the impacted habitats will be restored once installation works have concluded) within a narrow working strip, it was not considered proportionate to carry out sampling surveys for bat activity. The narrow, linear layout of a PCRC meant also that it would be impractical to collect meaningful data which would have a bearing on the siting of the cable. Instead, an appraisal of the habitats, particularly hedgerows and field margins for foraging and dispersal and trees/buildings for roosting, will be undertaken. Any such valued features which may be directly or indirectly affected by the proposals would be investigated further and the findings used in the final design of the route. At this stage, it is considered that the evaluation made above is based on robust evidence and is likely to be appropriate for the CSRA given the similarity of habitats and topography between it

and the array sites, although this will be corroborated through further walkover assessment as planned.

Otter

- 9.4.71 Otter are a Species of Principal Importance and protected under the Habitats Regulations.
- 9.4.72 For Cottam 1, ten desk study records of otters were present within the red line boundary, all within Coates South, showing association with the River Till and tributaries. A further 15 records were present within 250m of Coates West.
- 9.4.73 No records of otter within 2km of Cottam 2 were present in the Desk Study data.
- 9.4.74 For Cottam 3, there were four pre-2000 records of otter approximately 2km from the Site.
- 9.4.75 Otter are relatively widespread within Lincolnshire, being associated with all principal river catchments in the county.
- 9.4.76 During the two surveys of ditches carried out across the Sites, several signs of otters were recorded, as can be seen in **Appendix 9.6**.
- 9.4.77 Records are associated with the most permanently wet, and higher quality ditches. There are no major watercourses on any of the Sites, rather intermittently-drying ditches and minor streams/drains with fewer food items than rivers. The ditches and streams were seen to be relatively devoid of bankside features conducive to holt creation, with trees being present only occasionally and bankside scrub being generally absent or sparse.
- 9.4.78 Considering the presence of otter principally within the larger watercourses at the Sites and relatively limited riparian corridors within the red line boundaries, otter are considered to be of **Local importance** in the context of the Site. This evaluation is considered likely to be appropriate also for the CRSA on account of the similarity of ditch and watercourse network within it, pending further walkover assessment of the habitats within the PCRC as planned.

Water Vole

- 9.4.79 Water voles are protected under the Wildlife and Countryside Act, are a Species of Principal Importance and appear on the Lincolnshire BAP.
- 9.4.80 For Cottam 1, 12 records of water vole were present within the red line boundary, all within Coates North, showing association with the ditch network on Site. A further 19 records were present within 250m of the Site showing association with the

ditches and also the River Till. 82 further records are located between 250m and 2km from the Site. Most records were made post-2000.

- 9.4.81 For Cottam 2, 14 records of water vole were present, six of which were located within the red line boundary between 2002 and 2011. Two were located within 250m of the Site.
- 9.4.82 For Cottam 3, 31 records of water vole were present, all located at least 250m from the Site boundary.
- 9.4.83 During the two surveys of ditches carried out across the Sites, several signs of otters were recorded, as can be seen in **Appendix 9.6**. It is concluded that otters and water voles will be present within the more suitable watercourses at least sporadically through the year, with the likelihood of there being otter holts being low (none have been confirmed so far). However, the River Till lies close or adjacent to Cottam 1 which can be expected to increase the likelihood of a regular presence thereon. Otters and water voles are unlikely to cover open ground, with otters remaining relatively inactive for most of the daylight hours. Both species are restricted to ditch and stream corridors and nearby scrub, thickets and dense vegetation.
- 9.4.84 As with otters, suitable habitat for water vole was restricted to river corridors, wet ditches and streams present on or adjacent to the Sites. Habitat requirements for water vole focus on shelter (diggable earth banks), aquatic vegetation and reliable access to water.
- 9.4.85 It is considered that water voles are of **District Importance** and that this evaluation is likely to apply to the CRSA on account of the similarity of ditch and watercourse network within it, pending further walkover assessment of the habitats within the PCRC as planned.

Other Mammals

- 9.4.86 Other mammals which are Species of Principal Importance and potentially present on site and capable of being impacted include hedgehog, harvest mouse, polecat and brown hare.
- 9.4.87 One polecat record 1.2km southeast of Cottam 1 was revealed by the desk study. Records of this species in Lincolnshire are extremely sparse, with their strongholds being Wales and the west of England. Polecat are likely to be of **Local Importance** in the context of the Site.
- 9.4.88 Brown hare are ubiquitous across the Sites, present in relatively high numbers within the arable fields and field edges. Not of particular conservation interest in the area, brown hare are considered to be of **Local Importance** in the context of the Site.

- 9.4.89 Hedgehogs are likely to be present across the Sites, particularly in field boundaries, with numerous records of this species being present within the desk study data. A single dead hedgehog was found in a field boundary during fieldwork on Cottam 1. Given that hedgehog numbers are in decline nationally, this species is considered as being of **Local Importance**.
- 9.4.90 Harvest mice or their nests have not been observed during site visits but can be assumed to be present at least at low density within the hedgerow, woodland and field margin habitats, with many records present in the desk study data. This species is therefore considered to be of **Local Importance** in the context of the Site.
- 9.4.91 No deer species receive special legal protection or are considered priority species of conservation concern. Fallow deer, muntjac and roe deer all occur in Lincolnshire. The arable fields are of little value to deer, which would be expected to keep more closely to woodland, pasture and field boundaries. Considering the highly open nature of the Site's habitats and general absence of woodland or dense habitats, as well as a very low coverage of permanent pasture, deer are considered to be of **Site Importance**.
- 9.4.92 All evaluations are likely to apply to the CRSA on account of the similarity of farmland habitats within it, pending further investigation within the PCRC.

Reptiles

- 9.4.93 Reptiles are Species of Principal Importance and receive varying levels of protection under the Wildlife and Countryside Act.
- 9.4.94 At Cottam 1, 6 historical (pre-2000) records for common lizard located beyond 250m of the Site were present, as well as 32 records for grass snake (4 post 2000) again all beyond 250m from the Site.
- 9.4.95 No reptile records were present within 2km of Cottam 2.
- 9.4.96 All reptile records for Cottam 3 were located approximately 2km from the Site to the north, presumably close to the populations within Laughton and Scotton commons. These comprised 35 records of common lizard, 39 records of adder and 14 records of grass snake.
- 9.4.97 Habitats for reptiles are generally limited in quality and extent across all the Sites, being restricted to hedgerow bases, tussocky field margins and woodland edges. The desk study data shows a lack of records for reptile species within 2km of the sites, with an absence generally within 250m. The only significant number of reptile records in proximity to the sites are derived from Laughton Forest some 2km north of Cottam 3. For these reasons, specific reptile surveys were not considered proportionate to undertake.

- 9.4.98 The only reptile sighting on site to date was of a single grass snake on the banks of the River Till in Cottam 1.
- 9.4.99 Considering the restricted extent and suitability of habitats for reptiles, and their likely presence across the Sites at a low or very low density, reptiles are of **Local Importance** in the context of the Site. At this stage, this is considered likely to be the case for the CRSA until a walkover assessment of habitats within the PCRC can be made as planned.

Amphibians

- 9.4.100 Great crested newt and common toad are Species of Principal Importance and all newts are listed on the Lincolnshire BAP.
- 9.4.101 For Cottam 1, 76 great crested newt records are present beyond 250m of the Site, the closest being 475m south west of the Site. 43 records of toad were present in the dataset, the closest being located 600m west of the Site. A small number of other amphibian records (smooth newt, common frog and palmate newt) were revealed between 250m and 2km from the Site.
- 9.4.102 No amphibian records were present within 2Km of Cottam 2.
- 9.4.103 For Cottam 3, 36 records of toad were present, mostly made pre-2000, the closest located 500m west of the Site. In addition, there were 34 records of common frog similarly distributed.
- 9.4.104 Clusters of records of amphibians exist predominantly around Lincoln, presumably due to a more diverse sub-urban landscape with more permanent coverage and interconnectivity of scrub, grassland, gardens and woodland and greater recording effort. Clusters of records are also present around the Trent valley – especially on floodplain grassland between Cottam power station and Torksey. The dearth of records within the arable landscape may also indicate the influence of under-recording away from established settlements.
- 9.4.105 Great crested newt eDNA surveys of 26 ponds on Site have been undertaken which found one positive pond very close to (but beyond) the boundary of Cottam 1 (south – see **Appendix 9.1**). Several great crested newt desk study records were derived from the surrounding area. Habitat for great crested newt is localised and limited to the hedgerow and woodland network as well as the limited extent of scrub and uncultivated grassland within the site. The arable fields are considered to be highly suboptimal for this species. Other amphibian species recorded within the desk study included common toad, common frog and smooth newt.
- 9.4.106 Considering the lack of records or substantial presence of optimal habitat for these species, amphibians are considered to be of **Local Importance**. This evaluation is

likely to apply to the CRSA on account of the relative dearth of ponds within it, pending further investigation within the PCRC.

Breeding Birds

- 9.4.107 From the data records for Site, notable species within the data search included farmland birds including corn bunting, lapwing, grey partridge quail, skylark, tree sparrow, turtle dove, yellow wagtail and yellowhammer, as well as barn owl, waders and raptors. Many records were from outside of the redline boundary which is likely due to lack of data from within, rather than absence of species.
- 9.4.108 Many bird species are listed as Species of Principal Importance and appear as either green, amber or red-listed species within the RSPB/BTO Birds of Conservation Concern lists. Farmland birds appear on the Lincolnshire BAP. All birds and their eggs are protected, while some which appear on Schedule 1 of the Wildlife and Countryside Act are protected further from disturbance while nesting.
- 9.4.109 At Cottam 1, numerous records of 56 species of notable birds, or birds of conservation concern, were revealed by the Desk Study. These are detailed in **Appendix 9.1**. The only species with records made within the Site boundary was house sparrow (Coates West). The majority of these species records comprise farmland birds such as corn bunting, quail, barn owl and turtle dove as well as waders and raptors.
- 9.4.110 For Cottam 2, numerous records of 23 species of birds were recorded. These included several within the red line boundary of the site, which were; two records of barn owl, four records of lapwing and four records of skylark. All other bird species were recorded beyond 250m from the Site, including curlew, tree sparrow and yellowhammer.
- 9.4.111 For Cottam 3, numerous records of 17 bird species were recorded. One record of cuckoo was located within 250m of the red line boundary. All other records were located beyond approximately 500m of the Site, including species such as yellowhammer, yellow wagtail, nightjar, lapwing and barn owl.
- 9.4.112 The most prevalent species included within the data search included those typically associated within farmland and woodland habitats, with species of note including barn owl, corn bunting, curlew, lapwing, quail, tree sparrow, turtle dove and yellow wagtail, as well as waders and raptors. The nesting habitats present on site of greatest value to breeding birds were generally restricted to the hedgerows and trees, adjacent woodland and any uncultivated field margins, tussocky grassland, scrub and game cover crop, excluding ground-nesters. Of course the majority of these species have also adapted and utilise the surrounding farmland to secure territories and foraging resources throughout their breeding season and, for some, to support overwintering their populations. This includes arable managed fields and

pasture even where intensive management is creating habitats that are overall suboptimal for a large proportion of species. The majority of farmland species are inevitably closely associated with in-field habitats, especially lapwing, grey partridge, linnet, skylark, quail, yellow wagtail and yellowhammer which all forage within the arable fields, among other habitats.

- 9.4.113 Following preliminary survey information analysis, species recorded on or adjacent to the site considered most vulnerable to habitat loss and change impacts would be ground-nesting species of open habitats, principally lapwing, skylark and yellow wagtail as they almost exclusively nest within the arable and cultivated fields and require long, unbroken sightlines for predator avoidance. Common quail are also mostly associated with open fields but potentially at a lesser risk given their use of boundary habitats for nesting and records returned from each land parcel. This included single records of singing males on single visits at each land parcel and therefore considered likely to have some breeding attempts on Site. Skylark and yellow wagtail territories were recorded consistently across all Sites, with approximately 250 skylark territories recorded. Lapwing were also present, although occurred more sporadically. Curlew, including calling individuals, were also recorded at the same land-parcel at Cottam 1 across three separate visits and considered likely foraging within arable fields and potentially breeding nearby (but off-site). Overall, the breeding bird species assemblage and distribution appear to be relatively uniform across the Sites owing to the similarities in habitat and topography, but with habitat diversity field size and land-use all affecting the overall value and assemblage of birds at any given land-parcel to breeding birds.
- 9.4.114 Species typically associated with boundary habitats were recorded consistently across the Sites with distribution patterns largely influenced by their specific ecological requirements, such as yellowhammer and linnet utilising vegetation boundaries (e.g. hedgerow, scrub) whilst nesting in hedgerow and amber-listed reed bunting nesting within ditch habitats/margins and feeding within arable crops, especially oilseed rape. The farmland species with more specific requirements and loyalty nesting places or established colony locations were recorded less frequently, such as tree sparrows. Although recorded across the Sites, their distribution was very localised around likely nesting places within hedgerow, standard trees etc. as well as foraging in-field.
- 9.4.115 Another farmland bird with specialist requirements included turtle dove with a single individual observed feeding within a fallow field at Cottam 3 on one occasion and subsequently heard calling from fields adjacent to this land parcel on another and considered to be a breeding territory. All sites support breeding grey partridge, while Cottam 1 particularly rich in numbers as nearby land is specifically managed for these birds.

- 9.4.116 Waterbodies also increase habitat diversity of any given site with amber-listed breeding moorhen recorded at Cottam 2. A notable species for Lincolnshire, ravens were recorded at Cottam 1 and Cottam 2 although not breeding on-site.
- 9.4.117 Several birds of prey were noted on Site, including barn owl, hobby, kestrel, little owl, peregrine, marsh harrier and short-eared owl. The possible breeding of Schedule 1 species, including peregrine at Cottam 3 and nesting and foraging barn owl across Cottam 1 – Cottam 3. Marsh harriers were also recorded foraging/commuting across Cottam 1 and Cottam 2. Kestrel were also confirmed breeding at Cottam 2 including juveniles seen. Little owl and short-eared owl are green-listed species and as such field survey results will be summarised for these species in a breeding bird survey technical report.
- 9.4.118 At present, given the similarity of the habitats present on Site with those in the surrounding area, and the likelihood that the breeding bird assemblage on Site is mostly very typical of the surroundings save for some notable additions. Overall, the assemblage of breeding birds at the Sites is considered to be of **District Importance** in the context of the Site. At this stage, this is considered likely to be the case for the CRSA until a walkover assessment of habitats within the PCRC can be made as planned. In the impact assessment a differentiation will be made between ground nesting birds of open habitat and other species.

Overwintering Birds

- 9.4.119 The large majority of the Sites are managed as autumn or winter sown arable, with very few fields containing pasture, grassland or overwinter stubbles which are of greater interest to overwintering birds for foraging purposes.
- 9.4.120 A technical report analysing the findings of the wintering bird surveys at the Sites is in preparation. Preliminary wintering bird survey results indicate that the Sites are of some value to winter thrushes, waders and wildfowl, although the Sites are unlikely to be of elevated value above that of neighbouring land. Cottam 1 was observed as being sporadically used by moderate to large flocks of golden plover and smaller numbers of lapwing. Pink-footed geese were regularly observed flying high above the Sites, presumably on passage between the Humber Estuary and The Wash, although direct interaction with the Site was not observed. Moderate numbers of meadow pipit and skylark persist in the fields for cover and foraging purposes.
- 9.4.121 It is considered likely that the assemblage of wintering birds at the array sites is of **Local Importance** in the context of the Site. At this stage, this is considered likely to be the case for the CRSA until a walkover assessment of habitats within the PCRC can be made as planned.

Invertebrates

- 9.4.122 White-clawed crayfish appear on the Lincolnshire BAP.
- 9.4.123 At Cottam 1, records of 27 species of notable invertebrate species (three butterfly and 24 moth species), were revealed by the Desk Study. All species were recorded beyond 250m of the Site boundary. No invertebrate records within 2km of Cottam 2 were present in the Desk Study. The only records of invertebrates given within 2km of Cottam 3 were of hazel pot beetle, wall butterfly and two moth species all between 500m and 2km north of the Sites.
- 9.4.124 The only invertebrate species to feature on the Lincolnshire BAP is white-clawed crayfish. This species is restricted to a 27km stretch of the upper River Witham, in south Lincolnshire near Grantham, and in three river catchments in western Nottinghamshire (Erewash, Leen and Maun) significantly distant from Cottam 1.
- 9.4.125 The principal habitats present at the Sites, arable fields and species-poor semi-improved grassland, along with managed and minor hedgerows, ditches, and streams, are not considered to be of special conservation value for invertebrates or likely to support notable communities of invertebrate species. Considering their often regular maintenance in the form of trimming and dredging, together with overspray and run-off of pesticides and other treatments, the network of boundary hedgerows, margins and drainage ditches which make up the remainder of the site are most likely to support only common invertebrate assemblages typical of the local arable farming landscape. For these reasons, it was not considered proportionate to carry out aquatic or terrestrial invertebrate surveys.
- 9.4.126 Invertebrates are considered likely to be of **Local Importance** within the array sites and CRSA (pending walkover of the PCRC).

Plants

- 9.4.127 Only one notable plant species occurs within the desk study data which was bluebell, in proximity to Cottam 1 and 2. Greater water parsnip appears on the Lincolnshire BAP but has not been recorded on or near the site.
- 9.4.128 The habitats on site are considered typical in diversity and quality for their surroundings, resulting from highly managed farming practises and management. Some hedgerows and patches of uncultivated grassland may be of elevated interest above others on site, however it is considered unlikely that notable botanical communities, including rare arable weeds, are present within them. Indeed, none have been recorded by the experienced surveyors who have been regularly surveying the site.

- 9.4.129 The botanical interest of the Site is considered to be of **Site Importance**. Pending further investigation, the botanical interest of the CRSA is given **Local Importance** until an assessment can be made within the PCRC.

Freshwater Fish

- 9.4.130 A small number of records of European eel, barbel and spined loach derived from the waterways close to Cottam 1 and 3 occur within the desk study data which are Species of Principal Importance. Freshwater fish are listed on the Lincolnshire BAP.
- 9.4.131 Considering the nature of the proposals, it has not been considered appropriate to conduct detailed surveys for freshwater fish. The presence of these species is assumed within principal watercourses including the River Till and the River Trent. Consequently, these species are considered to be of **Local Importance** in the context of the Site's dominance by arable habitats.

Invasive Species

- 9.4.132 Invasive non-native species appear on the Lincolnshire BAP.
- 9.4.133 No observations of invasive non-native species have been made during any of the fieldwork carried out to date. Species particularly closely looked for were Himalayan balsam, Japanese knotweed and giant hogweed.
- 9.4.134 Further surveys are ongoing and any such incidental sightings will be noted, including within the PCRC.
- 9.4.135 It is illegal to release or cause the dispersal of invasive non-native species and therefore they will be considered within the impact assessment as a non-IEF included in light of legal obligations.

Preliminary Ecological Evaluation Summary

- 9.4.136 Table 9.2 summarises the Preliminary Ecological Evaluation. All features considered Important Ecological Features will be carried through to the assessment of effects.

Table 9.2. Summary of Preliminary Ecological Evaluation

Ecological Feature	Ecological Importance	IEF?
Humber Estuary SPA	International	Yes
Willingham to Fillingham Road Verges LWS	County	Yes
Willingham Parish Fields LWS	County	Yes
Dallison Plantation LWS	County	Yes
Upton Grange Road Verges LWS	County	Yes
Scotton Common SSSI	National	Yes
Scotton Road Verges LWS	County	Yes

Scotton Beck Fields SSSI	National	Yes
Scotton Common, Loates Field LWS	County	Yes
Laughton Forest South-east LWS	County	Yes
Scotton Common East LWS	County	Yes
Laughton Forest East LWS	County	Yes
Laughton Common SSSI	County	Yes
Scotton and Laughton Forest Ponds SSSI	National	Yes
Tuetoos Hill SSSI	National	Yes
Owlet LNR	County	Yes
Thornhill Lane Drain LWS	County	Yes
North Leys Road Ditch LWS	County	Yes
Cow Pasture Lane Drains LWS	County	Yes
Coates Wetland LWS	County	Yes
Trent Port Wetland LWS	County	Yes
Woodland	Local	Yes
Hedgerows and Trees	District	Yes
Arable Fields	Site	No
Grassland and Arable Field Margins	Local	Yes
Ditches and Watercourses – Array Sites	District	Yes
Ditches and Watercourses – CRSA	County	Yes
Ponds	Local	Yes
Badgers	Site	No, but included in Impact Assessment for legal reasons.
Bats – General assemblage	Local	Yes
Bats – Barbastelle and Nathusius' pipistrelle	District	Yes
Bats – Serotine	County	Yes
Otter	Local	Yes
Water Vole	District	Yes
Polecat	Local	Yes
Brown hare	Local	Yes
Hedgehog	Local	Yes
Harvest mouse	Local	Yes
Deer	Site	No
Reptiles	Local	Yes
Amphibians	Local	Yes
Breeding Birds	District	Yes
Overwintering Birds	Local	Yes
Invertebrates	Local	Yes
Plants	Site	No
Freshwater Fish	Local	Yes
Invasive Species	Site	No, but included in Impact Assessment for legal reasons.

9.5 Scheme Design and Potential Ecological Impacts

Design Elements with Ecological Influence

- 9.5.1 As described within **Chapter 4**, the scheme will comprise the construction, operation, maintenance and decommissioning of ground mounted solar panels and a battery energy storage scheme. Solar panels will be mounted on a galvanised steel and anodised aluminium mounting system which is pushed into the ground with a small plant rig to a depth of between 1 and 2m. Cables linking the rows of panels are buried in the ground within trenches. Further cables are used to link areas of panels to inverters which are constructed on concrete pads, which are then linked (via the PCRC) to an existing electricity distribution site at Cottam Power Station. Internal access tracks are required, which involve the laying of permeable aggregate. The battery energy storage system will be located on hard standing.
- 9.5.2 Assessment is made of impacts which might arise during both the construction phase (which is anticipated to last up to two years) and the operational phase (which it is estimated to be 40 years for the purposes of the EIA).
- 9.5.3 Design measures proposed that have ecological influence include:
- A Landscape and Ecological Management Plan (LEMP) will be produced to accompany the ES. To accompany this PEIR, an Outline LEMP has been produced (**Appendix 4.5**) to summarise the principles which will be followed within the design of mitigation and enhancement for landscape and ecology. This will set out the whereabouts, rationale and objectives for habitat mitigation and creation across the Scheme, such as for hedgerows, trees and grassland. The LEMP will also provide details on the ongoing management of these habitats for the duration of the Scheme as well as ecological monitoring requirements. The LEMP will be secured by a Requirement in the DCO.
 - An outline Construction Environmental Management Plan (CEMP) has been produced to accompany the PEIR. It can be found as **Appendix 4.3**. A detailed CEMP will be produced to accompany the ES. The CEMP will detail measures and approaches to be adopted which will limit the likelihood of impacts upon retained habitats through damage, pollution and disturbance during the construction phase in order to achieve the objectives set out in the ES (and this PEIR). The CEMP is intended to be followed by those responsible for the construction of the Scheme. The CEMP will contain (among others) the following provisions.
 - Detail on the location and specification of temporary and permanent protective fencing to be installed prior to the onset of construction. It is anticipated that the specified buffer zones will drive these locations.

- Restrictions on the use of fuels and other contaminants in proximity to boundary features and other sensitive habitats.
- Measures to limit the dust generating activities, such as when working in dry conditions.
- Measures to limit the mobilisation of sediments and run-off, such as when working in very wet conditions or the use of silt fencing when working in ditches.
- Construction personnel will receive a 'Toolbox Talk' detailing the presence of sensitive ecological features at or close to the Sites and will be informed that no materials should be stored, or vehicles drive, through buffer zones.
- Access tracks will be routed with ecological sensitivity in mind, along existing farm tracks, and will be sited to avoid designated buffer zones wherever possible. Any unavoidable deviations from this (e.g. for access to critical hardware) will be clearly set out in the ES.
- Access for construction and operation will utilise existing field entrances and gaps in hedgerows and other linear habitats wherever possible. The final locations of any unavoidable new gaps in hedgerows will be provided in due course to accompany the ES. Hedgerow losses associated with the construction phase only will be reinstated. Translocation of hedgerow sections will be explored as a further mitigation option where appropriate. New accesses will range from 3 – 5 metres depending upon whether they are for construction or operation (operational access are usually narrower than construction ones).
- The final cable route will be sited to best avoid impacts on ecological features as identified during the desk study and ecological fieldwork. This will include observing appropriate buffers from sensitive boundary features wherever possible.
- Lighting will be required during construction periods but will be temporary in nature and normal working hours will be adhered to except in specified circumstances.
- Buffers from field boundary habitats have been recommended according to a set of ecological importance criteria. Buffers are measured from the outer edge of the hedgerow, root protection area of the tree canopy (in the case of woodland or individual trees) or the banktop of the watercourse. Buffers will not contain any array structures, hard standing or electrical hardware. Buffers over 10m may contain perimeter fencing or simple tracks for maintenance

vehicle access although this will only be where essential. Protected construction-phase fencing will also observe these buffer distances. The layout of ecological buffers is mapped in **Appendix 9.7**. The measurement criteria are as follows:

- 5m minimum from species-poor hedgerows with no associated ditch.
- 8m minimum from either a species-rich hedgerow, a field boundary containing a tree with 'low' potential for roosting bats, or a field boundary/hedgerow with a ditch of any kind.
- 10m minimum from an 'outlier' badger sett, any field boundary with a ditch/watercourse with signs of either otters or water vole, or a boundary containing a tree with 'moderate' potential for roosting bats.
- 12m minimum from any boundary containing a tree with 'high' potential for roosting bats.
- 20m minimum from a 'subsidiary' or 'annexe' badger sett, moderate-sized watercourses (e.g. becks, dykes and streams), ponds (not positive for GCN eDNA) or woodland.
- 30m minimum from a 'main' badger sett, ancient woodland or major watercourses (e.g. rivers).
- 50m minimum from ponds testing positive for GCN eDNA.
- Other, bespoke buffers will be agreed around bat roosts and the nesting sites of Schedule 1 birds as appropriate.
- Within the above-mentioned buffer zones, habitat management options in order to provide net gains for biodiversity will be agreed and set out within the finalised LEMP in due course.
- The perimeter of the arrays will be fenced for security purposes. It is not established at this stage to what extent internal array field boundaries will be fenced. This will determine the separation or continuity of habitat management within buffer zones or under arrays.
- A standoff of between 2 and 3m between the perimeter security fencing and array structure will be implemented in order to allow movement for maintenance vehicles.
- Habitats under operational arrays will be either managed through grazing or cutting. The proportion of grazing and cutting will be balanced so as to emphasise the ecological benefits which can arise from a sensitively-timed

cutting regime. Grazing methods such as pulse-grazing, aftermath grazing and conservation grazing can also be employed. Management proposals are contained within the Outline LEMP which can be found as **Appendix 4.5**. Further information will be contained within the detailed LEMP which will accompany the ES submitted with the DCO application.

- Where land has been excluded from development within the array sites, these areas will be examined for their potential to be managed for ecological mitigation and enhancement, in order to provide Biodiversity Net Gain and contribute to policy-led green infrastructure and Nature Recovery Network principles. All such enhancements will be detailed within the ES submitted with the DCO application.
- It is anticipated that the Scheme will deliver substantial new hedgerow and tree planting, reinforcement planting at existing hedgerows and field boundaries, extensive grassland habitat creation and sympathetic management both within buffers and under the arrays, as well as discrete, valuable habitat creation away from the panels. While these measures have not yet been final, they are discussed as appropriate in relation to proposed ecological mitigation, Biodiversity Net Gain and enhancements in later sections within this document. Final details will be provided within the ES submitted with the DCO application.
- Operation of the array requires minimal intervention and as such levels of disturbance (light, noise and human presence) upon wildlife within the Site will be minimal, and likely lower or no more than at present, during the operational phase. As noted in **Chapter 4**, operational lighting will only be necessary during periodic maintenance activities during the hours of darkness and only associated with substation structures and the battery energy storage facilities. No lighting will be installed at the array sites.
- Final details for the installation of the cables are not yet determined but general principles are understood to comprise the creation of a narrow trench with an excavator into which a duct or ducts are placed before the trench is backfilled. The cables will be pulled through the ducts between intermittent access hatches. Intermittent site compounds are understood to be necessary, and the working width is understood to likely be narrow (a maximum parameter of 25m has been included in the description of the Scheme in **Chapter 4**, however it could be less than this at certain locations). It is understood that this will be narrower at crossings of field boundary features but a measurement cannot be given at this stage. As already outlined, the final route the cable will take will depend on the outcome of the planned further ecological surveys. The route design process will continue to seek to avoid all ecologically valuable features as far as possible and mitigated for any impacts

arising. It is anticipated that a Precautionary Method of Working will be employed, to include the supervision of an Ecological Clerk of Works where necessary, sensitive ecological timing of works, horizontal directional drilling beneath particularly sensitive features and other mitigation measures outlined in this section. The ecological avoidance, mitigation and compensation measures determined to be necessary for cable route installation will be detailed within a detailed CEMP.

Potential Sources of Impact

- 9.5.4 The following sources of ecological impacts are given here to provide context in the preliminary assessment of effects. The examples given are not exhaustive.
- 9.5.5 Chartered Institute of Ecology and Environmental Management (CIEEM) guidance draws a necessary distinction in Ecological Impact Assessment between ‘impacts’ and ‘effects’. An ‘impact’ is an action resulting in changes to an ecological feature, whereas an ‘effect’ is the outcome to an ecological feature from an impact. Impacts are discussed here while potential effects and potential options for mitigation are discussed later in this chapter.

Construction Phase

- **Habitat Loss and Habitat Change:** Limited habitat loss (for example at hedgerows) may occur where access for construction and operation is required where existing field accesses cannot be used or need to be widened. Other examples include clearance to facilitate any permanent hard standing such as foundations or footings. Habitat change will principally be associated with the reversion of arable fields to grassland and other habitats through management, as well as habitat creation where valuable habitat creation opportunities are identified.
- **Killing and Injury:** Habitat clearance and the actions of plant during construction has the potential to cause direct harm to species.
- **Fragmentation:** Described by CIEEM as, “The breaking up of a habitat, ecosystem or land-use type into smaller parcels with a consequent impairment of ecological function”. Potentially in combination with habitat loss and habitat change, fragmentation can reduce the function of a habitat as well as impede the ability of a species to disperse and maintain a viable population. Installation of fencing or culverting streams may also cause fragmentation, as well as through excessive light and noise disturbance.
- **Disturbance:** Pressures or changes in the environment acting on individuals of a species so as to alter their behaviour may arise through noise, movement

and vibration during construction operations, as well as increased human presence.

- **Pollution and Habitat Degradation:** Release of chemical, sediment or dust pollution can interfere with the normal function of habitats and directly harm species, while processes such as erosion, compaction and alteration of soil/water chemical composition cause the degradation of habitat quality. The construction phase risks the release of pollutants through vehicle and plant movement/operation as well the introduction of new materials onto and into the soil. Protection of sensitive features will be important in safeguarding them throughout the life of the scheme.
- **Habitat Creation and Enhancement:** Beneficial effects are likely to arise from the creation of new woodland, grassland, hedgerow and wetland habitats on site, as well as the enhancement of retained habitats through development-free buffer zones and increased habitat connectivity. Beneficial effects may also be derived from the cessation of cultivation, chemical treatments and soil inputs.

Operational Phase

- **Habitat Loss and Habitat Change:** Significant impacts from these are not anticipated as operation will be largely benign, unless major unexpected maintenance or repair events are required. Ongoing habitat maintenance will seek to ensure favourable condition and enhancement of all newly created and retained habitat for the life of the scheme. Ecological monitoring will be key to realising this.
- **Killing and Injury:** Routine operational works are unlikely to give rise to these effects although there is the risk of direct harm to species from the movement of vehicles around the site, or the trapping of certain species within the fencing or fenced area.
- **Fragmentation:** The presence of a solar project is anticipated to be habituated to by most species, especially with the creation of new, and enhancement of retained, habitats. Typical perimeter fencing is not considered to impede the movement of most mammals, although movement of deer is likely to be impacted. Migrating birds and bats may interact with or be perturbed by the surfaces of the solar array so this will be considered in the assessment.
- **Disturbance:** Operational disturbance may occur through the routine movement of vehicles and personnel on site, as well as the presence of low-level noise associated with electrical equipment. Light reflection may be another factor.

- **Pollution and Habitat Degradation:** The risk of these impacts during operation are very low. Good maintenance practice will be key to avoid further pollution events or degradation of adjacent habitats.
- **Habitat Creation and Enhancement:** Ecological benefits can be maximised through the implementation of a habitat management and monitoring scheme for the life of the development. Beneficial effects may also be derived from the cessation of cultivation, chemical treatments and soil inputs.

Decommissioning Phase

9.5.6 A 40 year operational lifespan of the Scheme has been assumed for assessment purposes. Given this, the accurate prediction of decommissioning effects is challenging and can only be informed by the legal, policy and conservation constraints and priorities present at the time of the DCO application.

- **Habitat Loss and Habitat Change:** It is assumed that the fields will be able to be returned to agricultural use upon decommissioning, therefore this habitat change will need to be considered, including impacts on any newly created habitats.
- **Killing and Injury:** As per the construction phase, risks for direct harm to species should be discussed.
- **Fragmentation:** While the removal of development infrastructure as a reversal of the construction phase is unlikely to result in habitat fragmentation, the reversion to agriculture may impact the habitats and species which have arisen as a result of the proposed development.
- **Disturbance:** Disturbance impacts are likely to be the same as the construction phase.
- **Pollution and Habitat Degradation:** Pollution and habitat degradation risks are likely to be the same as the construction phase.

In-combination Impacts

9.5.7 The following sources of potential in-combination impacts will be considered in the assessment:

- The combination of individual effects, for example, the combined effects of noise, dust and visual effects on a particular receptor;
- The combination of individual topics, for example, the combined effects of climate change on ground conditions;

- The combination of different works of the Scheme on a particular receptor for example, the in-combination effects of the construction of the cable route and the energy storage at the same time; and
- The combined effects of the three generating stations and cable route.

9.6 Preliminary Assessment of Effects

- 9.6.1 This section identifies and characterises potential construction and operation phase impacts of the Scheme considered possible according to current baseline data and current designs on each Important Ecological Feature. Likely and potential measures to avoid and mitigate for these impacts are outlined, which includes any measures already incorporated into the scheme design. Ecological enhancements which will or may be adopted are also outlined. A preliminary assessment is made of the significance of any residual effects after mitigation measures have been accounted for.

Designated Sites

Humber Estuary SPA

- 9.6.2 The distances between the Site (including CRSA) and the Humber Estuary (between 24km and 35km) are substantial and minimise the likelihood that they can be considered to be functionally linked. While several (golden plover, marsh harrier, teal, mallard and lapwing) of the 31 species for which the SPA has been designated have been recorded flying over or, far less frequently, foraging or sheltering within the Sites during bird surveys, they are highly unlikely to be dependent to any significant extent upon the Site themselves for this reason. Furthermore, the Scheme does not trigger any Impact risk Zones for the Humber Estuary. This assessment has been informed and corroborated through consultation with Natural England. Consequently, the SPA should be considered beyond the Zone of Influence of the proposals and therefore no impacts upon the SPA from the construction or operational phases are likely to occur. No mitigation measures are considered necessary and **no residual effects** likely.

Willingham to Fillingham Road Verges LWS, Willingham Parish Fields LWS and Upton Grange Road Verges LWS.

Construction Phase Impacts

- 9.6.3 These three LWSs are located in close proximity to Cottam 1, with Willingham to Fillingham Road Verges LWS located adjacent to the northern section of Cottam 1. This makes it the most susceptible to short to medium-term degradation impacts from discharge/deposition of sediments, dust and contaminants (although situated beyond the Site's boundary hedgerows), or temporary over-run from traffic

movements. The other two sites are separated from Cottam 1 by 165m and 1.1km respectively, lessening the likelihood and potential severity of the above impacts

9.6.4 Careful design of Site accesses will be carried out in order to minimise the number of new field accesses. However, the current design requires a single new access to be imposed (access 10 as shown in the CTMP at **Appendix 14.1** Figure 2.1) at Cottam 1 (north) as there are no other permissible access points into this field. In this case, a short section of the Willingham to Fillingham Road Verges LWS will be permanently lost. The other LWSs will not be affected in this way.

9.6.5 Depending on the final location of haul routes, the remaining two LWSs may also receive some minor impacts from dust deposition, with the Upton Grange Road Verges LWS potentially receiving a temporary increase in vehicle over-run damage.

Operational Phase Impacts

9.6.6 Operationally, impacts on these three sites are likely to be negligible, owing to the nature of the Scheme whereby no further construction activity or other intrusive, extractive or potentially damaging/polluting activity is required. Access onto the Sites for maintenance of hardware and habitats will be required at regular intervals but by small numbers of vehicles and personnel. Vehicle movements along public roads is not anticipated to be greater than baseline levels. There is a very low likelihood of accidental discharge of pollutants from the movement and refuelling of vehicles and plant on the adjacent LWS.

9.6.7 Specifically for the Willingham to Fillingham Road Verges LWS, a beneficial impact may arise from the cessation of the use of agricultural sprays and inputs which may cause the reduction of biodiversity value in its habitats (particularly for invertebrates) and lead to the encouragement of vigorous grasses and plants which outcompete other desirable species.

Mitigation Measures

9.6.8 The smallest practical access gap permissible will be used at the proposed new access 10 (CTMP **Appendix 14.1**, Figure 2.1). The final access location will be determined through follow-up investigation of the designated site during the summer months which will establish whether any lower-quality sections may be more appropriate sites for the gap.

9.6.9 Consultation with Lincolnshire Wildlife Trust and the Greater Lincolnshire Nature Partnership will be carried out in order to discuss compensatory habitat management measures in order to restore and improve the ecological value of the LWS elsewhere along its length. The outcome of this will be incorporate into the ES submitted with the DCO application.

- 9.6.10 A permanent buffer of 12m from the edge of the adjacent hedgerow/ditch banktop to the development zone/fencing will be observed. This will minimise the likelihood and severity of any pollution or run-off events affecting the LWS.
- 9.6.11 Measures within the CEMP set out in Section 9.5 concerning the protection of sensitive habitats and avoidance of accidental damage, dust deposition or pollution events will be secured.
- 9.6.12 A Construction Traffic Management Plan (CTMP) will be produced at the DCO application stage which will detail how vehicles, plant and materials will be transported to the construction zone and the measures required to avoid over-run and damage of the verges of both roadside LWSs. (An Outline CTMP has been produced to accompany the PEIR).

Ecological Enhancement

- 9.6.13 The LWS lies within a Biodiversity Opportunity zone identified as 'Opportunity for Creation' by the Greater Lincolnshire Nature Partnership (see **Appendix 9.1**). The potential to enhance the Green Infrastructure network to which this LWS contributes, potentially through sympathetic and management of adjoining and adjacent road verges at the Sites will be explored.
- 9.6.14 The planting of significant new lengths of native hedgerow within the Scheme will contribute positively to the network of Green Infrastructure local to the Site.

Residual Effects

- 9.6.15 There is likely to be a small loss and fragmentation of the Willingham to Fillingham Road Verges LWS as a result of the Scheme. However, the proposed mitigation, incorporating sensitive siting, buffering, protection and compensatory management of the LWS itself, is considered to reduce the overall severity to result in a **neutral** residual effect that is **non significant**. With the successful implementation of habitat enhancement beyond the LWS, this has the potential to realise a net benefit for the features for which the LWS is designated, although this will depend on ongoing maintenance and monitoring.
- 9.6.16 For all three LWSs, taking into account the protective measures proposed for inclusion within the CEMP, the potential effects from pollution and dust deposition are reduced to **neutral** levels that are **non significant**.

Dallison Plantation LWS, Scotton Common SSSI, Scotton Road Verges LWS, Scotton Beck Fields SSSI, Scotton Common, Loates Field LWS, Laughton Forest South-east LWS, Scotton Common East LWS, Laughton Forest East LWS, Laughton Common SSSI, Scotton and Laughton Forest Ponds SSSI, Tueto Hill SSSI and Owlet LNR

Construction Phase Impacts

- 9.6.17 These 12 designated sites are all located within 5km north of Cottam 3 and all are associated with an area of mostly post-WWII plantation woodland to the north and west of the village of Laughton. This complex of complementary and inter-related designated sites occupy wetland, heathland and grassland habitats both within and on the periphery of the woodland plantation areas. They are all functionally inter-linked and hydrologically connected.
- 9.6.18 The proposed development does not trigger any Impact Risk Zones for the SSSIs and, therefore, it is reasonable to assume that this is the case for the LWSs and LNR. None of the habitats for which the species the designated sites are notified are present within Cottam 3, such as heathland, woodland or acid grassland supporting woodlark and nightjar. The absence of strong habitat corridors between the designated sites and Cottam 3 also reduces the likelihood that any of the reptiles or invertebrate species listed under the designations would rely on or disperse onto/via Cottam 3. These reasons, in conjunction with the nature of the development, being self contained and largely passive for its duration, means it is unlikely that any impacts on the designated sites will arise. This conclusion is supported by advice received from Natural England on the subject.
- 9.6.19 A low possibility of pollution events via the known hydrological links between Cottam 3 and Laughton Common SSSI exists, where sediments or contaminants may be discharged accidentally into watercourses.

Operational Phase Impacts

- 9.6.20 During the operational phase, it is considered unlikely that any impacts beyond the low possibility of contamination or sediment mobilization occurring.

Mitigation Measures

- 9.6.21 Due to the extent of the 12 sensitive designated sites within proximity to Cottam 3, it is imperative that measures are adopted during the construction period which will avoid as far as possible the chance of sediment mobilisation and release of contaminants into the ditches and watercourses surrounding the Site.
- 9.6.22 Measures within the CEMP set out in Section 9.5 concerning covering the protection of boundary features, working in extremely dry or wet weather, storage and use of fuels and chemicals so as to minimise the risk of discharge of pollutants and sediments into the shared water catchment will be secured as part of the DCO.

Ecological Enhancement

- 9.6.23 It is proposed that a proportion of the retained and created habitats either beneath the arrays, within buffer zones or in areas not proposed for coverage with arrays

may be able to be managed proactively for biodiversity. Practical opportunities to manage some of these habitats to benefit those species which for which these sites are designated will be explored through consultation with key stakeholders such as Natural England and the Greater Lincolnshire Nature Partnership.

Residual Effects

- 9.6.24 Provided the CEMP is implemented fully during the construction phase, a **non significant neutral** effect on these 12 designated sites is anticipated.

Thornhill Lane Drain LWS, North Leys Road Ditch LWS, Cow Pasture Lane Drains LWS, Coates Wetland LWS and Trent Port Wetland LWS

Construction Phase Impacts

- 9.6.25 These designated sites all occur within the CRSA and are separated from each other in terms of location and functional linkage. They variously contain road verges, ditches, diverse grassland and wetland habitats. As the route of the cable has not yet been finalised, a detailed assessment of impacts upon these sites is not possible. However, in the absence of mitigation, potential impacts upon them could arise from direct harm should any part of the sites be removed to facilitate cable installation. Indirectly, fragmentation from this habitat loss, or degradation reduction in habitat quality from pollution or other means may also follow.

Operational Phase Impacts

- 9.6.26 Once the cable is installed, it is understood that the cable route will remain undisturbed for the life of the Scheme. Therefore, impacts upon these sites are not anticipated during this phase.

Mitigation Measures

- 9.6.27 The process of finalising the cable route will avoid any direct impacts upon all the designed sites as far as possible. All alternatives to passing through or causing impacts upon these sites will be explored.
- 9.6.28 In the event that the cable route cannot avoid a designated site, the most likely method of cable installation to be adopted would be that of Horizontal Directional Drilling, entailing the trench-less installation of cable using an automated drilling machine. Care would be taken in any case in order to minimise sediment release or disturbance through appropriate siting of entry and exit pits and depth settings.
- 9.6.29 In the event that direct impacts are unavoidable, detailed survey and consultation with bodies such as Lincolnshire and Nottinghamshire Wildlife Trusts and the Greater Lincolnshire Nature Partnership will be carried out to determine the best way to remediate and reinstate habitats which are affected, tailored to the site in

question. An agreed method of working, likely to involve Ecological Clerk of Works supervision, sensitive seasonal timing and phased habitat clearance would form part of the CEMPCI for the cable route in this instance.

Ecological Enhancements

- 9.6.30 Where the finalised cable route passes in proximity to any designated site, opportunities for the enhancement of the designated site, or of intervening connected Green Infrastructure as a result of the Scheme will be explored. Advice will be sought from the above-mentioned parties for practical and meaningful steps to improve local biodiversity and contribute to Nature Recovery Networks.

Residual Effects

- 9.6.31 It is fully intended that all reasonable steps will be taken to ensure that **no residual effects** will occur on these sites as a result of the cable installation works.

Habitats

Woodland

Construction Phase Impacts

- 9.6.32 No direct loss of woodland is anticipated, as all access, hardware and cabling installation will avoid the few woodland habitats which occur adjacent to the Sites.
- 9.6.33 A protective development-free buffer of 20m from all woodland has been designed into the scheme and will be demarcated by protective fencing prior to commencement of construction as part of the CEMP so that accidental damage can be avoided. The buffer distances would be observed for the life of the scheme thereafter.
- 9.6.34 Woodland in close proximity to the array sites, haul routes and cable installation works would remain sensitive to degradation through accidental pollution events, dust deposition and vehicle over-run. In the absence of mitigation the severity of these impacts would range from minor to severe but would be expected to be short or medium term and reversible in the long term.
- 9.6.35 Construction activities could lead to a small amount of noise and possibly light disturbance to the species within the woodland. However, this would be temporary and would only affect the margins of the woodland. It should be noted that a certain amount of noise disturbance, dust deposition and run off would be anticipated as a result of routine agricultural activities, and as such impacts are likely to be similar to the current baseline conditions.

Operational Phase Impacts

- 9.6.36 Due to the largely passive nature of the operational Scheme, impacts on woodland are not anticipated. A LEMP will be implemented so as to delineate all different retained and protected habitats and set out the different management practices to be carried out within them. Woodland management is not anticipated to be necessary, although periodic pruning or trimming back of self-seeded boundary vegetation might be required in order to keep the arrays and maintenance tracks clear of tall, woody vegetation.
- 9.6.37 Maintenance visits by a small number of personnel at regular intervals will be required, although movement of vehicles close to the woodland edges is not anticipated during operation of the array due to the imposition of sufficient protected buffer zones and the restriction of vehicles to demarcated tracks wherever possible.
- 9.6.38 Woodland habitats are currently subject to spray drift following intensive arable farming practices, from the use of pesticides and herbicides. The cessation of these processes is likely to be of benefit to the woodland habitat edges during the life span of the Scheme, encouraging the proliferation of woodland ground flora.

Mitigation Measures

- 9.6.39 Measures within the CEMP set out in Section 9.5 covering the protection of woodland at boundaries, working in extremely dry or wet weather, storage and use of fuels and chemicals and the movement of vehicles and plant will be secured as part of the DCO.

Ecological Enhancements

- 9.6.40 In places, new tall woodland belts and shelter are proposed, which would contribute to the joining up of woodland stands and proliferation of Green Infrastructure. Locations for planting will be directed by the need for landscaping and visual impact mitigation but will also be influenced by the objectives within the Biodiversity Opportunities Mapping for Lincolnshire and where gains from connecting habitats parcels are clearest.

Residual Effects

- 9.6.41 Provided the CEMP is implemented during the construction phase and buffer zones observed, **no residual effects** on woodland are anticipated.

Hedgerows and Trees

Construction Phase Impacts

- 9.6.42 The potential for loss of hedgerows and trees to the Scheme is very limited as existing hedgerow gaps will be utilised in order to gain access for construction and operation. In the finalisation of designs, there may be the need for a small number of new gaps to be created, although in the context of the site's hedgerow network, any loss will be proportionately very small.
- 9.6.43 A protective development-free buffer of between 5m and 12m from all hedgerows and trees has been designed into the scheme, to be installed during the construction phase and observed for the life of the scheme thereafter. This will help avoid any accidental damage or degradation during the construction phase.
- 9.6.44 All individual in-field trees will be retained within the Sites. Such trees act as island or stepping-stones for wildlife and these are to be buffered from development according to their ecological value (between 8m and 12m from extent of Root Protection Zone). In addition, they are to be 'reconnected' to field boundaries through the planting of corridors of hedgerow and trees, improving their contribution to Green Infrastructure as corridors of dispersal.
- 9.6.45 The cessation of intensive arable farming and use of pesticides and fertilisers is likely to be of benefit to the hedgerows and trees during the life span of the Scheme, encouraging the diversification of hedgerow ground flora.

Operational Phase Impacts

- 9.6.46 As with woodlands, the largely passive nature of the operational Scheme means impacts on hedgerows and trees are not anticipated, especially considering all buffers to be observed. The LEMP will set out the different management regimes which apply to the hedgerows, including periodic pruning or trimming back of self-seeded boundary vegetation in order to keep the arrays and maintenance tracks clear of tall, woody vegetation.

Mitigation Measures

- 9.6.47 Measures covering the protection of woodland at boundaries, working in extremely dry or wet weather, storage and use of fuels and chemicals and the movement of vehicles and plant will be incorporated into the CEMP and specifically tailored to avoid impacts upon hedgerows and trees.
- 9.6.48 Management measures will be contained within the LEMP which will have the aim of maximising the biodiversity value of retained and planted hedgerows in the long term. This will include rotational cutting of the hedgerows to ensure a diversity of habitats on the site each year and the aim to maintain head rose at a minimum

height of 2m as this has been demonstrated to be important for promoting the biodiversity value of hedgerows.

Ecological Enhancements

- 9.6.49 Enhancement through the planting of new trees and hedgerows at boundaries is proposed and will focus on the gapping up of currently defunct hedgerows, creation of new hedgerows at boundaries where none exists, planting around Public Rights of Way and where landscape and visual impact mitigation is required. In addition, there may be some limited opportunities for the replanting of old, removed field boundaries where appropriate.

Residual Effects

- 9.6.50 Provided the CEMP is implemented during the construction phase and buffer zones observed, impacts on hedgerows and trees are anticipated to be **neutral** and **not significant**.

Grassland and Arable Field Margins

Construction Phase Impacts

- 9.6.51 Without the creation of the protective buffer zones, arable field margins would stand to be lost to some, potentially significant, degree during the clearance of the site and construction of the arrays. This would be avoided by the establishment of the buffer zones protected by fencing (to measure between 5 and 20+m depending on habitat value) prior to the onset of construction activities.
- 9.6.52 Without careful scheme design, the most diverse fragments and patches of peripheral semi-improved grassland would either be lost or would succeed to scrub over time.
- 9.6.53 Other grassland present on site, such as improved pasture and silage fields would also be lost, although this is not considered to be an adverse impact.

Operational Phase Impacts

- 9.6.54 While arable field margin habitat within the retained buffer zones and patches of semi-improved grassland would benefit from cessation of agricultural inputs and sprays, they would be at risk of long term degradation through eventual succession to scrub without periodic management.

Mitigation Measures

- 9.6.55 The implementation of extensive buffer zones which almost universally measure wider than current arable field margins will result in a significant net gain in the coverage of marginal grassland habitats.
- 9.6.56 Areas of semi-improved grassland with moderate species and structural diversity which do not get cultivated will be retained wherever possible, particularly in field headlands and in those areas close to the River Till in Cottam 1 which are difficult to cultivate. These habitats will be managed sympathetically via the LEMP through implementation of a rotational cutting regime whereby not all areas are cut each year.

Ecological Enhancements

- 9.6.57 The arable fields which dominate the Site will be reverted to grassland under the panels following ground preparation and sowing which should lead to a significant net gain for grassland biodiversity. Prescriptions for the management of all grassland on site (under panels and in buffer/ecological mitigation zones) would be set out within the eventual finalised LEMP. The general objective would be to generate a simple mosaic of grassland habitats through the adoption of a number of different habitat management types revolving around the timing and frequency of cutting. Grassland management objectives would range from conservation-grazed pasture, to tussocky grassland, flowering meadow and ruderal-mix grassland. Further detail and refinement of the LEMP would be undertaken in consultation with key stakeholders including conservation organization, site management companies and consultees, so as to ensure both the optimum biodiversity value and practicability/delivery of the prescriptions.

Residual Effects

- 9.6.58 It is anticipated that only small areas of arable field margins and only the species-poor semi-improved grassland habitats will be lost to the Scheme. These would be more than adequately compensated for through the retention of wider undeveloped buffer zones, the reversion of arable to a mosaic of grassland management and an ecologically beneficial management scheme. The species richness and structural diversity of all arable land will be increased and support habitats of higher biodiversity value than at baseline. Taking into account the measures to be set out in the LEMP, a **moderate beneficial effect** is considered likely to occur which would be **significant** at a **District** level.

Ditches and Watercourses

Construction Phase Impacts

- 9.6.59 The Scheme will avoid and minimise direct impacts upon ditches by utilising existing crossings for access wherever possible. The number of new ditch crossings is anticipated to be very small and as such proportionately very little of the overall ditch and watercourse network. Consequently, a neutral effect on ditches is anticipated. The small size of the crossing required will not result in fragmentation of this habitat.
- 9.6.60 Without the implementation of protective buffer zones, there is a risk that the existing habitat may be damaged or degraded through direct construction damage or indirect impacts such as the release of sediments or dust which could flow into connected watercourses off site. Accidental pollution events are considered unlikely, but if they were to occur they would potentially have a detrimental effect on the quality of habitats on site and downstream beyond the Site in the short to medium term depending on severity. The Scheme has, however, been designed to implement buffer zones free of development at least 8m from every ditch and up to 20 and 30m for larger watercourses as previously described.
- 9.6.61 It should also be noted that a certain amount of dust deposition and run off would be anticipated as a result of routine annual agricultural activities and as such effects are likely to be similar to the current baseline conditions. Nevertheless, given the large extent of this habitat present at the site, effects from dust deposition and/or run off are considered to have the potential to result in detrimental impacts.

Operational Phase Impacts

- 9.6.62 Water quality can be expected to significantly increase post-development due to the anticipated reversion to permanent grassland under the array (reduced sediment run-off) and cessation of application of fertilisers and pesticides.
- 9.6.63 The sympathetic management of field margin habitats which will be detailed within the eventual LEMP can be expected to benefit the biodiversity value of the ditch network through the proliferation of marginal wetland species following a reduction in management (cutting) frequency and agricultural inputs.
- 9.6.64 The risk of ongoing pollution or damage from routine maintenance operations is minimal given the general restriction of vehicle movements to made-up tracks and the imposition of development free buffer zones between hardware and ditch habitats.

Mitigation Measures

- 9.6.65 Protective measures within the eventual CEMP including fencing and steps to minimise the risk of accidental pollution or sediment mobilisation as previously described will be implemented.
- 9.6.66 The LEMP will set out habitat management measures to be carried out in retained buffer zones and grassland habitats adjacent to rivers and streams which will benefit the flora and fauna associated with the ditch network.

Ecological Enhancement

- 9.6.67 The opportunity for practicable ditch and watercourse management, including vegetation clearance (for choked ditches) or planting of locally-appropriate wetland marginal species will be explored through consultation with local conservation stakeholders and consultees.

Residual Effects

- 9.6.68 With the provisions of the CEMP and LEMP in place, potential impacts upon watercourses and ditches can be mitigated and/or avoided, thereby resulting in a **non-significant neutral** effect. There is the potential for this effect to be improved to a minor or moderate beneficial effect at a Local to District level depending on the outcome of habitat management and monitoring and the adoption of ecological enhancements for the benefit of the ditch and watercourse network.

Ponds

Construction Phase Impacts

- 9.6.69 No ponds will be directly impacted through habitat loss or fragmentation as a result of the proposed Scheme. All ponds are situated relatively close to the field boundaries and can be sufficiently excluded and buffered from development, with the vast majority, if not all, intervening connected habitat retained. A 20m development free buffer from all ponds will be observed. This will extend to a minimum of 50m for all pond testing positive for GCN eDNA.
- 9.6.70 There is a risk of degradation of the retained pond habitats through dust deposition, accidental pollution events and run off doing construction activities. This could damage the habitat within and surrounding the ponds as well as affecting the species which inhabit them. This impact would be temporary, as it would be the result of construction activities close to the pond only. This effect could be reversible in the short to long term depending on severity.

Operational Phase Impacts

- 9.6.71 There is a risk that ponds may become damaged should sheep be utilized for grazing post construction. Sheep may poach pond habitats causing damage to the adjacent vegetation and increased suspended sediment content of the water
- 9.6.72 The risk of ongoing pollution or damage from routine maintenance operations is minimal given the general restriction of vehicle movements to made-up tracks and the imposition of development free buffer zones between hardware and ditch habitats.
- 9.6.73 As with ditches and other watercourses, the cessation of agricultural practices is likely to lead to an improvement in the water quality within retained ponds.

Mitigation Measures

- 9.6.74 The adoption and implementation of the CEMP and its measures to avoid and minimise the risk of impacts from damage, run-off and pollution will be crucial to mitigating impacts on ponds.
- 9.6.75 The LEMP will contain grassland, buffer and pond-edge habitat management measures with the aim of maximising the biodiversity value of the retained ponds, including minimising the risk of poaching by livestock.

Ecological Enhancement

- 9.6.76 Opportunities to create new areas of standing water, either in the form of swales for flood water attenuation or wildlife ponds will be explored during the next design stages of the Scheme. Ponds may be inappropriate in locations at high risk of drying out, while may be better located to extend or augment an existing pond network in a hydrologically suitable location.

Residual Effects

- 9.6.77 Protective measures that will be adopted in the form of the CEMP, together with positive habitat management via the LEMP would mean that potential impacts upon the ponds could be mitigated to **non significant, neutral** effects.
- 9.6.78 There is the potential for this effect to be improved to a minor or moderate beneficial effect at a Local to District level depending on the outcome of habitat management and monitoring and the adoption of ecological enhancements for the benefit of the ditch and watercourse network.

Species

Bats

Construction Phase Impacts

- 9.6.79 The hedgerows, woodland edges and the ditches and watercourses were considered to be the habitats of highest value for foraging and commuting bats on Site. While the existing field accesses will be utilised in the vast majority of cases, losses of short (3-5m) sections of hedgerow will be unavoidable in a small number of cases, to be determined. Pending the final allocation of new gaps, they are highly likely to be proportionately very minor in terms of the overall hedgerow network, and unlikely to significantly fragment foraging or commuting routes. The species recorded on the Site and considered able to overcome hedgerow gaps of 3-5m (as per existing gaps) when dispersing. At this stage, it is considered that a low number of new gaps would be unlikely to have an impact upon the favourable conservation status of bat assemblage present within the Site.
- 9.6.80 No artificial construction lighting is considered likely to be required outside of the winter months. During winter, artificial lighting may be required within the construction zone due to the short day lengths. If this is the case, light may spill onto hedgerows. It is understood that the construction phase would be progressive, working on one or a small number of fields after another, rather than across all fields at the same time, thereby lessening potential impacts. Furthermore, as bats are in hibernation during the winter months, and only active occasionally for short periods, they are unlikely to be significantly affected. Therefore it is anticipated that fragmentation of habitat as a result of light pollution will not occur.
- 9.6.81 Many trees with bat roosting potential were recorded on Site within hedgerows, tree belts and woodland edges. 50 trees with high roosting potential, 67 with moderate, 74 with low and 118 with negligible potential were recorded. Any loss of trees capable of supporting roosting bats, could result in direct harm, population fragmentation and habitat degradation, and construction activities could cause disturbance through noise and vibration, although this is unlikely to far exceed baseline levels originating from agricultural activity. The adoption of a variety of development free buffers at field boundaries will reduce the potential for disturbance impacts upon any roosts present in trees, as well as the potential for accidental damage.

Operational Phase Impacts

- 9.6.82 The effects of the installation of solar panels on bat activity and the activity of their prey is largely unknown. However, a recent study into this concluded that no significant differences in bat abundance between the centre and edges of fields

containing solar arrays⁴⁰. Some concern has previously been raised that the presence of solar panels may have detrimental impacts on bats when echolocating, for instance by confusing solar panels for water bodies. Studies^{41,42} into this potential impact do not suggest that this would result in detrimental impacts on bat populations however. It is probable that these impacts on bats will be largely neutral, especially given the higher habitat suitability of both boundary habitats and field-centre habitats in operational situations over baseline.

- 9.6.83 External lighting is only to be installed at substations and battery storage facilities (and not within the arrays) and will only be used as necessary. Luminaires installed will be downward directional so as to avoid upward light spill.
- 9.6.84 The planting of trees, hedgerows and other new habitats, as well as the enhancement of those being retained, would likely increase the permeability of the landscape and overall habitat diversity and quality for bats.
- 9.6.85 Beneficial effects may potentially arise from the increased capacity of the newly-sown and managed grasslands under and around the panels to support flying invertebrates compared to arable, thereby improving access to foraging resources.

Ecological Enhancement

- 9.6.86 The planting of new hedgerows and the management of diverse field boundaries stands to benefit bat populations through an increased number of roosting opportunities and increases in foraging capacity respectively.
- 9.6.87 The opportunity to create new waterbodies and wetland features will be explored in conjunction with flood attenuation requirements.
- 9.6.88 Opportunities for the inclusion of new bespoke tree and building-mounted bat roosting features will be explored.

Mitigation Measures

- 9.6.89 Trees will be retained wherever possible. Any trees for which removal is unavoidable will be re-investigated closely through a climbing inspection and the use of video endoscopes to determine the presence or likely absence of roosts. The loss of any roost will need to be covered under a licence from Natural England, but all

⁴⁰ Montag H, Parker G and Clarkson T (2016) The Effect of Solar Farms on Local Biodiversity: A Comparative Study. Clarkson and Woods and Wychwood Biodiversity.

⁴¹ Russo, D., Cistrone, L., and Jones, G. (2012) Sensory ecology of water detection by bats: a field experiment. *PLoS ONE*. 7(10): e48144

⁴² Greif, S., and Siemers, B. M. (2010) Innate recognition of water bodies in echolocating bats. *Nat. Commun.* 2(1):107

alternatives will be explored beforehand. The remaining trees will be retained and so no further loss of potential roosting sites will occur.

- 9.6.90 The CEMP will detail habitat protection measures and any lighting which will be required within the construction phase.

Residual Effects

- 9.6.91 With the adoption of buffer zones and the sensitive design of the Scheme to retain as much bat habitat as possible and avoid lighting impacts, it is considered that residual effects on bats would be at least **neutral** and **not significant**. Further information will be required on new hedgerow gap and lighting requirements, as well as noise assessments, in order to make a full assessment. The potential exists for the diversity and abundance of night flying invertebrates, as well as roosting opportunities in the long term, to increase on Site as a result of the Scheme. This has the potential to confer a benefit on the local bat population provided that management objectives are successfully realised.

Otter and Water Vole

Construction Phase Impacts

- 9.6.92 Otters and water voles may be impacted through direct harm (to animals or their burrows) or disturbance during any construction activity affecting ditches, watercourses and associated adjacent scrub, hedgerows or woodland habitat.
- 9.6.93 Barriers to movement in the form of severed or blocked/culverted watercourses and linear natural features may cause population fragmentation, however it is not known at this stage how many new ditch/watercourse crossings will be required and their design/form that they will take.
- 9.6.94 Construction activities and, potentially, routine operation and maintenance may cause disturbance to otters and water voles within shelter and accidental harm to their habitat or burrows.
- 9.6.95 Riparian habitat quality is at risk of degradation through pollution resulting from run-off, sediment/dust deposition and contamination are possible during the construction phase.
- 9.6.96 The design of the Scheme is such that buffer zones will be installed prior to the onset of the construction phase, limiting movements of construction vehicles, plant, personnel and material within at least 8m (and up to 30m) of every ditch and watercourse.

Operational Phase Impacts

- 9.6.97 Operational impacts are expected to be minimal as vehicle movements will be infrequent and limited, taking place by and large outside of the installed buffer zones. This will significantly limit the risk of disturbance, pollution and damage impacts.

Ecological Enhancement

- 9.6.98 The opportunity to enhance existing watercourses where otters and/or water voles have been recorded, or those connected to such features which have the potential to support these species, will be explored with advice from local conservation organisations.

Mitigation Measures

- 9.6.99 The detail of all protective measures to safeguard the suitability of habitats on Site for otters and water voles will be set out in the CEMP.
- 9.6.100 The LEMP will secure the favourable management of the site's buffer zones for the duration of the scheme, thereby maintaining and potentially enhancing the habitat quality of ditches and water voles.

Residual Effects

- 9.6.101 Taking into account the CEMP requirements, residual effects upon otters and water voles are considered to be **neutral** and **not significant**. A beneficial effect may be possible through the enhancement of ditches and watercourses to make previously poorly-suitable ditches more favourable for these species.

Polecat, Hedgehog and Harvest Mouse

Construction Phase Impacts

- 9.6.102 These species are all potentially, or confirmed to be, present at the Site, likely in low to moderate densities given the suboptimal to moderate habitat suitability for them (predominantly managed hedgerows and field margins). Harvest mouse would also be expected to reside within the arable fields, if present. It is probable this is also the case within the CRSA.
- 9.6.103 Impacts upon these species may arise from direct harm and mortality through movement of vehicles and clearance of habitat associated with creation of access gaps where necessary and the trenching of cables at or close to field boundaries.

- 9.6.104 Habitat degradation through pollution events may also occur, and disturbance during the construction period may also cause some temporary displacement of these species.
- 9.6.105 Unmitigated, these impacts are likely to be localised and short term, although the buffer zones designed into the scheme will avoid them for the most part.
- 9.6.106 Harvest mouse stand to be adversely affected by the loss of arable crop within which to make nests and forage. While the presence of harvest mice is known in the county, accurate data on populations and distribution in Lincolnshire is sparse as this species is hard to detect. Intensive arable is considered suitable, although modern farming practices, including spraying and a lack of winter stubbles and uncultivated overgrown headlands, have reduced this suitability. The population on Site is therefore assumed to be widespread but at a low to moderate density. The impact of habitat loss would be felt for the life of the Scheme and potentially be of moderate to high severity.

Operational Phase Impacts

- 9.6.107 Impacts on polecat, hedgehog and harvest mouse during the operation of the Scheme are likely to be minimal, considering the adoption of ecological buffer zones and the restriction of development and vehicle movement to outside of these, save for habitat management operations.

Mitigation Measures

- 9.6.108 The CEMP will detail precautionary methods of working during any necessary clearance of boundary habitats associated with creating new access gaps, as well as trenching of cables. These will include sensitive seasonal timing of works, the presence of an Ecological Clerk of Works and phased habitat removal. All cable trenching works will be followed by the reinstatement of any lost boundary habitats.
- 9.6.109 The LEMP will include a significant proportion of tussocky grassland habitat management within both buffer zones and beneath arrays. Furthermore, significant lengths of new hedgerow and tree planting is proposed. Buffer zones will be wider than existing uncultivated field margins throughout the Scheme. These measures will increase the abundance of field margin habitat of suitability to these species, including mitigating the effects of habitat loss for harvest mice. Connectivity and dispersal corridors for these species would likely increase, along with a reduction in disturbance and degradation from farming practices.

Residual Effects

- 9.6.110 Taking into account the protective precautionary measures of the CEMP, and the positive habitat management measures of the LEMP, residual effects on polecat and

hedgehog should be able to reduce to **neutral** levels and be **non significant**. **Minor adverse** residual effects on harvest mice are considered likely to be **non significant** due to the replacement of lost suitable habitat with substantial tussocky and tall grassland within the majority of the Sites and cessation of intensive arable practices.

Brown Hare

Construction Phase Impacts

- 9.6.111 Brown hares do not utilise burrows and instead raise their young leverets in scrapes (shallow indentations in the middle of fields). Although the leverets are precocial from birth, there is still a small risk of injury or mortality from construction activities. Hares breed between January and August and during these periods impacts upon hares may be slightly greater than at other times of year.
- 9.6.112 Hares are highly mobile and the temporary loss of habitats within the array sites during construction is anticipated to be similar in effect (i.e. causing disturbance or temporary displacement to hare) to the regular agricultural activities or harvesting, sowing, harrowing and rolling that take place at present. It is considered that the Site would become suitable again for hares immediately once works in a particular area are complete. The progressive nature of construction, rather than all fields being developed simultaneously, would enable disturbance impacts to be dissipated over the development area.
- 9.6.113 Security or protective fencing is not considered to impede the movement of hares around or onto the Site. Monitoring carried out over large numbers of active solar arrays indicates that hares appear to benefit from the access to grazing and foraging beneath panels, being found in relatively high densities at sites where hares were recorded pre-construction. This may be due to either improved abundance or quality of food items or improved predator avoidance within an array.

Operational Phase Impacts

- 9.6.114 Operationally, the cessation of intensive arable farming and expected reversion of land to sheep grazed grassland is likely to benefit hares, particularly as a result of the lack of disturbance from ploughing and harvesting. The solar panels also appear to be attractive sheltering features for brown hares avoiding predators and inclement weather.

Mitigation Measures

- 9.6.115 The CEMP will detail how a 10mph speed limit will be applied across the construction sites, how the arable habitats will be cleared or left fallow prior to construction. It will also detail that, as part of their induction, construction staff will be informed of the potential presence of protected species including hare as well as the need to

temporarily cease works and implement an exclusion zone in the unlikely event that dependent leverets are discovered on site. Construction traffic will generally be confined to the main access roads.

Residual Effects

- 9.6.116 No adverse effects above that which are currently experienced by brown hare within an agricultural system are anticipated as a result of the development. It is likely that a **minor beneficial** effect on brown hare results from the reversion of arable to grassland, which would be significant at a **Local** level.

Reptiles and Amphibians

Construction Phase Impacts

- 9.6.117 Almost universally, the Scheme will be sited on land of low habitat quality for reptiles, being restricted to narrow uncultivated field margins, hedgerows and sporadic pockets of woodland edge. Grass snake and common lizard have been noted on Site.
- 9.6.118 To date, one pond adjacent to the Site (Cottam 1) has been found to support great crested newts. Habitat for amphibians is limited owing to the general absence of wetland habitat and standing water, together with the network of generally poor hedgerow and field margin habitat. It has been therefore assumed that widespread amphibian species are potentially present at low densities both within these peripheral habitats at the array Sites and within the PCRC.
- 9.6.119 Impacts upon these species might comprise direct harm, habitat degradation and habitat loss should any clearance of hedgerows or other field boundary habitats be required for access or cable trenching, although this is likely to be very limited as the intention is to use existing field accesses wherever possible. These impacts are likely to be avoided through the incorporation of generous ecological buffer zones during construction and operation of the Site, measuring wider than existing field margins. A vegetated exclusion zone of at least 50m from the GCN-positive pond adjacent to Cottam 1 will be incorporated within final proposals. Where limited numbers of breaches for Site access are required, some minor habitat loss can be expected, although the distances involved (3-5m) are not considered to be a significant barrier to dispersal. Ponds will be retained on Site.
- 9.6.120 The habitat suitability and species distribution is likely to be the same or similar within the PCRC, pending further survey. The cable route will be expected to require the clearance of several narrow gaps through hedgerows at field boundaries which, if unmitigated, could lead to direct harm to these species. As habitat reinstatement will follow immediately after completion of trenching in each location, impacts on connectivity are considered to be temporary and short-term.

Operational Phase Impacts

- 9.6.121 Impacts on reptiles and amphibians during the operation of the Scheme are likely to be minimal, considering the adoption of ecological buffer zones and the restriction of development and vehicle movement to outside of these, save for habitat management operations.

Ecological Enhancement

- 9.6.122 Specific habitat features, as well as habitat management prescriptions, can be incorporated into the LEMP for locations within the Sites considered to be of greatest value to reptiles and amphibians. These include tussocky grassland margins to the River Till and scrubby field margins where occasional reptile sightings have already been made.

Mitigation Measures

- 9.6.123 The CEMP shall set out the supervision and protective measures required during works affecting potential reptile habitat at field boundaries, for example where new hedgerow gaps for access or cabling are required. These will include sympathetic, staged habitat clearance and timing and the supervision of an ecologist where necessary.
- 9.6.124 Habitat management operations will be timed appropriately to minimise mortality risk and detailed in the LEMP, although no habitat management operations involving the removal of such habitats will be required. Habitat management within and close to the 50m buffer zone surrounding the known GCN pond will be tailored to maximise its value to this species, particularly through encouragement of tussocky grassland and scattered scrub.

Residual Effects

- 9.6.125 Protective construction-phase measures to be detailed within the CEMP and sympathetic habitat management operations to be set out in the LEMP would be likely to reduce potential effects to **neutral** levels and be **non significant**. It is possible that habitat enhancement measures, in conjunction with the favourable management of buffer zones which are considerably larger than current field margins, would result in a beneficial effect for reptiles, potentially significant at a local level.

Breeding Birds – Ground Nesting Birds of Open Habitats

Construction Phase Impacts

- 9.6.126 Conservation priority ground-nesting bird species present on Site and likely to be most impacted by development of the open habitats are skylark, yellow wagtail and

lapwing. Preliminary data analysis indicated approximately 250 territories for skylark on Site. Territory numbers are considerably smaller for yellow wagtail, and only a handful of likely territories exist for lapwing, from within Cottam 1. These species are considered likely to be displaced to a significant degree owing to the imposition of tall structures and other hardware into the arable fields. Yellow wagtail may stand to be displaced the least as they are believed to be able to nest in taller habitats and with shorter sightlines. Displacement may lead to population fragmentation and increased intra-specific pressures on surrounding arable and grassland habitat which may be at, or approaching, carrying capacity.

- 9.6.127 Grey partridge and quail are ground nesting species which were recorded on Site, although nesting by quail could not be determined as they are notoriously difficult to detect. These species are more likely to be found nesting towards the edges of fields, although not exclusively. It is considered that the nest habitat requirements of these species are less particular than those above as they are able to exploit scrub, woodland-edge and field boundary habitats and therefore are likely to persist, at least to a moderate degree, within the developed Site. Impacts of solar development on these species are largely unknown, therefore a precautionary approach should be taken, and a moderate level of displacement is assumed in the absence of mitigation.
- 9.6.128 There is the potential for accidental mortality to these birds during site clearance or preparation procedures at the onset of construction, for both the array and cable routes. The temporary nature of the cable installation means disturbance would be very time limited for any particular location. Similarly, the very limited land-take of the cable installation operation means that the likelihood of encountering nests is low.

Operational Phase Impacts

- 9.6.129 During the operation of the Scheme, further impacts on these bird species are likely to be limited as displacement will have occurred at the construction phase. However, it is important to note that while nesting by skylark, lapwing and yellow wagtail stands to decline significantly on Site, the reversion of arable to diverse, low-input grassland which is managed relatively infrequently, is likely to increase the abundance of invertebrate prey items for skylark and yellow wagtail markedly. A mosaic of grassland management would be employed for maximum benefit. Therefore, displacement effects are expected to be counteracted to an extent by the increased foraging potential of the operational array sites. Skylark and yellow wagtail regularly forage tens or hundreds of metres away from nesting sites and both have been recorded foraging in significant numbers on active solar arrays. Lapwing are less likely to enter the solar arrays for foraging as they are more reliant on short-sward vegetation in open environments within which to probe for food item.

- 9.6.130 Grey partridge and quail are likely to benefit from the creation of wider field margins through the imposition of buffer zones free of development which are two or three times wider than at present. This will substantially increase both the suitability and abundance of habitat for foraging and nesting by these birds and offset the probable reduced availability of low-productivity foraging habitat within the arrays.

Mitigation Measures

- 9.6.131 The CEMP will detail nest avoidance precautions to be taken during the construction phase at both the array site and cable route. These will comprise measures such as seasonally timed working, the presence of an Ecological Clerk of Works and the setting up of exclusion zones around nesting sites.
- 9.6.132 Measures to mitigate for the displacement effects on skylark and yellow wagtail and lapwing from the array Sites are currently being explored. These are likely to consist of favourable management practices on suitable land where possible which have the aim of increasing the carrying capacity so as to 'absorb' territories, or a significant proportion of territories from the Site. Such measures, in conjunction with the increased foraging productivity within the Site should reduce residual effects on these species significantly. All mitigation sites will be managed under the terms of prescriptions contained within an eventual LEMP.
- 9.6.133 Measures to mitigate for the displacement effects on lapwing from the array Sites are currently being explored and would involve the management of open areas of grassland or arable farmland as productive nesting sites for these species. All mitigation sites will be managed under the terms of prescriptions contained within an eventual LEMP.

Residual Effects

- 9.6.134 It is not possible at this stage to predict the residual effects on skylark, yellow wagtail and lapwing as mitigation measures have not been fully designed, although a substantial reduction in the severity and significance of adverse effects is anticipated.
- 9.6.135 For grey partridge and quail, it is predicted that nesting will continue to occur within the Site and that the enhanced boundary habitats (with a greater abundance of weedy, seed bearing vegetation), together with the presence of permanent short grassland within the mosaic of habitat management under the array will reduce displacement of these birds to **minor adverse** effects, significant at a **local** level.

Breeding Birds – Other Species

Construction Phase Impacts

- 9.6.136 Conservation priority bird species which breed in field boundary and woodland-edge habitats such as tree sparrow, yellowhammer, linnet, common and lesser whitethroat, reed bunting, and great spotted woodpecker were recorded on Site. Several raptor species were noted to breed on site, including barn owl, short-eared owl, little owl, peregrine, hobby and kestrel. Hobby, peregrine and barn owl are all species which receive protection from disturbance while nesting under Schedule 1 of the Wildlife and Countryside Act, 198 (as amended).
- 9.6.137 Nesting sites of all these birds are capable of being harmed by certain habitat clearance activities, either to facilitate access onto the array Sites or cabling works. Accidental damage to nesting habitat, or degradation through pollution events would be avoided through the adoption of protective buffer zones from the onset of construction.
- 9.6.138 Minor losses of hedgerow habitat at the array sites are not considered to cause a cumulative impact on the birds which use them as losses are limited to 3-5m lengths and represent a fraction of the total hedgerow network available.
- 9.6.139 A turtle dove was observed foraging within Cottam 3 and associated with a territory immediately off Site. Loss of foraging habitat for this species might adversely affect the breeding success of this species of conservation concern.

Operational Phase Impacts

- 9.6.140 Owing to the use of development free buffer zones from the onset of construction, it is considered unlikely that the habitats within which these birds nest will be degraded through the presence of the adjacent arrays. Similarly, the temporary nature of the cabling work means that once cabling is complete, no impacts are anticipated.

Ecological Enhancement

- 9.6.141 The addition of bespoke features which provide nesting opportunities for various bird species, including for barn owl, will feature within the LEMP and make use of trees, on-Site structures and adjacent buildings.

Mitigation Measures

- 9.6.142 The CEMP will detail measures to be taken during the cabling works and to ensure that disturbance of Schedule 1 bird species are not disturbed while nesting and that any other bird nests are not harmed. This will involve sensitive timing of works in proximity to known or likely nesting sites, pre-commencement and regular

monitoring by an Ecological Clerk of Works, briefing talks to all construction staff and the enhanced buffering from development of certain buildings or trees confirmed or likely to contain nesting sites.

- 9.6.143 An area of habitat will be reserved for turtle dove foraging habitat within Cottam 3 and not be included within the array layout. This will be managed specifically to promote fallow and set-aside type habitat which contains the seed producing foodplant species relied on by turtle doves. The creation, management and monitoring of this habitat will be set out in the LEMP.
- 9.6.144 The LEMP will contain details of the extensive additional planting of new hedgerows, trees and other woody vegetation across the Site boundaries which will increase nesting and foraging opportunities for numerous bird species.
- 9.6.145 The LEMP will also detail the various habitat creation and management prescriptions to be applied as a mosaic within the buffer zones and panelled areas. The reversion of the arable land to a patchwork of grassland types, and the widening of uncultivated margins, will increase the availability of seed and invertebrate food for a wide variety of bird species.

Residual Effects

- 9.6.146 The protective measures during construction and cable-laying, together with the improvements in habitat diversity and productivity for recorded bird species should ensure that potential adverse effects can be reduced to **neutral, non-significant** levels. The potential exists for a moderate beneficial effect on the general bird species assemblage, due to the proposed habitat management prescriptions, and enhancements set out in the LEMP. Such benefits could be significant at a Local to District level.

Overwintering Birds

Construction Phase Impacts

- 9.6.147 The potential for, and severity of, impacts on overwintering birds depends on the timing of construction activities. It is assumed that, with a c.18 month build programme, working over the winter months will be unavoidable. Consequently, there remains the risk that flocks of wading birds such as golden plover and lapwing will be dissuaded from areas of the Site or PCRC they might ordinarily use on an occasional basis for foraging and shelter. However, given the considerable extent of similar open habitat in the vicinity, and the fact that the habitats on Site were not seen to be of elevated importance compared to their surroundings, or functionally linked to important sites designated for bird conservation, this impact is not considered to be more than a minor one.

- 9.6.148 The onset of construction or cable installation activities within a given field, or the movement of vehicles or personnel into undeveloped fields, risks the disturbance and flushing of birds at a time of year where they are most susceptible to energetic stress. However, the Site was not seen to regularly support such flocks but rather act as an 'option' within a large network of similar habitat in the landscape.

Operational Phase Impacts

- 9.6.149 The operation of the arrays would mean that the Site is effectively removed as an option for foraging and shelter for flocks of waders during the winter. As a proportion of this habitat in the local area, it is relatively small, especially given the lack of functional linkage with sites designated for overwintering bird conservation.
- 9.6.150 It is considered likely that flocks of other birds observed overwintering at the site such as starling, redwing and fieldfare would continue to forage within the grassland beneath panels and be largely unaffected.

Mitigation Measures

- 9.6.151 The CEMP will detail how work during the winter months will seek to minimise potential impacts on flocks of overwintering birds. This will involve the construction (including cabling) site management following a regime where undeveloped fields are not entered by plant or personnel unless it can be confirmed that they do not contain flocks of waders or wildfowl such as geese or plovers, so as to avoid unnecessary energy expenditure at a sensitive time of year.

Residual Effects

- 9.6.152 It is not proposed for any specific mitigation for the removal of the Site from the overall expanse of foraging habitat within the local landscape, although this impact is considered to be minor. Mitigation against the risk of causing undue disturbance is proposed. Overall, it is considered that there would likely be **minor adverse** residual effects, significant only at a **Site level**.

Invertebrates

Construction Phase Impacts

- 9.6.153 The hedgerows, woodland edges, ditches, watercourses and uncultivated field margins were relatively higher in value to invertebrates than the cultivated arable land. No habitat of particularly elevated or notable/significant quality for terrestrial or aquatic invertebrates was recorded within the array Sites. This is likely to also be the case within the PCRC, pending further survey.
- 9.6.154 The nature of the proposals are such that these edge habitats will be retained by and large in their entirety, with array development activities taking place within the

fields. Cable route laying may impact a number of very short individual sections of hedgerow and field boundary habitats temporarily, before being reinstated. Where non-arable vegetation is removed from the Site, there is a minor risk for adverse impacts on the assemblage of invertebrate species associated with these plants, although the suitability of habitat for invertebrates is generally low or of little conservation significance.

- 9.6.155 Aquatic invertebrates associated with rivers such as the Till and Trent may be impacted through sediment mobilisation during horizontal directional drilling activities.
- 9.6.156 Construction activities may result in dust/sediment deposition leading to degradation of the varied habitats at the field boundaries, including woodland edge, hedgerows, and ditches/watercourses, which were considered to be the most valuable habitats for invertebrates. Effects of this are only likely to be temporary, although could end up being felt in the long term if aquatic habitats are seriously affected. However, the imposition of fenced buffer habitats during construction (and beyond) will minimise the potential for these harms.

Operational Phase Impacts

- 9.6.157 The cessation of intensive arable farming practices (particularly insecticide spraying) and reversion of the land to permanent (for at least the duration of the array) grassland can be expected to result in increased diversity and abundance of invertebrates at the operational Site. This includes a number of pollinating butterfly and bee species which have been shown to have increased diversity and abundance in solar arrays compared to control plots. Given the large extent of habitat that will likely increase in quality, the operational impacts of the development will have beneficial effects on a range of invertebrates.

Ecological Enhancement

- 9.6.158 Opportunities to enhance the biodiversity value of the ditches and watercourses around the Site will be explored in collaboration with local conservation organisations. Furthermore, management options of benefit to invertebrates within the Site's retained and protected buffer zones and the grassland habitats beneath the arrays will be developed in the finalisation of the LEMP.

Mitigation Measures

- 9.6.159 The CEMP will set out measures to minimise the risk of pollution, run-off and dust deposition impacts on the Sites' boundary habitats during construction.
- 9.6.160 Fieldwork to be conducted for the PCRC will take account of the relative habitat suitability for invertebrates, especially at field boundaries. This will enable key areas

of relatively elevated suitability to be identified in advance of any cabling activities which will require further assessment, mitigation or compensation. It is anticipated that any loss of suitable habitat, such as hedgerows and marginal grassland, shall be reinstated so as to ensure any impacts are temporary and short term. These measures will be set out within the CEMP and LEMP.

- 9.6.161 The CEMP will also provide precautionary working methods surrounding the installation of the cables and the minimisation of risks associated with horizontal directional drilling. This would include visual monitoring for discharge of sediments, monitoring for vibrations, suitable depth settings and precautionary siting of entry and exit pits.

Residual Effects

- 9.6.162 Taking into account the habitat protection measures in the CEMP, and appropriate habitat investigation and reinstatement measures for cabling works, residual effects on invertebrates are likely to be able to be reduced to **neutral, non significant levels**.

Freshwater Fish

Construction Phase Impacts

- 9.6.163 Several records of notable fish species were present in the desk study data derived from major watercourses in proximity to the Site. While these waterways do not form part of the Sites themselves, the Sites and CRSA lie within the catchment for them and contain drains or streams which flow downstream into this catchment zone. Therefore, within the array Sites, potential impacts on these species is considered only possible from pollution events during construction, although it is considered that these would have to be of a high severity or duration to cause significant impacts, which is thought unlikely due to the wide buffer zones to be implemented around all ditches and watercourses on Site, although possible where ditch/boundary feature crossings are proposed.
- 9.6.164 The cable installation process which is likely to be required to cross underneath rivers, will utilise directional drilling methods. While this is far preferable to any cable installation which might involve any direct harm to the river beds themselves, a small risk remains of vibrations leading to sediment mobilisation, or the emission of pollutants. Such impacts are likely to be minor to moderately adverse in the short to medium term, depending on severity.

Operational Phase Impacts

- 9.6.165 As the nature of the proposals are relatively passive, with movement of vehicles and personnel close to ditches and watercourses being restricted, the opportunity for impacts from pollution or run-off is highly limited.

Mitigation Measures

- 9.6.166 In addition to the various boundary buffer zones, the CEMP will contain a raft of measures to be followed during construction which will limit the potential for pollution events and the release of sediments and run-off into watercourses. This will include ecological supervision and inspection prior to and during works affecting watercourses, such as installation of ditch crossing for access, and precautions concerning vehicle/plant refuelling, sediment trapping and storage of materials.
- 9.6.167 The CEMP will also provide precautionary working methods surrounding the installation of the cables and the minimisation of risks associated with horizontal directional drilling. This would include visual monitoring for discharge of sediments, monitoring for vibrations, suitable depth settings and precautionary siting of entry and exit pits.

Residual Effects

- 9.6.168 Provided that the construction phase risk mitigation measures to be detailed in the CEMP are followed in full, risks of adverse effects on freshwater fish populations can be minimised to **neutral** levels which are **not significant**.

Non-IEFs

Badgers

Construction Phase Impacts

- 9.6.169 Badgers may be adversely impacted by the proposed development through loss of habitat in which to build setts, accidental direct harm during construction, disturbance by vehicles and personnel or the compaction of soil around setts. 10m, 20m and 30m development free buffer zones around all known setts according to their status have been designed into the Scheme.
- 9.6.170 Perimeter fencing is not considered to be a barrier to badger movement given their propensity for digging (the fencing is not proposed to be buried).
- 9.6.171 During construction works, if deep trenches are left open overnight or high voltage machinery is present, there may be potential for incidental injury or mortality to badgers exploring the site during the night.

Operational Phase Impacts

- 9.6.172 Badgers are likely to benefit from improved abundance of favoured food items within the grassland under the arrays as permanent pasture grassland has been shown to contain a greater abundance of earthworms and soil invertebrates than arable soils.
- 9.6.173 Further benefits include reduced disturbance or habitat degradation due to cessation of agricultural activities and increased sheltering and dispersal habitat cover due to new hedgerow, tree and grassland habitat creation.
- 9.6.174 With the buffer zones in place, badgers are not considered likely to be affected by ongoing operational maintenance. Routine maintenance will also not typically be conducted during the hours of darkness.

Mitigation Measures

- 9.6.175 Badger gates are not considered necessary within security or protective fencing as there is no evidence of their usage from information gathered from extensive monitoring of active solar sites. Badgers are known to preferentially dig under fencing or move through gaps in the fencing material as opposed to actively seek features such as gates. Natural undulations in the ground should be used to ensure sufficient space beneath fencing to facilitate badger access is available. Where no such undulations occur it is considered most effective to raise the height of fencing panels to leave a narrow gap (no greater than 100mm) which badgers (among other animals) will exploit to gain access.
- 9.6.176 Permanent or temporary exclusion of the known badger setts is not anticipated to be required.
- 9.6.177 All contractors will be informed about the presence of setts via a toolbox talk delivered by an ecologist prior to construction. No machinery will be driven within buffers or materials stored in them.
- 9.6.178 The CEMP will detail measures to be taken to reduce the probability of incidental mortality of badgers, especially in situations where open excavations are made and in respect of site speed limits.

Residual Effects

- 9.6.179 With the implementation of the buffer zones and above mitigation measures, effects on badgers can be expected to be **moderately beneficial** at the **Site** level.

Invasive Species

Construction Phase Impacts

- 9.6.180 Although none have been observed to date, invasive non-native species may be caused to spread through works associated with ditches and crossing thereof, or during any necessary works to clear habitats. Non-native plant species are considered most likely to occur at field boundaries and in habitats associated with watercourses.

Operational Phase Impacts

- 9.6.181 Should any be present, operational phase impacts are considered unlikely due to the buffering of peripheral habitats included within the Scheme.

Mitigation Measures

- 9.6.182 The fieldwork proposed for the PCRC will pay attention to the presence of non-native invasive species and record these where found.
- 9.6.183 The CEMP will describe precautionary measures to be taken to avoid the accidental spread of these species. This includes a briefing for all construction staff on the issue to ensure vigilance for these species, as well as inspections of proposed working locations at watercourses and ditches by an ecologist prior to commencement.

Residual Effects

- 9.6.184 It is considered that the continued and specific monitoring for invasive non-native plant species as set out in the CEMP will reduce potential residual effects on this issue to **neutral** levels, especially considering their absence in the baseline information to date.

9.7 Decommissioning Effects

- 9.7.1 Please refer to the Decommissioning Statement which accompanies this PEIR. Removal of solar panel frames, underground cabling (although cabling is intended to remain in situ), substations and concrete footings, access and battery energy storage would be expected to have similar or lesser effects as those described in the construction phase impacts for each receptor. Comparable levels of disturbance from movement of vehicles and personnel would be expected. However, the duration of decommissioning activities is expected to be shorter than construction.
- 9.7.2 The restoration of the land back to open arable farmland would likely be beneficial for some species of farmland bird which require open sightlines, as well as for plant species associated with arable margins, but much of the biodiversity value which it is anticipated will develop in the preceding (approximately) forty years would be lost

along with habitat for a variety of other species. In order to revert back to arable food production, it may be required to enhance the nutrient content of the soil if it has been depleted, which would likely be achieved through treatment with fertilisers, although it is believed that this is highly unlikely and an increase in soil fertility is likely to arise and this will be explored further at the DCO application stage. An increase in the use of pesticides and herbicides would also be expected. The decision on the nature of the agricultural use will be made by the landowner, once it has been handed back to them post decommissioning.

- 9.7.3 Depending on the ecological value of the habitats that develop over the lifespan of the scheme, it is possible that certain areas of the site may need to be retained due to their value for wildlife on decommissioning. Alternatively, and on application of the ecological mitigation hierarchy principles (i.e. avoidance-mitigation-compensation as per CIEEM guidance), their loss may require compensation through on or off-site measures to ensure land/habitats are preserved for wildlife into the future.
- 9.7.4 No more than twelve months prior to decommissioning commencing, the site will be visited by an appropriately qualified ecologist to identify any ecological constraints arising from decommissioning activities. Further surveys, mitigation and/or compensatory measures may then be required. As a minimum, an extended Phase 1 Habitat survey (or equivalent) will be required to identify the potential presence of protected species and important habitats.
- 9.7.5 Based upon current (2022) legislative protection, protected species which could be directly impacted by decommissioning activities would include badgers, water vole, otter, great crested newts, reptiles (grass snake) and breeding birds. Further surveys to identify the use of the site by these receptors would therefore also be expected as a minimum.
- 9.7.6 Any mitigation measures undertaken at the point of decommissioning aimed at maintaining ecological value of the site should take account of changes in ecological objectives that have occurred over the lifespan of the array and battery energy storage elements. In particular, changes in ecological conditions both on the site and on a national scale as a result of climate change may result in new ecological objectives that cannot at the current time be reasonably foreseen.

9.8 Cumulative Effects

- 9.8.1 Cumulative effects arising from the combination of similar or large-scale development in proximity to the Scheme will be fully assessed within the ES submitted with the DCO application. Development schemes we are aware of at this stage which will form part of the assessment are:

- **West Burton Solar Project** – A similar sized scheme as Cottam Solar Project located in Bassetlaw District and West Lindsey District. Application and construction timetable to run in parallel with Cottam Solar Project.
- **Gate Burton Energy Park** – c.500MW scheme located close to Gate Burton, northwest of Cottam 1. EIA scoping opinion issued December 2021. The CRSA overlaps the Gate Burton 'Grid Connection Corridor Options'.

9.8.2 The above schemes are likely to be very similar to the proposed Scheme, in that they will both revolve around the reversion of arable fields to solar arrays and battery energy storage, and retain, protect and (it is assumed) enhance the vast majority of their boundary habitats, which are the most important ecological assets. Consequently, the likelihood of cumulative effects on protected species associated with the boundary habitats is low.

9.8.3 Ground nesting bird species of open countryside will be adequately mitigated for by the proposed Scheme, although the presence of the above schemes may combine to cause a fragmentation effect within the local landscape. Similarly, harvest mice stand to be adversely affected by the loss of arable, and although mitigation is proposed, cumulative effects from the combination of these schemes may result. As these sites will remain permeable to the majority of wildlife, cumulative fragmentation effects are considered largely unlikely. While not considered an Important Ecological Feature, impediments to the movement of deer may be increased through the cumulative effect of these developments as they are the only mammal species considered likely to be impacted by the presence of perimeter fencing. This represents the most likely cumulative effects at the present time and so is not an exhaustive assessment. This assessment will be expanded as further survey work, analysis, design and consultation are carried out.

9.9 Biodiversity Net Gain and Ecological Enhancements

9.9.1 A detailed Biodiversity Net Gain assessment will be carried out to support the DCO application. The assessment will follow Defra's Biodiversity Metric 3.1 (or later) protocol. No assessment can be carried out at this time given the incomplete survey data and preliminary nature of the Scheme designs.

9.9.2 It is anticipated that a significant Net Gain for area-based, linear and water habitats is possible as a result of the scheme. This is due to the large scale reversion of arable to permanent grassland, as well as the adoption of generous ecological buffer zones (including of watercourses and marginal habitat) which will be sympathetically managed to maximise biodiversity value (within the LEMP). Furthermore, significant planting of new hedgerows and tree lines will contribute to the enhancement of linear habitats.

10 Hydrology, Flood Risk and Drainage

10.1 Introduction

10.1.1 The Hydrology, Flood Risk and Drainage chapter of the PEIR considers the likely significant environmental effects of the Scheme on the local hydrology during its construction, operation and decommissioning phases. For the purposes of this assessment, the term 'hydrology' includes risks associated with surface water and drainage and further includes an assessment of flood risk from all sources of flooding, namely:

- Tidal (flood risk from the sea)
- Fluvial
- Surface water
- Groundwater
- Artificial Sources (sewers, reservoirs and canals)

10.1.2 The Site is over 1 hectare in size and therefore requires a Flood Risk Assessment to support the planning application in line with Chapter 14 of the NPPF guidance. Surface water management is also a key consideration at the Site with regards to both surface water and water quality control.

10.1.3 Given the scale of this development and its separation into multiple parcels individual parcel assessments have been undertaken, these are included as separate appendices. The appendices form part of a covering assessment which will draw together the findings from the individual parcels that make up the Site.

10.1.4 This document is supported by the following appendices:

- **Appendix 10.1:** Flood Risk Screening Assessment – Cottam 1 (North)
- **Appendix 10.2:** Flood Risk Screening Assessment – Cottam 1 (South)
- **Appendix 10.3:** Flood Risk Screening Assessment – Cottam 1 (West)
- **Appendix 10.4:** Flood Risk Screening Assessment – Cottam 2
- **Appendix 10.5:** Flood Risk Screening Assessment – Cottam 3a
- **Appendix 10.6:** Flood Risk Screening Assessment – Cottam 3b

10.2 Policy and Legislation Context

10.2.1 Policy and legislation specifically relevant to this topic area is outlined below.

National Policy

10.2.2 Guidance on the issues to be assessed for renewable energy developments has been obtained through reference to the Overarching National Policy Statement (NPS) for Energy (EN-1, DECC, 2011a), and the NPS for Electricity Networks Infrastructure (EN-5, DECC, 2011c).

10.2.3 The following paragraphs from NPS EN-1 are considered relevant:

- Applicants for new energy infrastructure must consider the potential impacts of climate change and adopt appropriate mitigation or adaption measures for the lifetime of the proposed infrastructure (paragraph 4.8.6).
- NPS EN-1 sets out the minimum requirements for a flood risk assessment (paragraph 5.7.5) and that they should:
 - “be proportionate to the risk and appropriate to the scale, nature and location of the project;
 - consider the risk of flooding arising from the project in addition to the risk of flooding to the project;
 - take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made;
 - be undertaken by competent people, as early as possible in the process of preparing the proposal;
 - consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure;
 - consider the vulnerability of those using the site, including arrangements for safe access;
 - consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;

- consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
 - include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project;
 - consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems;
 - consider if there is a need to be safe and remain operational during a worst case flood event over the development's lifetime; and
 - be supported by appropriate data and information, including historical information on previous events."
- The policy states consultation on assessment methodologies should be undertaken at early stage with the Environment Agency (paragraph 5.7.8)
 - States that the applicant should undertake an assessment of the existing status of, and impacts of the proposed project on water quality, water resources and physical modifications to the water environment (paragraph 5.15.2)
 - Sets out requirements for the environmental statement relating to water quality, existing water resources, physical characteristics and impacts on WFD source protection zones (paragraph 5.15.3)

10.2.4 NPS EN-5 requires that applicants set out to what extent the Scheme is expected to be vulnerable, and as appropriate, how it would be resilient to flooding, particularly for substations (paragraph 2.4.1)

National Legislation

10.2.5 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 implement the Water Framework Directive 2000/60/EC (WFD). The WFD establishes a framework for community action in the field of water policy. The WFD seeks to enhance the status of aquatic ecosystems, promotes sustainable water use and contributes to mitigating the effects of flood and drought. It is a requirement of the WFD that member states classify major rivers and their tributaries in terms of their ecological status with reference to biological, chemical and hydro-morphological quality indicators. The requirements of the WFD continue to apply following the UK leaving the European Union, through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

- 10.2.6 The Groundwater (England and Wales) Regulations 2009 (now revoked) and Groundwater (Water Framework Directive) (England) Direction 2014 initially transposed the Groundwater Daughter Directive 2006/118/EC. The former addresses the protection of groundwater against pollution caused by certain dangerous substances and places an obligation to prevent pollution of groundwater by substances including hydrocarbons and control the introduction of named metals. The Daughter Directive requirements have been transposed into UK law by the Environmental Permitting (England and Wales) Regulations 2016. The "Daughter Directive" to the WFD establishes specific measures as provided for in the WFD to prevent and control groundwater pollution. It defines criteria for the assessment of good groundwater chemical status
- 10.2.7 The Flood and Water Management Act (2010) (England and Wales) clarifies responsibilities for land drainage and flood risk management and transfers some key responsibilities to local authorities. The Act intends to provide better, more comprehensive management of flood risk for people, homes and businesses. In particular, it encourages the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt Sustainable Drainage Systems (SuDS) for new developments and redevelopments.
- 10.2.8 The Water Resources Act 1991 (and Land Drainage bylaws) (England and Wales) requires the prior written consent of the Environment Agency (EA) for any works or structures in, over, under or within 8 metres of any watercourse designated as a 'Main River'. Main Rivers are classified watercourses under the jurisdiction of the EA. Section 109 of the Water Resources Act 1991 (titled "Structures in, over or under a main river" has been repealed. Previously under Section 85 it is an offence to cause or knowingly permit poisonous, noxious, or polluting matter, or any solid waste matter to enter controlled waters (which include rivers), however this was repealed as part of the Environmental Permitting (England and Wales) Regulations 2010 and replaced by regulation 38(1) of the Environmental Permitting (England and Wales) Regulations 2016, which notes that it is an offence to cause or knowingly permit a water discharge activity or groundwater activity without an environmental permit.
- 10.2.9 The consenting regime for discharges to controlled waters is set out in the Environmental Permitting (England and Wales) Regulations 2016.
- 10.2.10 The Nitrate Pollution Prevention Regulations 2015 (applicable in England), aim to reduce nitrate concentrations from agriculture entering water systems through measures which include the following:
- A requirement to designate Nitrate Vulnerable Zones (NVZs);
 - A requirement to plan nitrogen applications on agricultural land;

- The setting of limits on nitrogen fertiliser applications;
- The establishment of closed periods for spreading; and
- Controls on the application and storage of organic manure.

10.2.11 The EA is responsible for assessing farmers' compliance with measures in NVZs.

10.2.12 The Land Drainage Act 1991 (England and Wales) places responsibility for maintaining flows in watercourses on landowners.

National Planning Policy

10.2.13 The revised National Planning Policy Framework (NPPF) was last updated on 20th July 2021 (superseding the original NPPF published in 2012 which superseded the Planning Policy Statement 25 (PPS25)) along with previous updates in 2018 and 2019. It is supported by the National Planning Practice Guidance (NPPG), which is a 'live' document.

10.2.14 The NPPF seeks to ensure that climate change is considered for long term factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. New development should therefore be planned to avoid increased vulnerability to the range of effects arising from climate change. Where new development is brought forward in areas which are vulnerable to the range of effects arising from climate change, care should be taken to ensure that flood risk can be managed through sustainable adaptation measures.

10.2.15 In relation to flood risk, inappropriate development in areas at high risk of flooding should be avoided by directing development away from areas at the highest risk, but where development is necessary, the development should be made safe for its lifetime without increasing flood risk elsewhere.

10.2.16 NPPF states that a Site-specific Flood Risk Assessment (FRA) is required for the following scenarios:

- Proposals of 1 hectare or greater in Flood Zone 1;
- All proposals for new development in Flood Zones 2 and 3;
- Proposals in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the EA); and
- Any Scheme or change of use to a more vulnerable use, on land in Flood Zone 1 which may be subject to other sources of flooding.

- 10.2.17 The majority of the Scheme will be located within the administrative boundary of West Lindsey District Council and Lincolnshire County Council. The grid connection at the former Cottam Power Station and a part of the cable search corridor are located within the jurisdiction of Bassetlaw District Council and Nottinghamshire County Council.

Local Planning Policy

West Lindsey District Council

- 10.2.18 The West Lindsey Local Plan (First Review) was adopted on 19th June 2006 and 'saved' under the regulations until 18th June 2009 pending the preparation of a replacement Local Plan.
- 10.2.19 The Central Lincolnshire Plan formally replaced the West Lindsey Local Plan (First Review) on 24 April 2017. The Central Lincolnshire Local Plan, adopted April 2017, contains the following policies in relation to flood risk and drainage:

Policy LP14: Managing Water Resources and Flood Risk

All development proposals will be considered against the NPPF, including application of the sequential and, if necessary, the exception test.

Through appropriate consultation and option appraisal, development proposals should demonstrate:

- a. That they are informed by and take account of the best available information from all sources of flood risk and by site specific flood risk assessments where appropriate;*
- b. That there is no unacceptable increased risk of flooding to the development site or to existing properties;*
- c. That the development will be safe during its lifetime, does not affect the integrity of existing flood defences and any necessary flood mitigation measures have been agreed with the relevant bodies;*
- d. That the adoption, ongoing maintenance and management of any mitigation measures have been considered and any necessary agreements are in place;*
- e. How proposals have taken a positive approach to reducing overall flood risk and have considered the potential to contribute towards solutions for the wider area; and*
- f. That they have incorporated Sustainable Drainage Systems (SuDS) in to the proposals unless they can be shown to be impractical.*

Protecting the Water Environment

Development proposals that are likely to impact on surface or ground water should consider the requirements of the Water Framework Directive.

Development proposals should demonstrate:

- g. That water is available to support the development proposed;*
- h. That development contributes positively to the water environment and its ecology where possible and does not adversely affect surface and ground water in line with the requirements of the Water Framework Directive;*
- i. That development with the potential to pose a risk to groundwater resources is not located in sensitive location to meet the requirements of the Water Framework Directive;*
- j. They meet the Building Regulation water efficiency standard of 110 litres per occupier per day;*
- k. How Sustainable Drainage Systems (SuDS) to deliver improvements to water quality, the water environment and where possible to improve amenity and biodiversity have been incorporated into the proposal unless they can be shown to be impractical;*
- l. That relevant site investigations, risk assessments and necessary mitigation measures for source protection zones around boreholes, wells, springs and water courses have been agreed with the relevant bodies (e.g the Environment Agency and relevant water companies);*
- m. That adequate foul water treatment and disposal already exists or can be provided in time to serve the development;*
- n. That no surface water connections are made to the foul system;*
- o. That surface water connections to the combined or surface water system are only made in exceptional circumstances where it can be demonstrated that there are no feasible alternatives (this applies to new developments and redevelopments) and where there is no detriment to existing users;*
- p. That no combined sewer overflows are created in areas served by combined sewers, and that foul and surface water flows are separated;*
- q. That suitable access is safeguarded for the maintenance of water resources, flood defences and drainage infrastructure; and*
- r. That adequate provision is made to safeguard the future maintenance of water bodies to which surface water is discharged, preferably by an appropriate authority*

(e.g. Environment Agency, Internal Drainage Board, Water Company, the Canal and River Trust or local council).

Bassetlaw District Council

10.2.20 The Bassetlaw Core Strategy was adopted 2011.

Policy DM12: Flood Risk, Sewerage and Drainage

A. Flood Risk

Proposals for the development of new units in Flood Zones 2, 3a and 3b that are not defined by national planning guidance as being suitable for these zones will not be supported while development sites remain available in sequentially superior locations across the district. Reference should be made to the Council's Strategic Flood Risk Assessment when making assessments about likely suitability. Site specific Flood Risk Assessments will be required for all developments in flood risk areas, even where flood defences exist, as defined on the Proposals Map.

Where suitable redevelopment opportunities arise, the Council will require, in liaison with the Environment Agency, the opening up of culverts, notably in Worksop and Retford, in order to reduce the blocking of flood flow routes. Particular support will be given to the Flood Alleviation Scheme for Retford Beck.

B. Sewerage and Drainage

Proposals for new development (other than minor extensions) will only be supported where it is demonstrated to the Council's satisfaction that the proposed development will not exacerbate existing land drainage and sewerage problems in these areas.

All new development (other than minor extensions) will be required to incorporate Sustainable Drainage Systems (SuDS) and provide details of adoption, ongoing maintenance and management. Proposals will be required to provide reasoned justification for not using SuDS techniques, where ground conditions and other key factors show them to be technically feasible.

Preference will be given to systems that contribute to the conservation and enhancement of biodiversity and green infrastructure in the district.

Lincolnshire County Council

10.2.21 The Lincolnshire County Council 'Sustainable Drainage Design and Evaluation Guide' was produced to facilitate the best possible SuDS design. It is primarily intended for use by developers, designers and consultants who are seeking guidance on the Lead Local Flood Authority (LLFA) standards for the design of sustainable surface water drainage in Lincolnshire.

CIRIA SuDS Manual

- 10.2.22 The CIRIA SuDS Manual, C753 (CIRIA, 2015) provides best practice guidance on the planning, design, construction, operation and maintenance of Sustainable Drainage Systems (SuDS).

10.3 Assessment Methodology and Significance Criteria

- 10.3.1 This PEIR chapter is based on the proposed Cottam Solar Project EIA Scoping Opinion issued by PINS 9th March 2022, which is the most recent scoping opinion adopted. The scoping response is set out in Table 10.1 below:

Table 10.1: Consultation Table

Consultee and Date	Matter	Scoping / Consultee Responses
The Planning Inspectorate, Scoping Opinion, March 2022	Hydrological receptors	<p>Scoping Report paragraphs 9.3.2 and 9.3.3 state that a hydrological assessment will be undertaken to establish local catchments and overland flow routes and significance will be informed by the valuation of watercourses. No reference is made to other water features e.g. ponds although they are located at both West Burton 2 and 3 sites (Scoping Report paragraph 8.2.24). These are not identified in Appendix 9 which only establishes the flood risk baseline, and location of, watercourses.</p> <p>The ES assessment should identify and locate all water resources, including ponds, ditches, groundwater resources, wetlands etc. that are hydrologically linked to, and may be impacted by, the Scheme site, including the cable route and siting of the storage/substation components. If this is assessed in other Chapters, the ES should cross-reference accordingly.</p>
The Planning Inspectorate, Scoping Opinion, March 2022	Climate change projections	<p>Scoping Report paragraph 9.3.2 states that hydrological analysis will consider climate change but provides no further detail on how this will be considered in the ES assessment, specifically on what projections will be applied and why.</p> <p>For clarity, relevant, up to date, climate change allowances as set out in the Planning</p>

Consultee and Date	Matter	Scoping / Consultee Responses
		Practice Guidance for flood risk and coastal change should be applied.
The Planning Inspectorate, Scoping Opinion, March 2022	Maintaining existing drainage patterns	Scoping Report paragraph 9.3.12 states that rainwater will be 'shed' to the ground as per the existing situation however, it is not explained whether the concentration of runoff from solar panel faces will impact on existing drainage patterns. The ES, Flood Risk Assessment and Drainage Strategy should explain whether the presence of solar panels will affect runoff rates and distribution, describing any significant effects that may arise.
Lincolnshire LLFA December 2021 – and ongoing discussions	General acceptability of development from a flood risk and drainage perspective	Scoping Report paragraph 9.3.12 states that rainwater will be 'shed' to the ground as per the existing situation however, it is not explained whether the concentration of runoff from solar panel faces will impact on existing drainage patterns. The ES, Flood Risk Assessment and Drainage Strategy should explain whether the presence of solar panels will affect runoff rates and distribution, describing any significant effects that may arise.
Nottinghamshire LLFA February 2022 – and ongoing discussions	General acceptability of development from a flood risk and drainage perspective	Scoping Report paragraph 9.3.12 states that rainwater will be 'shed' to the ground as per the existing situation however, it is not explained whether the concentration of runoff from solar panel faces will impact on existing drainage patterns. The ES, Flood Risk Assessment and Drainage Strategy should explain whether the presence of solar panels will affect runoff rates and distribution, describing any significant effects that may arise.
EA September 2021 – and ongoing discussions	General acceptability of development from a flood risk perspective	Scoping Report paragraphs 9.3.1 to 9.3.3 state that a hydrological assessment will be undertaken to establish local catchments and overland flow routes and significance will be informed by the valuation of watercourses. No reference is made to other water features e.g. ponds although they are located at both West Burton 2 and 3 sites (Scoping Report paragraph 8.2.24). These are not

Consultee and Date	Matter	Scoping / Consultee Responses
		<p>identified in Appendix 9 which only establishes the flood risk baseline, and location of, watercourses.</p> <p>The ES assessment should identify and locate all water resources, including ponds, ditches, groundwater resources, wetlands etc. that are hydrologically linked to, and may be impacted by, the Scheme site, including the cable route and siting of the storage/substation components. If this is assessed in other Chapters, the ES should cross-reference accordingly.</p>
Witham IDB Nov 2021 - and ongoing discussions	Hydrological receptors	<p>Scoping Report paragraph 9.3.12 states that rainwater will be 'shed' to the ground as per the existing situation however, it is not explained whether the concentration of runoff from solar panel faces will impact on existing drainage patterns. The ES, Flood Risk Assessment and Drainage Strategy should explain whether the presence of solar panels will affect runoff rates and distribution, describing any significant effects that may arise.</p>

10.3.2 A desktop analysis of the available data has been undertaken to inform this PEIR chapter. Further data is provided in the flood risk screening assessments provided at **Appendices 10.1 to 10.6**. The assessments have identified and assessed the risks of fluvial and surface water flooding to proposed scheme, as the main potential flood risks to this type of development.

10.3.3 Delta-Simons are currently undertaking a detailed Flood Risk Assessment and Drainage Strategy which will assess each parcel for each which will identify and assessed the risks of all forms of flooding to and from the proposed scheme and will:

- Identify and evaluate the likely significant environmental effects and receptors at risk of harm from a change in the hydrological environment.
- Undertake consultation with the Environment Agency, Lead Local Flood Authority, IDB and other stakeholders.

- Identify whether the proposed scheme is likely to be affected by current or future flooding from any source.
- Assess whether it will cause increased flood risk elsewhere.
- Assess whether the measures proposed to deal with these effects and risks are appropriate.
- Undertake a review of the Sequential Test and, if required, the Exception Test.
- Review whether sustainable Drainage Systems (SuDS) will be examined for mitigating the increases in site runoff. This will be determined in consultation with the Environment Agency and Lincolnshire County Council and Nottinghamshire as Lead Local Flood Authorities.

10.3.4 A hydrological assessment has been undertaken to establish local drainage catchments and overland flow routes in **Appendices 10.1 – 10.6**.

10.3.5 The Flood Risk Assessment and Drainage Strategy to be submitted with the DCO application will include a review and summary of relevant legislation and national, regional and local planning policy relevant to the water environment. Assessment in the form of a drainage assessment in accordance with the CIRIA guidance 'The SuDS Manual C753' will be undertaken by:

- Site visit and hydrological/drainage surveys;
- Baseline hydrological assessment, data acquisition and regulatory consultation;
- Hydrological analysis (considering climate change);
- Sustainable drainage system design; and
- Surface water quality risk assessment & pollution control review.

10.3.6 The supporting ES chapter will consider the likely significant environmental effects to the Site and the surrounding area over the lifetime of the development and propose appropriate mitigation measures if required. The assessment of the significance of impact will be informed by the valuation of the watercourse and the magnitude of impact. In line with the Design Manual for Roads and Bridges (DMRB) guidance, the magnitude of impact will be determined only for residual impacts following mitigation.

10.3.7 Flood risk and surface water drainage will be summarised in the ES in accordance with guidance in the DMRB Volume 11, Section 3, Part 10 (HD 45/09).

- 10.3.8 The ES chapter will summarise the findings and recommendations of the Drainage Strategy. Recommendations will be made for mitigation measures in order to minimise the potential effects of the Scheme on water quality and drainage. Any residual effects will be identified as well as the potential for relevant cumulative effects associated with any other developments nearby.
- 10.3.9 A Screening and Scoping WFD Assessment will be undertaken. The aim of this assessment would be to determine the potential for any non-compliance of the Scheme with WFD objectives for affected water bodies, using readily available information and site observations. This will include an examination of the potential construction, operation and decommissioning phase effects of the Scheme on relevant WFD biological, hydromorphological and physio-chemical parameters. Depending on the outcomes of the Screening and Scoping WFD Assessment, more detailed investigations and assessments may be required, which will be determined in consultation with the Environment Agency. If further assessment is required, this would be provided alongside the ES.

Approach and Method

- 10.3.10 As summarised in Tables 10.2, 10.3 and 10.4 magnitude is considered in relation to the potential impact on the receptor with magnitude defined in a range from Negligible to Major. The receptor sensitivity is defined as Low, Medium or High depending on the specific receptor character and its ability to tolerate change. The significance of the effect is defined in relation to both the magnitude of the impact and receptor significance. If the significance of the potential effect is 'Moderate Adverse' or higher, then mitigation measures may need to be considered.

Table 10.2: Sensitivity/Importance of the Identified Environmental Receptor

Sensitivity	Definition
High	WFD Classification – Good or High Site protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar Site); European Designated salmonid fishery (or salmonid & cyprinid fishery); Important social or economic uses such as water supply, navigation or mineral extraction. Floodplain or defence protecting 1 or more residential properties or industrial premises from flooding.
Medium	WFD Classification: Moderate May be designated as a local wildlife Site. May support a small / limited population of protected species. Limited social or economic uses. Floodplain or defence protecting 10 or fewer industrial properties from flooding.
Low	WFD classification – Poor No nature conservation designations.

	<p>Low aquatic fauna and flora biodiversity and no protected species.</p> <p>Minimal economic or social uses.</p> <p>Floodplain with limited constraints and a low probability of flooding of residential and industrial properties.</p>
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Table 10.3: Methodology for determining impact magnitude

Magnitude of Impact	Examples of Receptor
Major (adverse)	<p>Loss of Protected Area.</p> <p>Pollution of potable sources of water abstraction.</p> <p>Deterioration of a water body leading to a failure to meet Good Ecological Status (GES) under the WFD and reduction in Class (or prevents the successful implementation of mitigation measures for heavily modified or artificial water bodies).</p> <p>Significant potential increase in peak flood level (1% annual probability).</p>
Moderate (adverse)	<p>Loss in production of fishery.</p> <p>Discharge of a polluting substance to a watercourse but insufficient to change its water quality status (WFD class) in the long term.</p> <p>No reduction in WFD class, but effect may prevent improvement (if not already at GES) or the successful implementation of mitigation measures for heavily modified or artificial water bodies.</p> <p>Moderate potential Increase in peak flood level (1% annual probability).</p>
Minor (adverse)	<p>Noticeable effect on features, or key attributes of features, on the Protected Areas Register.</p> <p>Measurable changes in attribute but of limited size and / or proportion, which does not lead to a reduction in WFD status or failure to improve.</p> <p>Minor potential increase in peak flood level (1% annual probability).</p>
Negligible	<p>No effect on features, or key attributes of features, on the Protected Areas Register.</p> <p>Discharges to watercourse but no significant loss in quality, fishery productivity or biodiversity.</p> <p>No effect on WFD classification or water body target.</p> <p>Negligible change in peak flood level (1% annual probability).</p>
Beneficial	<p>Improvement on features, or key attributes of features, on the Protected Areas Register.</p> <p>Improvement in fishery production or biodiversity.</p> <p>Improvement in WFD classification or water body target.</p> <p>Potential reduction in peak flood level (1% annual probability).</p>

Table 10.4: Methodology for determining significance of effect

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 10.3.11 In considering the significance of the effect, account is taken of an effect's duration; reversibility and compatibility with relevant environmental policies and standards. Effects can be temporary or permanent. Temporary effects are largely associated with the construction phase and permanent effects are largely associated with the operational phase.

Assumptions and Limitations

- 10.3.12 The methodology for assessment of potential water resource and flood risk effects has incorporated the following assumptions:
- That the Scheme will be low impact with access roads and footways surfaced with permeable surfacing and therefore assumed to be effectively permeable;
 - Any runoff from construction waste materials would be collected, contained and prevented from direct entry to local water courses;
 - That all clean roof drainage would be discharged directly to the nearest surface water drainage feature;
 - Analysis of flood extents is reliant on the accuracy of the published EA Flood Map for Planning and EA flood data. No new hydraulic modelling has been undertaken as part of this study;
 - Given the Scheme is anticipated to be unmanned, with infrequent attendance for maintenance, on-Site welfare facilities will be limited or non-existent. Therefore, no foul water discharge from the Scheme and no mains connected foul water drainage systems are likely to be necessary; and
 - Cable routes will be installed below the surface and will pass beneath local watercourses ensuring they are resilient to all forms of flood risk.
- 10.3.13 The flood risk from fluvial (Main Rivers) and coastal flooding is assessed through the use of the EA Flood Maps (flood risk from rivers or the sea). This map defines three zones of different flood risk, the third of which is subdivided into two categories:

- Zone 1 “Low probability of flooding” – This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 “Medium probability of flooding” – This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year;
- Zone 3a “High probability of flooding” – This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year; and
- Zone 3b “Functional floodplain” – A sub-part of Zone 3, this zone comprises land where water has to flow or be stored in times of flood. This zone is not normally included within the national Flood Map for Planning and is calculated where necessary using detailed hydraulic modelling.

10.4 Baseline Conditions

- 10.4.1 The baseline conditions for each of the Sites has been detailed in the reports included at **Appendices 10.1 – 10.6**. Mapping is included. In addition, the baseline conditions in respect of the cable corridors, relating to hydrology, flood risk and drainage is provided below.
- 10.4.2 The risk of tidal / fluvial flooding has been interpreted from the Environment Agency’s (EA) online Flood Map for Planning⁴³, from Site specific hydraulic modelling provided by the EA where available and the EA Long Term Flood Risk Map (Surface Water) where site specific modelling is not available. The risk of surface water flooding has been assessed from the EA Long Term Flood Risk Map (Surface Water)⁴⁴.
- 10.4.3 The Site is situated within both the Anglian and Humber River Basin Management Plan (RBMP) areas. Within the Anglian RBMP the Site is further situated within Witham Management Catchment and within the Humber RBMP the Site is Lower Trent and Erewash Management Catchment. Local land drainage feed into local watercourses several of which are WFD surface waterbodies.
- 10.4.4 As described in Chapter 4, the Scheme comprises three Sites named Cottam 1 to 3. At present, the final cable route is yet to be determined and there are ‘search areas’

⁴³ <https://flood-map-for-planning.service.gov.uk/>

⁴⁴ <https://flood-warning-information.service.gov.uk/long-term-flood-risk/map>

for the potential cable route. Only a narrow width within these corridors will be required for the cable route and its construction.

- 10.4.5 Cottam 1 consists of three parcels (North, South and West) and therefore, the assessment of each parcel has been undertaken separately. Furthermore Cottam 1 North and West are further divided into three further parcels each, as described in the appendices.

Cottam 1 (North)

- 10.4.1 The EA's Flood Risk Map for Planning indicates that the eastern and western boundaries of Parcel 1 are within the extents of Flood Zone 3. A minor extent of the north-western corner of Parcel 2 is located in Flood Zone 3. Parcel 3 is covered by the extents of Flood Zone 3 in the predominantly in the west and in the southern corner.
- 10.4.2 Flood Zone 3 defined as land assessed as having a 1 in 100 or greater >1% Annual Exceedance Probability annual probability of river flooding.
- 10.4.3 Fluvial risk across the Parcels within the Site is associated with a series of land drains and an Ordinary Watercourse to the west of Parcel 3 which is discharges into the River Till (Main River – responsibility of the EA to maintain) approximately 1.7 km south-west of the Site.
- 10.4.4 In the absence of site-specific modelled flood data, the 0.1% annual probability surface water flood scenario can be used as a proxy for the 1% Annual Exceedance Probability (AEP) plus Climate Change (CC) fluvial event. A map depicting flood depths associated with the 0.1% Annual Probability is included as Annex E in Appendix 10.1. No flooding with a depth greater than 0.9 m is present across any of the Site parcels. Flooding with a depth between 0.6 – 0.9 m is present along the western boundary of Parcel 1 and the north-western corner of parcel 2.
- 10.4.5 The EA's Long-Term Flood Risk Map indicates that Surface Water flooding with a High Risk (>3.3% Annual Probability) of occurrence is present across the Site.
- 10.4.6 Parcel 1 has High Risk areas associated with some land drains that cross the Parcel is the east and a topographical low point in the west. Parcels 2 and 3 have High Risk areas associated with the route of the River Till. There are multiple flow paths in the surrounding area that flow towards the Site

Cottam 1 (South)

- 10.4.7 The EA's Flood Risk Map for Planning indicates that the northern, western and a minor portion of the south-eastern extent of the Site are within Flood Zone 3.

- 10.4.8 Fluvial risk across the Site is associated with the River Till which flows southwards through the Site, the risk extents along some land drains in the north of the Site. The South Spinney/Beck Spinney is an Ordinary Watercourse (responsibility of the LLFA to maintain) and runs along the part of the south-eastern Site boundary.
- 10.4.9 The EA's Spatial Flood Defences dataset indicates that formal EA Flood Defences are present along the length of the River Till that runs through the Site. The defences are shown as 'embankments' on the dataset which upon inspection of Google Streetview appear to be raised grassy banks. The Standard of Protection (SoP) of the defence is shown as up to the 1 in 10-year event. The upstream crest level of the defence is stated as 7.62 m AOD and the downstream crest level as 7.20 m AOD.
- 10.4.10 The EA have provided depth grid data for the Defended 1% AEP + 20% Climate Change (CC) scenario and 0.1% AEP + 20% CC scenario taken from the Upper Witham Lincoln 2015 Model.
- 10.4.11 During the 1% AEP + CC scenario, flows are shown to overtop the right bank of the River Till and cover a minor portion of the Site in the south. The vast majority of the on-Site flooding is shown to be below 0.6 m however there are some minor areas shown to hold depths above 0.9 m, therefore development should be avoided in such areas. It should be noted that there appears to be a modelling error in the south-west corner of the Site where a 'clear' zone of no flood risk is shown. On comparison to LiDAR data, the elevation levels of the land in the flood free zone are not raised above the surrounding land, therefore there is no indication that flows would not reach this area. It should be assumed that flows would also cover this portion of the Site.
- 10.4.12 During the 0.1% AEP + CC scenario, the majority of the Site remains flood free however a greater proportion of the Site is shown to hold flooding with a depth greater than 0.9 m.
- 10.4.13 The EA's Long-Term Flood Risk Map indicates that Surface Water flooding with a High Risk (>3.3% Annual Probability) of occurrence is present across the western and eastern extents of the Site. The surface water extents shown on the EA Flood Map concur with the course of the watercourses that run through the west of the Site and along the eastern periphery.

Cottam 1 (West)

- 10.4.14 The EA's Flood Risk Map for Planning indicates that Parcels 2 and 3 are partially located within Flood Zones 2 and 3 associated with the River which flows in a south-easterly direction through Parcels 2 and 3.
- 10.4.15 The EA's Spatial Flood Defences dataset indicates that formal EA Flood Defences are present along the length of the River Till that runs through the Site. The defences

are shown as 'embankments' on the dataset which upon inspection of Google Streetview appear to be raised grassy banks. The Standard of Protection (SoP) of the defence is shown as up to the 1 in 10-year event. The upstream crest level of the defence is stated as 10.45 m AOD and the downstream crest level as 8.41 m AOD.

- 10.4.16 The EA have provided depth grid data for the Defended 1% AEP + 20% Climate Change (CC) scenario and 0.1% AEP + 20% CC scenario taken from the Upper Witham Lincoln 2015 Model.
- 10.4.17 During the 1% AEP + CC scenario, the vast majority of the Site is shown to remain flood free. A minor portion of flooding is shown to encroach the south-eastern corner of the Site however depths are shown to remain below 0.5 m.
- 10.4.18 During the 0.1% AEP + CC scenario, a minor portion of Parcel 1 is encroached by flooding however the depths are shown to remain below 0.4 m. Flooding is shown on both side of the River Till within the centre of Parcel 2, with some areas indicated to have flooding reaching depths above 0.9 m. The majority of the northern Parcel 3 is shown to be flooded however the depths are shown to be below 0.7 across the entire parcel. The eastern extent of the southern Parcel 3 is shown to be impacted, with maximum flood depths above 0.9 m in the eastern area of the parcel that bounds the River Till.
- 10.4.19 The EA's Long-Term Flood Risk Map indicates that Surface Water flooding with a High Risk (>3.3% Annual Probability) of occurrence is present across the Site. Parcel 1 has High Risk areas associated with some land drains that cross the Parcel is the east and a topographical low point in the west. Parcels 2 and 3 have High Risk areas associated with the route of the River Till. There are multiple flow paths in the surrounding area that flow towards the Site.

Cottam 2

- 10.4.20 The EA's Flood Risk Map for Planning indicates that the north and eastern boundary of the Site are encircled by Flood Zone 3. The EA's Spatial Flood Defences Dataset indicates that there are no flood defences present within the vicinity of the Site.
- 10.4.21 The EA's Long-Term Flood Risk Map indicates that Surface Water flooding with a High Risk (>3.3% Annual Probability) of occurrence is present across the boundaries of the Site, predominantly surrounding the north, east and west. The Site shows little surface water risk within the boundaries, aside from a small parcel within the centre of the site which is shown to be a Medium Risk (1% - 3.3%).

Cottam 3a

- 10.4.22 The EA's Flood Risk Map for Planning indicates that the Site is located wholly within Flood Zones 1.

- 10.4.23 The EA's Long-Term Flood Risk Map indicates that the majority of the Site is at Very Low to Low (<0.1 - 1%) risk of Surface Water flooding. Isolated areas of the Site are at Medium to High Risk (1 - 3.3% Annual Probability), notably on the north-eastern boundary of the Site for approximately 1 km. This forms a Surface Water flow path, running along the boundary and away from the Site northwards. Other isolated areas of Medium to High Risk on the Site are associated with minor topographic depressions which infill during rainfall events.

Cottam 3b

- 10.4.24 The EA's Flood Risk Map for Planning indicates that the Site is located wholly within Flood Zones 1.
- 10.4.25 The EA 'Flood Risk from Surface Water' map (Figure 2) indicates that the Site is largely at Very Low risk (<0.1% annual probability) of surface water flooding. However, there are some small areas throughout the Site which are at Low to High risk (0.1 - ≥ 3.3% annual probability) of surface water flooding; these areas are generally confined to the north-east and south-western extents

Cable Routes

- 10.4.26 The proposed cable routes cross watercourses and therefore pass through Flood Zones 1, 2 and 3 on the EA's Flood Risk Map for Planning.

10.5 Identification and Evaluation of Likely Significant Environmental Effects

- 10.5.1 The likely significant effects of the Scheme during decommissioning are likely to be similar to those encountered during the construction phase. Therefore, those effects considered for construction below are similarly expected during the decommissioning phase.
- 10.5.2 The unmitigated likely significant effects are reported below with mitigation considered in Section 10.8.

Construction

Effects on Flood Risk and Drainage

Mud and Debris Blockages

- 10.5.3 There is the potential for mud and debris arising from the construction works to enter the existing surface water / land drainage system, causing blockages and restricting flow. This could result in localised flooding on Site, especially after heavy or prolonged rainfall resulting in a potential risk to people and property. As the Site is at present predominantly agricultural the initial effect is considered to be limited.

However, as the multi parcel development progresses and the area of development increases this potential construction effects will become an increasing consideration.

- 10.5.4 The sensitivity of construction workers and equipment to mud and debris blockages is considered to be **Medium**. The potential for mud and debris to block drainage networks is considered to have an effect of **Low Adverse** magnitude on flooding to the Site itself and surrounding area which would result in flood risk to construction workers and equipment at the Site. The significance of effect is **Moderate Adverse**.

Temporary Increase in Impermeable Area and Compaction of Soils

- 10.5.5 Temporary increase in impermeable area during construction has the potential to increase flooding both on and off site. Temporary hardstanding or compacted areas could result in rapid surface water runoff to local watercourses or cause an increase in overland flow. As the Site is Greenfield at present there is potential for overland flows to be created and for localised flooding to occur. Increased, un-regulated discharges into local watercourses could also increase the risk of flooding downstream.
- 10.5.6 The effects would be temporary and short term. The sensitivity of construction workers and equipment is considered to be **Medium** with the temporary effects considered to have an effect of **Medium Adverse** magnitude to people working within - and property at - the Site as it could occur at a time of high flood risk (e.g. during a large storm event). The significance of effect is **Moderate Adverse**.
- 10.5.7 Construction of access tracks and movement of construction traffic, in the absence of construction good practice, can lead to compaction of the soil. This can reduce soil permeability, potentially leading to increased run-off rates and increased erosion. The superficial geology underlying the Development is generally of low permeability and is in agricultural use, so the effects of compaction would not result in a substantial increase in runoff from existing conditions.
- 10.5.8 In order to maintain the current level or improve the drainage, it is necessary to ensure that construction methods do not seriously disrupt the established drainage network and that no areas are surcharged, either by water discharge or spoil.
- 10.5.9 Maintenance of existing drainage infrastructure is critical to avoid compaction of soils, therefore all existing land drainage network, will be maintained. Existing access tracks have been used in the design where practicable, further reducing the potential for soil compaction.
- 10.5.10 The effects would be temporary and short term. The sensitivity of construction workers and equipment is considered to be **Medium** with the temporary effects considered to have an effect of **Medium Adverse** magnitude to people working

within - and property at - the Site as it could occur at a time of high flood risk (e.g. during a large storm event). The significance of effect is **Moderate Adverse**.

Effects on Water Resources

Silt-laden Runoff

- 10.5.11 During the construction phases of the Scheme, there are a number of activities which have the potential to negatively affect the local water environment. Activities such as potential dewatering of excavations, concreting, earthworks, and use of heavy plant can lead to significant quantities of silty runoff that may also be contaminated with oil, fuel and/or other construction materials, all of which have potential to cause pollution of the water environment and negatively affect the ecology it supports. Pollutants could be mobilised to watercourses or infiltrate to ground.
- 10.5.12 The Scheme is likely to involve construction of temporary access tracks to the Scheme. Access roads are expected to be constructed with compacted self-binding aggregate fill materials. Shallow excavation of vegetation and soils would be necessary for placement of road surfaces. Access roads would form long linear features that, in the event of rainfall, could provide temporary drainage routes for surface water during the construction phase of the development. With the potential for soil erosion and consequent liberation of sediment from shallow road excavations it would be necessary to ensure that pollution prevention measures within the Site are adequate to prevent migration of silt to surface watercourses and groundwater bodies.
- 10.5.13 The sensitivity of surface water and groundwater bodies to silt contamination is considered to be **Medium**. Without mitigation, potential effects are considered of a **Medium** magnitude. The significance of the effect is **Moderate Adverse** on a temporary short-term basis.

Spillages, Leakages and Pollutants

- 10.5.14 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and / or used on the Site. Leaks and spillages of these substances could pollute groundwater bodies through infiltration as well as the surface watercourses within the Site and those nearby if their use is not carefully controlled and spillages enter existing flow pathways. To allow such substances to enter a watercourse could be in breach of regulation 38(1) of the Environmental Permitting (England and Wales) Regulations 2016, therefore, measures to control the storage, handling and disposal of such substances will need to be in place prior to and during construction. The construction compound locations have not been determined, nor has it been confirmed at this stage whether

concrete will be batched off-site. Therefore, it has been assumed that these could be sited next to existing flow pathways,

- 10.5.15 The sensitivity of surface water and groundwater bodies to spillages, leakages and pollutants is considered to be **Medium**. Without mitigation measures spillages of chemicals/fuel stored and or used on the Site could cause short term, temporary effects of a **Medium** magnitude on the local watercourses (medium importance). The significance of effect is **Moderate Adverse** on a temporary short-term basis.

Inappropriate Wastewater Disposal from Welfare Facilities

- 10.5.16 In the absence of nearby public foul water sewers to which foul water from welfare facilities could be connected, a suitably sized self-contained unit will be installed on the Site that will be maintained by a specialist Contractor.
- 10.5.17 The sensitivity of surface water to inappropriate wastewater disposal from welfare facilities is considered to be **Medium**. Construction foul water will not be discharged into a watercourse under any circumstances and therefore the magnitude of impact and significance of this effect is considered to be **Negligible**.

Operation

Effects on Flood Risk and Drainage

Increase in Permanent Impermeable Area

- 10.5.18 Given the nature of the Scheme, the increase in permanent impermeable area on the Site will be negligible, however equipment such as the proposed substations and battery storage areas will generate increased surface water runoff when compared to the current use of the Site. This could potentially increase localised pluvial flooding on the Site, as well as increase flood risk to people and property in the immediate surrounding area and downstream.
- 10.5.19 The sensitivity of people and property is considered **Medium**. Whilst the effects would be temporary and short term, this is considered to have an effect of **Medium Adverse** magnitude to people and property as it could occur at time of high flood risk (e.g. during a large storm event). The significance of effect is **Major Adverse**.

Increase in Discharge to Local Watercourse

- 10.5.20 An increase in the volume of water discharged to local watercourses as a result of increased hardstanding area has the potential to increase the flood risk to areas downstream of the Scheme.
- 10.5.21 The sensitivity of people and property is considered **Medium**. Whilst the effects would be temporary and short term, this is considered to have an effect of **Medium**

Adverse magnitude to people and property (considered to be up to very high importance) occurring at time of high flood risk (e.g. during a large storm event). The significance of effect is **Major Adverse**.

Summary

- 10.5.22 During construction there are a number of potential effects on surface water which require mitigation to reduce the residual effect to **Negligible or Minor** which are discussed below. During operation, the risk to the receptors will be mitigated through implementation the embedded drainage discussed further below.

Operation

Effects on Water Resources

Diffuse Pollution Contained in Urban Runoff

- 10.5.23 The operation of the Scheme may negatively affect the local water environment. Urban runoff from the Site, along with the associated infrastructure, could contain diffuse urban pollutants such as hydrocarbons, heavy metals, and nutrients as well as debris and silt which could ultimately be discharged to the nearby watercourses via surface water runoff or infiltrate to ground. Without mitigation this could have a moderate adverse effect on water quality.
- 10.5.24 The sensitivity of surface water and groundwater bodies are therefore considered **Medium**. This is considered to have an effect of **Medium Adverse** magnitude on downstream watercourses. The significance of effect is **Moderate Adverse** for the local watercourses – including those within the Site - which is considered permanent if left unmitigated.

Increase in Highway Routine Runoff

- 10.5.25 Traffic on existing roads to and from the Site will increase albeit negligibly as a result of the Scheme. Any increase in traffic flows could lead to the introduction of new sources (or changed discharges) of highway runoff into receiving watercourses. Surface water runoff from roads can contain pollutants such as hydrocarbons, heavy metals and inert particulates which can cause chronic pollution of the water environment if allowed to enter watercourses without the appropriate treatment.
- 10.5.26 Without mitigation this could have a **Low Adverse** effect on water quality, the sensitivity of surface water is therefore considered **Medium**. This is considered to have an effect of **Low Adverse** magnitude on downstream watercourses. The significance of effect is **Minor Adverse** for the local watercourses which is considered permanent if left unmitigated.

Increase in Highway Spillage Risk

- 10.5.27 Spillages of pollutants (e.g. oil) on highways can be transported to watercourses via runoff, where they could impact upon ecological life, or infiltrate to ground.
- 10.5.28 The receptors at risk are surface watercourses and groundwater bodies which are considered to be of **Medium** Sensitivity. Without mitigation the increase in highway spillage risk is considered to have an effect of a **Low Adverse** magnitude. The significance of effect is **Minor Adverse** which is considered permanent if left unmitigated. Mitigation should form part of the civil engineering design going forward.

Increased Demand on Water Supply

- 10.5.29 Due to the nature of the Scheme, there is no significant demand for water. This is not directly considered to be a surface water quality effect, as it is unlikely that any required water would be sourced from local surface waters, and it is presumed that the Scheme would not proceed unless potable water was available from elsewhere. Anglian Water should be consulted regarding potable supply to the Scheme where necessary. Water consumption for any future Site users should be minimised through water efficiency measures.
- 10.5.30 The receptors at risk are surface water which are considered a **Low** sensitivity. The increased demand on water supply from the Scheme is considered to have an effect of **Negligible magnitude** (i.e. to locations where potable water supply is obtained from). The significance of effect is therefore **Negligible**.

Disposal of Surface and Foul Water from the Site

- 10.5.31 Access to the solar PV array during construction and operation will be taken from grassed /permeable tracks and existing farm tracks accessed from the wider highway network, limiting the requirement for new hardstanding.
- 10.5.32 The sensitivity on surface water is therefore considered **Medium**. This is considered to have an effect of **Medium Adverse** magnitude on downstream watercourses. The significance of effect is **Moderate Adverse** for the receiving watercourses which is considered permanent if left unmitigated.
- 10.5.33 Currently there is no existing foul network on the Site or adjacent. Due to the nature of the Scheme no welfare facilities are proposed and there will be no foul drainage network associated with the Site.

Table 10.5: Flood Risk and Drainage summary of likely significant effects and receptors at risk if left unmitigated

Likely Significant Effect	Receptor(s)
Construction Phase	
Mud and Debris Blockages	Flood risk to future people or property at the Site and surrounding areas. Construction workers and construction equipment
Temporary Increase in Impermeable Area	Flood risk to future people or property at the Site and surrounding areas. Construction workers and construction equipment
Compaction of Soils	Flood risk to future people or property at the Site and surrounding areas. Construction workers and construction equipment
Operational Phase	
Increase in Permanent Impermeable Area	Flood risk to future people or property at the Site and surrounding areas.
Increase in Discharge to Local Watercourses.	Flood risk to future people or property at the Site and surrounding areas.

Table 10.6: Water Resources summary of likely significant effects and receptors at risk if left unmitigated.

Likely Significant Effect	Receptor(s)
Construction Phase	
Silt-laden Runoff	Local watercourses including those within and adjacent to the Site, groundwater bodies
Spillages, Leakages and Pollutants	Local watercourses including those within and adjacent to the Site, groundwater bodies
Inappropriate Wastewater Disposal from Welfare Facilities	Local watercourses including those within and adjacent to the Site
Operational Phase	
Diffuse Pollution Contained in Urban Runoff	Local watercourses including those within and adjacent to the Site, groundwater bodies
Increase in Highway Routine Runoff	Local watercourses including those within and adjacent to the Site
Increase in Highway Spillage Risk	Local watercourses including those within and adjacent to the Site, groundwater bodies
Increased Demand on Water Supply	Surrounding area

Disposal of Surface and Foul Water from the Site	Local watercourses including those within and adjacent to the Site
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Summary

- 10.5.34 During construction there are a number of potential effects on surface water which require mitigation to reduce the residual effect to **Negligible** which are discussed below. During operation, the risk to the receptors will be mitigated through implementation of the embedded drainage discussed below.

10.6 In-combination Effects

- 10.6.1 There are considered to be no cumulative effects from inter-topic relationships following respective mitigation that would cumulatively impact the Site.

10.7 Cumulative Effects

- 10.7.1 In summary, the type of 'cumulative' effects which will be assessed are:

The combined effects of the Scheme with other significant and relevant committed proposals within the vicinity of the Scheme.

- 10.7.2 A 'long list' of potential cumulative development sites is provided in **Appendix 2.2** and the more substantial developments are shown on the plan at **Appendix 2.3**. Of particular relevance to any cumulative assessment is the West Burton Solar Project and Gate Burton Solar Project (both NSIP schemes). Overall, all local developments will have to work to the same planning policy and ensure that there is no increase in flood risk on or off-site as a result of the scheme's, so they remain safe for the lifetime of the developments.

- 10.7.3 A comprehensive CEMP will also be required for this development (as for other developments) to ensure there are no adverse impacts on local water resources and water quality. Therefore, the cumulative impact is considered **Negligible**.

10.8 Mitigation Measures

Embedded Development Design

- 10.8.1 8m Easements have been established around all watercourses, including Main Rivers, Ordinary Watercourses and IDB assets.
- 10.8.2 Beyond this, the separation of construction ground-works from drainage ditches has been maximised, particularly from the IDB maintained ditches onsite.

- 10.8.3 Existing access tracks, where possible, will be retained, limiting the requirement to develop new access which can disturb soils and lead to compaction. Where new access tracks are required, they have been designed to avoid crossing drainage ditches, where possible.
- 10.8.4 The CEMP describes water management measures to control surface water run-off and drain hardstanding and other structures during the construction and operation of the Development. This will form part of a Pollution Prevention Plan (PPP) to be implemented for the Development.
- 10.8.5 The easements embedded into the design for watercourses, in conjunction with the CEMP, will avoid potential effects on the local receptors.
- 10.8.6 It is also noted that, currently, the fields within the Core Study Area are typically used for arable farming and are ploughed to within a closer distance of the ditches than the separations proposed for the Scheme. The “with Development” scenario is therefore likely to be better in terms of drainage than the baseline scenario. The “with Development” scenario also does not include application of nitrates to the land, which is carried out periodically in the baseline scenario, and this will lead to further improvements in water quality in the “with Development” scenario compared to the baseline scenario.
- 10.8.7 Access to the site during construction and operation will be taken from permeable and existing farm tracks accessed from the local highway network. This limits the potential for increased surface water runoff rates and sedimentation effects during construction.
- 10.8.8 With regards to flood risk, the individual parcels which make up the Site have been assessed on the best available data for each parcel. Based on the assessed flood risk the following embedded design has been implemented:
- Critical infrastructure within the Development (the substations and battery storage compounds) have been sequentially located within Zone 1, an area with a “Low probability of flooding” and therefore in land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%); and
 - Non-flood sensitive infrastructure forming the wider development (PV arrays, cabling, inverters and transformer stations) have been sequentially located outside the 1 in 100 plus climate change annual probability extent (1% +CC) or where this is not possible restricted to areas which experience less than 1 m depth of flooding during the same event. Solar PV arrays are constructed on legs which place the panel 1.7 m above the ground ensuring that the potential for damage is minimised.

Mitigation by Design associated with Flood Risk and Drainage

Permanent Increase in Impermeable Area

- 10.8.9 Given the nature of the Scheme, the increase in permanent impermeable area on the Site will be negligible, however equipment such as the proposed substations and battery storage areas will generate increased surface water runoff when compared to the current undeveloped nature of the Site. There can be no off-site detriment in terms of surface water runoff rates and volumes and therefore it is proposed to maintain the predevelopment surface water regime post development. This will be achieved through:
- Utilising permeable surfacing (Type 2 aggregate) for the Site access, ensuring that surface water is retained where it falls and is allowed to infiltrate to subsoils as per the existing situation.
 - Installation of linear infiltration trenches around Critical infrastructure (the substations and battery storage compounds) or any other required hardstanding such as concrete bases. Infiltration trenches will ensure that any surface water generated by hardstanding is retained adjacent to the infrastructure, allowing it to infiltrate to subsoils as per the existing situation.
 - The solar panels have the potential to concentrate rainfall under the leeward edge of the panels themselves. Research in the United States by Cook & McCuen⁴⁵, suggested this increase would not be significant however, there is a potential increase in silt laden runoff. With the implementation of suitable planting (such as a wildflower or grass mix) the underlying ground cover is strengthened and is unlikely to generate surface water runoff rates beyond the baseline scenario.
- 10.8.10 Following implementation of the proposed mitigation the residual effect is considered to be **Negligible**. The arrangements for adoption should be investigated at an early stage and proposals agreed acceptable by the LPA.

Increase in Discharge to Local Watercourses

- 10.8.11 Maintaining the existing surface water run-off regime by utilising permeable surfacing for the Site access, linear infiltration trenches around any proposed infrastructure (substations and batteries) and wildflower planting at the leeward edge of solar panels will ensure that the Scheme is unlikely to generate surface water runoff rates beyond the baseline scenario.

⁴⁵ "Hydrologic Response of Solar Farms." J. Hydrol. Eng., 18(5), 536–541. 2013

10.8.12 The management train of any proposed SuDS will be designed appropriately so as not to exacerbate surface water risk from the Site. Suitability of the SuDS components will be determined in the detailed drainage design for the Scheme.

10.8.13 Following implementation of the proposed mitigation the residual effect is considered to be **Negligible**.

Mitigation by Design associated with Water Resources

Diffuse Pollution in Urban Runoff

10.8.14 Generally, the Scheme is likely to have a very-low pollution risk and so the management train should normally have one or two treatment stages. Generally, two treatment stages for run-off from access and one treatment stage for run-off from roofs are required, subject to agreement of the approving authority.

10.8.15 Where practical, at detailed design stage it is recommended that runoff from equipment and access tracks will be directed to permeable SuDS features with contributions being made from permeable surfacing, wildflower planting and linear infiltration trenches.

10.8.16 Inclusion of aforementioned features should in general provide sufficient treatment. Where some attenuation is provided in a below ground system, additional treatment may need to be provided by a suitably sized separator.

10.8.17 Future maintenance of the SuDS scheme should pass to a management company. Clear future finance arrangement should be in place for the future maintenance. An overview of possible SuDS features and possible future maintenance will be provided in the Flood Risk Assessment and Drainage Strategy for the development.

10.8.18 Following the implementation of mitigation measures the residual effect is considered to be **Negligible**.

Increase in Highway Routine Runoff / Spillage Risk

10.8.19 No mitigation is required beyond what is proposed in **Chapter 14 Transport**. Mitigation may include adaptations porous surfacing or similar; this would be confirmed at detailed design.

10.8.20 The residual effect is considered **Negligible**.

Disposal of Surface Water and Foul Water from the Site

10.8.21 Maintaining the existing surface water run-off regime by utilising permeable surfacing for the Site access, linear infiltration trenches around any proposed infrastructure (substations and batteries) and wildflower planting at the leeward

edge of solar panels will ensure that the Scheme is unlikely to generate surface water runoff rates beyond the baseline scenario.

- 10.8.22 The topography within the majority of the Site is relatively flat, meaning rainfall will tend to stay local to where it falls rather than running-off. In order to combat the effects of the concentration of water at the leeward edge of the solar panels, the area under the leeward edge should be seeded with a suitable grass / flower mix, to prevent drilling. With the implementation of suitable planting (such as a wildflower or grass mix) the ground cover is unlikely to generate surface water runoff rates beyond the baseline scenario.
- 10.8.23 No welfare facilities are proposed and there is no demand for Foul water generated on the Site.
- 10.8.24 Following the implementation of mitigation measures the residual effect is considered to be **Negligible**.
- 10.8.25 Mitigation measures are summarised in Table 10.6 below.

Additional Mitigation associated with Flood Risk and Drainage

Mud and Debris Blockages

- 10.8.26 Where necessary a temporary drainage network will be installed prior to the commencement of construction and a robust maintenance plan, confirmed through a Construction Environmental Management Plan (CEMP), should be maintained throughout the duration of construction works on the Site.
- 10.8.27 Following the implementation of mitigation measures the residual effect of mud and debris entering the surface water / land drainage system is considered **Negligible**.

Temporary Increase in Impermeable Area and Compaction of Soils

- 10.8.28 Construction mitigation guidance should be adhered to, for example ensuring that the impermeable area on the Site is increased as little as possible and where necessary installing a temporary surface water drainage system during construction. This effect should lessen as the Scheme progresses and the overall impermeable area increases with surface water drainage networks installed to deal with this effect.
- 10.8.29 The residual effect, following the implementation of a temporary construction drainage network, is considered to be Negligible.

Blockages of Drainage Networks

- 10.8.30 The drainage systems will be designed to good practice standards detailed within the CIRIA SuDS manual C753 and the implementation of a robust maintenance plan will aid in ensuring that the risk of flooding as a result of blockages is reduced. A third-party management and maintenance team would likely be established to maintain the features throughout the lifetime of the Scheme.
- 10.8.31 Following the implementation of mitigation measures the residual effect is considered to be **Negligible**.

Additional Mitigation associated with Water Resources

Silt-laden Runoff

- 10.8.32 The following mitigation measures can be utilised for silt management and control:
- Works that are likely to generate silt-laden runoff (e.g. earthworks and excavations) will be done preferentially during the drier months of the year;
 - During the construction phase easements of 10 m should be preserved adjacent to all receptors to ensure that there is a sufficient buffer from the sensitive receptor to the construction stages of development;
 - Site compounds and stockpiles will be located as far as possible (ideally at least 30 m) away from receptors;
 - A drainage system will be developed to prevent silt-laden runoff from entering surface water drains, watercourses and ponds without treatment (e.g. earth bunds, silt fences, straw bales, or proprietary treatment) under any circumstances;
 - Earth stockpiles will be seeded as soon as possible, covered with geotextile mats or surrounding by a bund;
 - Mud will be controlled at entry and exits to the Site using wheel washes and / or road sweepers;
 - Tools and plant will be washed out and cleaned in designated areas within Site compound where runoff can be isolated for treatment before discharge to watercourse under appropriate consent;
 - Debris and other material will be prevented from entering receptors; and
 - Construction SuDS (such as temporary attenuation) to be used during construction if necessary.

- 10.8.33 Following the implementation of mitigation measures the residual effect is considered to be **Negligible**.

Spillages and Leaks of Pollutants

- 10.8.34 To allow chemicals, fuels/oils and other such substances to enter a water body could be in breach of regulation 38(1) of the Environmental Permitting (England and Wales) Regulations 2016. As such measures to control the storage, handling and disposal of these substances will need to be put in place prior to and during construction. The following key mitigation measures relating to the control of spillages and leaks should be included a CEMP.
- Fuel will be stored and used in accordance with the Control of Substances Hazardous to Health Regulations 2002, and the Control of Pollution (Oil Storage) (England) Regulations 2001;
 - Fuel and other potentially polluting chemicals are to be stored in a secure impermeable and bunded area;
 - Refuelling of plant to take place off the Site if possible, or only in a designated area at the Site compound ideally at least 20 m from receptors;
 - Any plant / machinery / vehicles will be regularly inspected and maintained to ensure they are in good working order and clean for use in a sensitive environment. This maintenance is to take place off the Site if possible or only at designated areas in the Site compound;
 - All fixed plant used on the Site to be self-bunded;
 - Mobile plant to be in good working order, kept clean and fitted with drip trays where appropriate;
 - An Emergency Response Plan will be prepared and included in the CEMP. Spill kits and oil absorbent material to be carried by mobile plant and located at vulnerable locations on the Site. Construction workers will receive spill response training;
 - The Site is to be kept secure to prevent vandalism that could lead to a pollution incident;
 - Construction waste / debris are to be prevented from entering any water body;
 - Surface water drains on roads, other watercourse crossings or the core scheme compound area will be identified and where there is a risk that silt laden runoff could enter them, they will be protected (e.g. covers or sand bags); and

- Concrete wash water will be adequately contained and removed from the Site.

10.8.35 Following the implementation of the mitigation measures the residual effect is considered to be **Negligible**.

10.8.36 Mitigation measures are summarised in Table 10.7 below.

Table 10.7: Mitigation

Ref	Measure to avoid, reduce or manage any adverse effects and/or to deliver beneficial effects	How measure would be secured		
		By Design	By S.106	By Requirement
	Maintaining the existing surface water run-off regime by utilising permeable surfacing for the Site access, linear infiltration trenches around any proposed infrastructure (substations and batteries) and wildflower planting at the leeward edge of solar panels	X		
	Where necessary install temporary drainage network prior to the commencement of construction and robust maintenance plan should be maintained throughout the duration of construction works on the Site.			X
	Any proposed drainage features such as permeable surfacing, infiltration trenches and wildflower planting should be designed to good practice standards and a robust maintenance plan should be implemented.	X		X
	Include silt management and control measures in the CEMP.			X
	Ensure measures to control the storage, handling and disposal of pollutants are put in place prior to and during construction included in the CEMP.			X

10.9 Residual Effects

10.9.1 With the embedded design measures described above and those within the CEMP, all identified potential effects have been assessed as being of negligible significance, and therefore not significant in terms of the EIA Regulations.

10.9.2 No further mitigation is proposed.

11 Ground Conditions and Contamination

11.1 Introduction

11.1.1 The Ground Conditions and Contamination chapter of the PEIR assesses the land associated with Cottam 1, Cottam 2 and Cottam 3 (the “Sites”) and the cable corridors, as shown on the plans in **Appendix 3.1**; and identifies and evaluates the likely significant environmental effects posed by the Scheme during its construction, operation, management and decommissioning phases in relation to sensitive receptors (human health and controlled waters).

11.1.2 This chapter is supported by the following Appendices:

- **Appendix 11.1-11.3:** Delta-Simons Preliminary Geo-Environmental Risk Assessment Reports for Cottam 1, Cottam 2 and Cottam 3.

11.2 Policy context

Legislation

11.2.1 Part IIA of the Environmental Protection Act 1990 (**EPA 1990**) aims to ensure that contaminated land is identified and remediated where it poses unacceptable levels of risk. Section 78A(2) of the EPA 1990, provides the definition of “contaminated land” for the purposes of Part 2A, which is:

(2) “Contaminated Land” is any land which appears to the Local Authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that –

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- significant pollution of controlled water is being caused; or there is a significant possibility of such pollution being caused’.

11.2.2 In Section 78A(4) of the, EPA 1990, harm is defined as meaning ‘harm to the health of living organisms or other interference with the ecological systems of which they form part and in the case of man includes harm to his property’.

11.2.3 In addition, Sections 161 to 161D of the Water Resources Act 1991 gives powers to the Environment Agency to take action to prevent or remedy the pollution of controlled waters. A “works notice” served under Section 161A specifies what works or operations have to be carried out and in what time periods. A “works notice” is served on any responsible person where it appears that:

- any poisonous, noxious or polluting matter or any waste matter is or has been present in, or is likely to enter, any controlled waters; or
- any controlled waters are being or have been harmed, or are likely to be harmed, by any event, process or other source of potential harm

Guidance

11.2.4 The statutory government guidance to Part 2A (DEFRA, 2012), describes the concept of the 'contaminant linkage' in Sections 3.8 to 3.11 as quoted below:

3.8 *"Under Part 2A, for a relevant risk to exist there needs to be one or more contaminant-pathway-receptor linkages – "contaminant linkage" – by which a relevant receptor might be affected by the contaminants in question. In other words, for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters. For the purposes of this Guidance:*

(a) *A "contaminant" is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.*

(b) *A "receptor" is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.*

(c) *A "pathway" is a route by which a receptor is or might be affected by a contaminant.*

3.9 *The term "contaminant linkage" means the relationship between a contaminant, a pathway and a receptor. All three elements of a contaminant linkage must exist in relation to particular land before the land can be considered potentially to be contaminated land under Part2A, including evidence of the actual presence of contaminants. The term "significant contaminant linkage", as used in this Guidance, means a contaminant linkage which gives rise to a level of risk sufficient to justify a piece of land being determined as contaminated land. The term "significant contaminant" means the contaminant which forms part of a significant contaminant linkage.*

3.10 *In some cases the local authority may encounter land where risks are presented by groups of substances which are likely to behave in the same manner, or a substantially very similar manner, in relation to the risks they may present (e.g. as may be the case with organic substances found in oils). For the purposes of identifying and assessing contaminant linkages and taking regulatory decisions in*

relation to such linkages, the local authority may treat such groups of contaminants as being in effect a single contaminant and multiple contaminant linkages as being in effect a single contaminant linkage. The authority should only do this if there is a scientifically robust reason for doing so, and it should state clearly why this approach has been taken in relevant documentation (including the risk summary discussed later in this Section) if the land is later determined as contaminated land.

3.11 *In considering contaminant linkages, the local authority should consider whether:*

- (a) The existence of several different potential pathways linking one or more potential contaminants to a particular receptor, or to a particular class of receptors, may result in a significant contaminant linkage.*
- (b) There is more than one significant contaminant linkage on any land. If there are, the authority should consider whether or not each should be dealt with separately, since different people may be responsible for the remediation of individual contaminant linkages."*

- 11.2.5 The guidance also mentions that its broader approach may include using the planning system to ensure land is made 'suitable for use'.
- 11.2.6 The UK government guidance titled 'Land affected by contamination', updated in July 2019, provides guiding principles on how planning can deal with land affected by contamination including identifying and remediating statutorily defines contaminated and, the use of buildings regulations and permitting. Guidance is also provided as to how to determine if land is contaminated through the use of several recommended data sources (such as River Basin Management Plans, National Land Use Database, Historical Ordnance Survey Maps, Local Planning Authority Records and Natural England's MAGIC site).
- 11.2.7 The Environment Agency's, 'Managing and reducing land contamination: guiding principles', issued in March 2010 and updated in April 2016, sets out how to undertake a risk assessment focusing on risk to water, how to undertake a remediation options appraisal and how to implement remediation.
- 11.2.8 This assessment has been undertaken in general accordance with guidance on Land Contamination: Risk Management pages of the GOV.UK web pages, the relevant requirement of the National Planning Policy Framework (NPPF) (as revised 2021) (paragraphs 174 & 183-184) and the Planning Practice Guidance (Land Affected by Contamination). Further relevant UK Guidance relevant to this chapter includes;
 - British Standard BS 5930: Code of practice for ground investigations
 - British Standard BS 8485: Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

- British Standard BS 8576: Guidance on investigations for ground gas – permanent gases and volatile organic compounds
- CIRIA C665: Assessing risks posed by hazardous ground gases to buildings

Policy

11.2.9 National Policy Statements (NPSs) form a principal part of the decision-making process for Nationally Significant Infrastructure Projects (NSIPs); the policy statements of relevance to the Facility are:

- The overarching NPS for Energy (EN-1) (Department of Energy and Climate Change (DECC) 2011a) and draft revised NPS EN-1,
- NPS for Electricity Networks Infrastructure (EN-5), and
- Draft revised NPS EN-3 Renewable Energy Infrastructure.

11.2.10 Sections of the NPSs relevant to this chapter include;

- EN-1 Section 5.10.5 - The ES should identify existing and proposed land uses near the project, any effects of replacing an existing development or use of the site with the proposed project or preventing a development or use on a neighbouring site from continuing. Applicants should also assess any effects of precluding a new development or use proposed in the development plan.
- EN-1 Section 5.10.7 - During any pre-application discussions with the Applicant the LPA (Local Planning Authority) should identify any concerns it has about the impacts of the application on land use, having regard to the development plan and relevant applications and including, where relevant, whether it agrees with any independent assessment that the land is surplus to requirements.
- EN-1 Section 5.10.8 - Applicants should seek to minimise impacts on the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality (grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations. Applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed. For developments on previously developed land, Applicants should ensure that they have considered the risk posed by land contamination.

11.2.1 The NPPF (Ministry of Housing, Communities and Local Government (MHCLG), 2021) does not contain specific policies relating to NSIPs. However, some policy requirements detailed in the NPPF may be of relevance. The policies relating to this chapter include:

- Planning policies and decisions should contribute to and enhance the natural and local environment by inter alia preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate. (para 174)
- Planning policies and decisions should also ensure that: a) A site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation); b) After remediation, as a minimum land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; c) Adequate site investigation information, prepared by a competent person, is available to inform these assessments. (para 183)
- Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner. (para 184)
- Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. (para 185)

11.2.2 Cottam 1, 2 and 3 are located within the jurisdiction of West Lindsey District Council. The West Lindsey Local Plan was replaced by the Central Lincolnshire Local Plan on 24th April 2017. Local Policy 16 - Development on Land Affected by Contamination is relevant to this chapter.

11.2.3 The grid connection is at Cottam Power Station within the jurisdiction of Bassetlaw District Council. Bassetlaw Local Plan was published in August 2021 and Policy 49 – Contaminated and Unstable Land is relevant to this chapter.

11.2.4 The cable routes straddle both authority areas.

11.3 Consultation

11.3.1 A summary of the consultation of particular related to contaminated land and ground conditions is detailed in Table 11.1 below.

Table 11.1: Consultation and Responses

Consultee and Date	Response	Chapter Section Where Consultation Comment is Addressed
The Planning Inspectorate, 9th March 2022	<p>Scoping Report paragraph 10.5.1 proposed to scope out ground conditions and contamination impacts from Cottam one to three sites from the ES on the basis that the potential for impacts is low and mitigation measures will reduce potential impacts to negligible.</p> <p>Appendix 10 provides a Preliminary Risk Assessment (PRA) for Cottam Sites one to three. This sets out potential sources of contamination and contamination pathways; only limited contamination sources and pathways have been identified at each site and mitigation measures are described and committed to in Scoping Report paragraph 10.4.7 and 10.4.12.</p> <p>It is noted that Cottam one and two, ground gas sources have been identified and it is recommended that a further limited investigation be carried out once the site layout design is complete.</p> <p>The Inspectorate is content to scope out ground conditions and contamination at the Cottam three site on the bases of the PRA information. In light of the identified ground gas source at Cottam 1 and 2 the ES should include an assessment of impacts arising from ground gas sources where significant effects are likely to occur and describe and secure any associated mitigation. The approach to ground has emission assessment should be agreed with the local planning authority where possible.</p>	<p>The risk from ground gases are addressed in Section 11.6.6 following the confirmation of the proposed site layout which at the time of the PRAs was not included. No specific mitigation measures are considered to be required.</p>

11.4 Assessment Methodology and Significance Criteria

- 11.4.1 The baseline conditions associated with the soil and groundwater in order to determine the risk to human health and controlled waters have been obtained from a desktop review (Preliminary Geo-Environmental Risk Assessment (PRA)), for Cottam 1, Cottam 2 and Cottam 3 including the identification of the environmental setting, a review of historical and present-day maps and a review of regulatory information. The reports are dated November 2021 and are included in **Appendix 11.1-11.3** and the locations are as shown in **Appendix 3.1**. The Environmental setting information has been obtained from a variety of sources including; British Geological Survey (BGS) online data, Environment Agency (EA) data, a Landmark Envirocheck® Report for the assessment sites, Coal Authority (CA) online data and information provided by West Lindsey District Council.
- 11.4.2 The Site conditions are used to form a Conceptual Site Model (CSM) which considered the sources of contamination and potential pathways to determine the risk to a receptor and provide a qualitative risk assessment via the method described in Section 11.2.3.
- 11.4.3 Following the Preliminary Risk Assessment, the sensitivity and magnitude of impact has been determined by considering the nature of the change, its severity, the duration of an effect, the likelihood of an effect occurring, and the relative extent of the effects of contamination to the receptor. Therefore, the risk assessment has been based on a qualitative assessment and professional judgement. Potential effects in terms of ground conditions tend to be local given the nature of potential sources of contamination also generally being localised with the exception of naturally occurring elevated contaminants. Therefore, the effects have not been considered in relation to different geographical contexts.

11.5 Baseline Conditions

- 11.5.1 The baseline conditions are summarised for Cottam 1, Cottam 2 and Cottam 3 below comprising a description of the site and surrounding area, the geology, hydrogeology, hydrology and the historical uses including mining legacy. This description is provided given it forms the basis of the conceptual site model, identifies potential sources, pathways and receptors. All information provided below is summarised from the PRAs included in **Appendix 11.1-11.3** which should be read for full details.

Cottam 1

Site and Surrounding Area

- 11.5.2 Cottam 1 consists of a series of agricultural fields (Fields A to G as shown on Figure 2 within **Appendix 11.1**) separated by hedgerows, drains and occasional trees. The

fields are accessed via existing farm tracks. Cottam 1 is centred around the village of Coates.

11.5.3 Three concrete slabs are present in the southern and western areas of Field D and northern Field C. A number of farmyards, residential dwellings and woodland areas are encompassed by the Site in the southern and northern areas.

11.5.4 Overhead electrical powerlines and associated pylons area present across Fields D and E in the southern and western areas. The surrounding area is predominantly rural agricultural land with the villages of Willingham by Stow, Sturton by Stow and Normandy by Stow to the west, Ingham to the east and Scampton to the south east.

Geology

11.5.5 Published British Geological Survey (BGS) data indicates Cottam 1 to be underlain by superficial Till (Diamicton), Alluvium (Clay, Silt, Sand and Gravel), Glacio-fluvial Deposits (Sand and Gravel) and River Terrace Deposits (Sand and Gravel), as follows:

- Field A - Till across the majority of the area with Alluvium in the north west;
- Field B - Till across the majority of the area with Alluvium in the east and west;
- Field C - Till in the south and east with a band of Alluvium running through the central area in an east-west orientation. River Terrace Deposits may encroach along the south western boundary;
- Field D - Till in the south and east with a band of Alluvium in the north east and running through the western area in a north-south orientation. Glacio-fluvial deposits are mapped in the west. No superficial deposits are mapped in some western and eastern areas;
- Field E - No superficial deposits mapped across the majority of the area with a band of Alluvium along the east and northern boundaries;
- Field F - No superficial deposits are mapped across the majority of the area with a band of Alluvium running through the central area in a south east to north west orientation; and
- Field G - No superficial deposits are mapped across the majority of the area with River Terrace Deposits in the south east.

11.5.6 The bedrock is mapped as the Charmouth Mudstone Formation across the eastern areas (Field A, B, C and the majority of D and most eastern area of E) and the Scunthorpe Mudstone Formation (Mudstone and Limestone) across the western areas (Field F, G, most western area of D and majority of E).

- 11.5.7 Made Ground is anticipated in the three concrete storage areas, however, it is likely to be limited in thickness.

Hydrogeology

- 11.5.8 The Environment Agency (EA) classify the superficial Till as a Secondary Undifferentiated Aquifer and the Alluvium, Glacio-fluvial and River Terrace Deposits as Secondary A Aquifers.
- 11.5.9 Bedrock of the Charmouth Mudstone Formation as Secondary Undifferentiated Aquifer and the Scunthorpe Mudstone Formation is classified as a Secondary B Aquifer.
- 11.5.10 The EA also indicate that Cottam 1 is not located within a Groundwater Source Protection Zone (SPZ). There are no licensed groundwater abstractions recorded within 500 m of Cottam 1.

Hydrology

- 11.5.11 There are a series of unnamed drains across Cottam 1 and along the boundary. The River Till is present in the western area and dissects, or is present along the boundary of Fields D, E and F.

Mining

- 11.5.12 Coal Authority data indicates Cottam 1 is not within a Coal Mining Report Area. As such a Coal Mining Assessment is not required under the planning regime.
- 11.5.13 There are no BGS recorded mineral sites on or in the immediate area.

Historic Summary

- 11.5.14 Cottam 1 has remained largely undeveloped and comprises a series of agricultural fields with associated drains, ponds and sparse areas of development associated with concrete hardstanding for storage and development in the north western area of Field D.
- 11.5.15 Ponds in the central area of field A and B, the north western area of field D and northern and southern areas of Field G are all noted to have been potentially infilled. Development in Field D was no longer mapped by the 1980's and assumed demolished.

[Cottam 2](#)

Site and Surrounding Area

- 11.5.16 Cottam 2 consists of a series of agricultural fields separated by hedgerows, drains and occasional trees. The fields are accessed via existing farm tracks. A farmyard and residential house are present adjacent to the central area with associated vehicular access route.
- 11.5.17 Corringham Beck and Yewthorpe Beck are present along the northern and eastern boundaries, respectively. The surrounding area predominantly comprises rural agricultural land with the village of Corringham to the west.

Geology

- 11.5.18 Published BGS data indicates Cottam 2 to be underlain by superficial Till (Diamicton) across the majority of the Site with superficial Alluvium (Clay, Silt, Sand and Gravel) along the eastern and north eastern area.
- 11.5.19 The bedrock is mapped as the Scunthorpe Mudstone Formation (Mudstone and Limestone).

Hydrogeology

- 11.5.20 The EA classify the superficial Till and Alluvium as Secondary Undifferentiated and Secondary A Aquifers, respectively.
- 11.5.21 Bedrock of the Scunthorpe Mudstone Formation is classified as a Secondary B Aquifer. The EA also indicate that Cottam 2 is not located within a Groundwater Source Protection Zone (SPZ).
- 11.5.22 There are three licensed groundwater abstraction records within 500 m of Cottam 2. All of which are located approximately 480 m north east and relate to extraction for use in the petrochemical industry.

Hydrology

- 11.5.23 There are a series of unnamed drains across Cottam 2 and along the boundary. Corringham Beck and Yewthorpe Beck are present along the western and eastern boundaries, respectively.

Mining

- 11.5.24 Coal Authority data indicates Cottam 2 is not within a Coal Mining Report Area. As such a Coal Mining Assessment is not required under the planning regime. There are no BGS recorded mineral sites on or in the immediate area.

Historic Summary

- 11.5.25 The Site has remained undeveloped and comprises a series of agricultural fields with associated drains. A pond was located in the northern area prior to 1999 and was potentially infilled.

Cottam 3

Site and Surrounding Area

- 11.5.26 Cottam 3 consists of a series of agricultural fields (Fields J and K as shown in Figure 2 of **Appendix 11.3**) separated by hedgerows, drains and occasional trees. The fields are accessed via existing farm tracks.
- 11.5.27 Field K historically formed Blyton Airfield, prior to reclamation as agricultural land in the 1990's. An access road is present in the southern area of Field K which leads to a hay storage area.
- 11.5.28 The surrounding area is semi-rural with agricultural land to the east and south. Commercial properties are present to the north of Field K associated with distribution. The wider former airfield is in use as a motorsport track and driving centre. The village of Blyton is present to the south west.

Geology

- 11.5.29 Published BGS data indicates Cottam 3 to be underlain by superficial Till (Diamicton) across the majority of the Site with superficial Glacio-fluvial (Sand and Gravel) deposits along the western boundary.
- 11.5.30 The bedrock is mapped as the Scunthorpe Mudstone Formation (Mudstone and Limestone). Made Ground is anticipated in developed areas, although is likely to be limited in thickness.

Hydrogeology

- 11.5.31 The EA classify the superficial Till as a Secondary Undifferentiated Aquifer and the Glacio-fluvial Deposits as a Secondary A Aquifer.
- 11.5.32 Bedrock of the Scunthorpe Mudstone Formation is classified as a Secondary B Aquifer. The EA also indicate that Cottam 3 is not located within a Groundwater Source Protection Zone (SPZ).
- 11.5.33 There are no licensed groundwater abstractions recorded within 500 m of Cottam 3.

Hydrology

- 11.5.34 There are a series of unnamed drains across Cottam 3 and along the boundary.

Mining

- 11.5.35 Coal Authority data indicates Cottam 3 is not within a Coal Mining Report Area. As such a Coal Mining Assessment is not required under the planning regime.
- 11.5.36 There are no BGS recorded mineral sites on or in the immediate area.

Historic Summary

- 11.5.37 The southern Field J has remained undeveloped and comprises a series of agricultural fields with associated drains and ponds. Ponds in the central and southern western ponds were noted prior to 1972 and were potentially infilled.
- 11.5.38 The northern Field K was largely undeveloped comprising agricultural fields and a residential dwelling in the southern area prior to forming part of Blyton Airfield between the 1940's and 1950's. The Site has since been reclaimed as agricultural land by the early 2000's.

Cable Corridors

Site and Surroundings

- 11.5.39 The cable corridors link the sites to the grid connection point running from Cottam Power Station north-east towards Blyton, as shown in Appendix 3.1. Agricultural land comprises the majority of the land within the corridor and other land use types that the corridor crosses include the River Trent between Marton and Coates.

Geology

- 11.5.40 Some of the cable corridors affect areas of search and safeguarded sand and gravel reserves. These routes include the corridor linking Cottam 3 to 2 which runs through the sand and gravel area of search around Blyton and the sand and gravel safeguarded area around Aisby/Corringham, and corridors linking the various parcels on the western side of the Cottam 1 Site southeast of Willingham by Stow. All options running west from Cottam 1 across the Trent Valley affect the Trent Valley sand and gravel area of search and sand and gravel safeguarded area within Lincolnshire and the corresponding sand and gravel safeguarded areas within Nottinghamshire.

Hydrology

- 11.5.41 The proposed cable routes cross watercourses and therefore pass-through Flood Zones 1,2 and 3 on the EA's Flood Risk Map for Planning.

Mining

- 11.5.42 None of the cable corridor falls within a Coal Mining Report Area.

Historical Summary

- 11.5.43 The most significant land use change within the cable corridor historically, has been the construction of Cottam Power Station where construction started in 1968.

11.6 Identification and Evaluation of Likely Significant Environmental Effects

- 11.6.1 A risk assessment of the identified plausible contaminated linkages has been undertaken for Cottam 1, 2 and 3 as part of the PRAs included in **Appendix 11.1 to 11.3**. The underlying principle is the evaluation of pollutant linkages via the Conceptual Site Model in order to assess whether the presence of a source of contamination could potentially lead to significant harm. A contaminant linkage consists of three elements:
- A “contaminant” is a substance which is in, on or under the land and which has the potential to cause significant harm to a relevant receptor, or to cause significant pollution of controlled waters.
 - A “receptor” is something that could be adversely affected by a contaminant, for example a person, an organism, an ecosystem, property, or controlled waters. The various types of receptors that are relevant under the Part 2A regime are explained in later sections.
 - A “pathway” is a route by which a receptor is or might be affected by a contaminant.
- 11.6.2 The sensitivity is based on the relative importance of the receptor, as detailed in Table 11.2.

Table 11.2: Sensitivity Criteria

Sensitivity	Definition
High	Land to be used for human consumption (e/g agricultural, allotments), highly sensitive ecosystems (eg. SPA, SAC, SSSI, NNR) and the receptor being a public drinking water supply.
Medium	Parks and open spaces, regional or locally sensitive ecosystems and water bodies of medium quality.
Low	Commercial or industrial land uses, low to non-sensitive ecosystems (e.g derelict land, solar farms), water bodies of low quality and not a public water supply.

11.6.1 The magnitude of impact on the receptor is detailed in Table 11.3.

Table 11.3: Magnitude of Impact

Sensitivity	Definition
High	The proposal will cause the release of contamination which is significantly above guideline values (such as C4SLs, soil guidance values, SoBRA guidance values, etc. specific to the source, receptor and development) or release hazardous contamination for the operational timescale of the develop. Remediation will be required.
Medium	The proposal will cause the release of contamination close to the guidance values (such as C4SLs, soil guidance values, SoBRA guidance values, etc. specific to the source, receptor and development) during construction or operational timescale of the development. Remediation may be required.
Low	The proposals will cause the release of contamination which is below the guideline values (such as C4SLs, soil guidance values, SoBRA guidance values, etc. specific to the source, receptor and development) for short period of time. Remediation will be not required; however, mitigation measures may be used to reduce the potential impact.
Negligible	Contaminants found at very low concentrations. Remediation not required.

11.6.2 The significance of any environmental effects is determined by the interaction of the magnitude of any impacts and the sensitivity of the receptor and can be positive or negative. The significance of an effect should be established with reference to Table 11.4.

Table 11.4: Criteria for assessing the significance of effects

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

11.6.3 The following potential contaminant linkages were assessed and the PRAs indicate that the risk is generally classified as Moderate to Minor across Cottam 1, 2 and 3 based on the data identified and reviewed within the PRA's in the absence of mitigation/control measures and site specific geo-environmental ground investigation data:

- Construction Workers – Direct contact/ingestion and inhalation of dust, vapours and asbestos fibres – Moderate/Minor significance
- Adjacent site users or residents – Direct contact/ingestion and inhalation of dust, vapours and asbestos fibres- Moderate/Minor significance
- Controlled waters – Leaching of contamination into groundwater and vertical/lateral migration through permeable deposits below the Site - Minor to Moderate significance
- Future site users - Direct contact/ingestion and inhalation of dust, vapours and asbestos fibres -Moderate/Minor significance
- Built Environment – Direct contact between and accumulation of gas in enclosed spaces and sub-floor voids - Minor significance

11.6.4 Potential contaminant linkages from contaminated soils to human receptors (construction workers, future Site users and adjacent Site users) are considered to be Moderate/Minor as limited potential sources of contamination have been identified across the mainly agricultural use. The northern area of Cottam 3 historically formed part of Blyton Airfield, however, has since undergone land reclamation back to agricultural use. A full list of potential sources for Cottam 1,2 and 3 is provided in the PRAs in **Appendix 11.1 to 11.3**.

11.6.5 None of the Sites are located within designated groundwater Source Protection Zones (SPZs) and significant sources of contamination have not been identified, as such the risk to controlled waters is considered very low.

- 11.6.6 Small and minor areas of potentially infilled ponds/Made Ground have been identified across Cottam 1, 2 and 3, however, given the small scale of these features and the age of any infill material, the potential for gas generation is low. Furthermore, based on the proposed infrastructure, the potential for hazardous ground gases to accumulate within confined spaces is considered very low. Furthermore, no buildings are proposed in the vicinity of potentially infilled ponds/pits across all four areas and no further assessment is required.
- 11.6.7 Significant environmental impacts of the development during operation and management are covered under separate chapters given the ground conditions are unlikely to be disturbed during operation. Any maintenance construction should follow the below remedial measures.
- 11.6.8 Prior to mitigation, the potential impact for construction, operation, management and decommissioning are of a moderate/minor or minor significance. As assessed within the PRAs and summarised above.

11.7 Cumulative and In-combination Effects

- 11.7.1 A 'long list' of potential cumulative development sites is provided in **Appendix 2.2** of the PEIR and the more substantial developments are shown on the plan at **Appendix 2.3**. Of particular relevance to any cumulative assessment is the West Burton Solar Project and Gate Burton Solar Project (both NSIP schemes).
- 11.7.2 A comprehensive CEMP will be required for this development (as for other developments) to ensure there are no adverse impacts arising in respect of contamination. Given modern methods of construction and the low sensitivity end use, there is not considered to be any cumulative effects to human health or controlled waters. Therefore, the risk of cumulative effects occurring is considered to be negligible.
- 11.7.3 There are no potential in-combination sources identified during the Preliminary Risk Assessment. Therefore, the risk of in-combination effects is considered to be negligible.
- 11.7.4 The Ground Conditions ES chapter will present a full assessment of the cumulative sites that are agreed with the relevant consultees.

11.8 Mitigation Measures

- 11.8.1 A Construction Environmental Management Plan (CEMP) will be secured via a DCO requirement, which will describe the construction related mitigation measures outline below. The plan will clearly set out best practise to ensure any environmental impacts during construction and in terms of land contamination are minimal. An Outline CEMP has been provided within the PEIR at **Appendix 4.3**.

- 11.8.2 Limited potential sources of contamination have been identified across Cottam 1, 2 and 3 which are detailed within the PRAs included in **Appendix 11.1 to 11.3**. Site workers will be made aware of the possibility of encountering localised contamination through toolbox talks and good standards of personal hygiene, including welfare facilities on-site and the use of appropriate levels of personal protective equipment (PPE), will be enforced.
- 11.8.3 Site workers will adhere to health, safety and environmental precautions in order to reduce the potential for any accidents and incidents.
- 11.8.4 A 'Discovery Strategy' protocol should be drawn upon to ensure that any contamination identified during construction is assessed by a specialist in land contamination. This will include but not be limited to stopping works in the area and ensuring the identified contamination does not pose a risk until an environmental specialist undertakes an assessment and a method is agreed to deal with the identified contamination. If required, the Local Planning Authority will be notified.
- 11.8.5 Methods will be used to reduce the amount of dust, e.g. washing down of vehicle's wheels, dampening down, etc.
- 11.8.6 Any bulk fuels or chemical used on site should be stored appropriately, within an impervious bund of 110% of the volume of the container in order to reduce the potential for any contamination source in the event of a container failure/ leak of battery fire and associate fire waters. Also, any spillages will be promptly addressed by appropriate measures, such as spill kits.

11.9 Residual Effects

- 11.9.1 The PRAs have identified that the potential contaminant linkages associated with the development across Cottam 1, 2 and 3 as moderate/minor or minor significance.
- 11.9.2 With mitigation outline above and the implementation of well-established good industry practises in construction for managing contaminated land which will be incorporated into the CEMP, it is considered that the potential effects of contamination or risk of contamination will be negligible and not significant.

12 Minerals

12.1 Background

- 12.1.1 This PEIR chapter has been prepared in support of the Cottam Solar Project, as described in **Chapter 4** of the PEIR. The Minerals Chapter considers the Sites, including the cable corridors (which connect the Sites together and which connects the generating stations to Cottam Power Station).
- 12.1.2 In terms of surface mineral resources these are addressed individually. All three Sites also lie within a much wider area of interest for oil and gas reserves. The potential implications for those reserves are dealt together. This assessment is based on current known information about the geology of the site and the surrounding area.
- 12.1.3 This chapter is supported by the following appendices:
- **Appendix 12.1** Figures 1-6 Mineral Resource Assessment Plans

12.2 Assessment Methodology

- 12.2.1 The assessment of impact identifies how the Scheme is predicted to affect identified mineral resources and the significance of those effects. The assessment process has taken account of published good practice guides such as the Mineral Safeguarding in England Good Practice Advice British Geological Survey 2011(ref 5).
- 12.2.2 The mineral resource that has been assessed has been identified by the British Geological Survey (BGS) in their Mineral Resource Reports for Lincolnshire (ref 6) and Nottinghamshire (ref 7) and through allocations, areas of search and mineral safeguarding areas contained in the Adopted Lincolnshire Minerals and Waste Local Plan Core Strategy (ref 1), Lincolnshire Minerals and Waste Local Plan Site Locations (ref 2) and the Nottinghamshire Minerals Local Plan (ref 3). Assessment of the impacts of the Scheme on the mineral interests needs to consider a number of parameters including extent, magnitude, duration and reversibility of the development as well as the extent, likely quality and situation of the mineral reserve. The significance is assessed on the impacts on identified mineral resources and implications in terms of national and local planning policy.
- 12.2.3 The impact of the Scheme has been considered as a whole with no distinction in terms of impact on mineral resources between construction, operation and decommissioning phases.
- 12.2.4 For the purposes of this assessment the impact on mineral resources has been limited to the Sites to be occupied by the solar arrays and associated infrastructure together with a margin extending 250 metres from the Site boundaries of each. The

250 metre boundary is based on the buffer zones adopted by Lincolnshire County Council and applied around their mineral safeguarding areas. Incompatible development close to mineral safeguarding areas may lead to sterilisation of part of the resource. The BGS good practice advice suggests that it may therefore often be appropriate to extend the mineral safeguarding areas beyond the resource boundary to take account of such risks. Although the solar arrays are not considered to be particularly sensitive developments, adopting a 250 margin does ensure that all potential impacts on mineral resources including existing mineral extraction sites are considered. In addition to the Sites this assessment has also considered the potential impact of the cable corridors connecting the Sites.

- 12.2.5 The baseline is the current geological strata, changes to which occur in timescales relevant to the proposed Scheme.
- 12.2.6 The following table identifies the impacts of the activities detailed and their effects and ranks the significance of the effect taking into account status and amount of receptor, sensitivity, timescale and vulnerability.

Table 12.1: Assessment of significance of impact

Sensitivity	Definition
High	Permanent Sterilisation of identified mineral resource.
Medium	Constraint to future exploitation of identified mineral resource
Low	Minimal impacts on mineral resources/prior extraction is possible

- 12.2.7 Table 12.2 identifies the magnitude criteria which will be used in the assessment:

Table 12.2: Magnitude Criteria

Magnitude	Definition
Major	The total loss or major change/substantial alteration to key elements/features of the baseline (pre-development) conditions, such that the post development character/composition/attributes will be fundamentally changed
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions, such that post development character/composition/attributes of the baseline will be materially changed
Minor	A minor shift away from baseline condition. As change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation
Negligible	Very little change from baseline conditions. The change will be barely distinguishable and approximating to a non-change situation
Neutral	No change from baseline conditions

12.2.8 Table 12.3 identifies the degree of significance which will be used in the assessment:

Table 12.3: Degrees of Significance

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

12.2.9 Following the assessment of the impact of the development on identified mineral resources, an assessment of the mitigation options, to the extent that they are necessary, is considered.

12.3 Consultation

12.3.1 The Planning Inspectorate published its Scoping Opinion Ref EN010133 on 9th March 2022 (ref 9). Table 12.4 provides a summary of the minerals related comments and the responses to these in the PEIR:

Table 12.4: Summary of Consultation

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
The Planning Inspectorate	The Scoping Report states that approximately 50 hectares of Cottam 1 is identified in the Lincolnshire Minerals and Waste Local Plan as being within two sand and gravel mineral safeguarding areas and that 25 hectares of Cottam 2 lies within a sand and gravel mineral safeguarding area. The Scoping Report also identifies a small area of Cottam 3 which also lies within a sand and gravel mineral safeguarding area. The Scoping Report identifies that this area	Meetings took place with both Nottinghamshire and Lincolnshire County Councils as Mineral Planning Authorities on the 14 th April 2022. Both Authorities confirmed that they did not consider the proposal would have any impact on foreseeable plans for mineral extraction within their respective areas. Neither considered the proposal would have any impacts for	

	<p>forms part of the 46 hectares of the site that lies within an identified area of search (sand and gravel) in the Lincolnshire Minerals and Waste Local Plan.</p> <p>Paragraph 5.9 of Appendix 11.1 confirms that “the proposed development does not require deep excavations or foundations and thus disturbance is limited to the surface layers rather than underlying deposits”. The ES should demonstrate that the Minerals Planning Authority has been consulted in respect of the proposals and that the Proposed Development does not impact on future ambitions for minerals extraction within the region.</p>	to meet anticipated mineral supply needs.	
	<p>Scoping Report Appendix 11 does not provide any figures identifying the location and extent of mineral safeguarding areas or the identified area of search. The Scoping Report confirms that the whole site is covered by a Petroleum Exploration and Development License (PEDL) as shale gas is located beneath the sites; this is currently prohibited to be extracted in the UK (Scoping Report Appendix 11).</p> <p>Two oil extraction sites are located 1km and 6km from Cottam one and three respectively although none</p>	<p>A set of drawings have been prepared and are included in the PEIR to show the extent of mineral safeguarding affected by the proposed development. The potential implications of the proposed cable routing options on identified mineral reserves have been considered and included in this assessment.</p>	<p>Appendix 12.1 Section 12.6</p>

	<p>of the Cottam array sites fall within the mineral consultation zones for these sites. It is unclear whether the cable routes do or not.</p> <p>The ES should include a figure identifying the location and extent of the PEDL and any mineral safeguarding within the zone of influence of the Proposed Development. An assessment of impacts from the Proposed Development on extraction activities should be provided where significant effects are likely to occur.</p>		
Nottinghamshire County Council	<p>In terms of the specifics relating to 'Cottam Solar Farm' and the cabling options for connection to the national grid, the entire of western side of River Trent lies within a Sand and Gravel Mineral Safeguarding Area, but that given relatively small land take we do not foresee any issues.</p>	Noted	Section 12.6
Lincolnshire County Council	<p>The proposed development is partially located within a Mineral Safeguarding Area (MSA) for Sand and Gravel. Within an MSA applications for non-minerals development should be accompanied by a Minerals Assessment. This should provide an appropriate assessment of the mineral resource, its potential for use in the forthcoming development and an assessment of whether it is feasible and viable to</p>	<p>A Minerals Assessment has been prepared taking account of the policies and proposals contained in the Lincolnshire Minerals and Waste Local Plan</p>	Chapter 12

	<p>extract the mineral resource ahead of development to prevent unnecessary sterilisation. The assessment should also assess the potential for proximal sterilisation of mineral resources in adjacent land.</p> <p>The potential sterilisation of mineral resources should therefore be 'scoped in' to the EIA and addressed through a minerals assessment as part of the ES. We acknowledge for example that the vast majority of the PV site itself does not lie within the MSA, and the potential sterilisation of mineral resources may therefore be very limited.</p>		
	<p>The proposed grid connection corridors, however, require more detailed consideration. All of the connection options pass through the sand and gravel MSA situated between the A156 and River Trent. Whilst the final footprint of the grid connection may be limited, by dissecting the MSA it could introduce a constraint to the potential for any future extraction of the sand and gravel resources in the surrounding land. The minerals assessment as part of the ES should therefore include consideration of this matter and it should be given due consideration when determining the final</p>	<p>Consideration has been given to the cable corridors and the potential impact on safeguarded mineral resources</p>	<p>Section 12.6</p>

	route/method of the grid connection.		
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12.4 Planning Policy Context

National Planning Policy

- 12.4.1 Minerals are important national resources and adequate and steady supplies are vital for development and sustaining the economy and society. Minerals are a finite natural resource that can only be worked where they are found. A key aspect of sustainable development is the conservation and safeguarding of non-renewable resources for future generations. As such it is important that other development does not needlessly prevent the future extraction of mineral resources.

National Policy Statement for Energy

- 12.4.2 The overarching National Policy Statement (NPS) for Energy (EN-1) (ref 10) came into force in July 2011. It sets out general principles and impacts to be taken into account for all types of energy NSIP development covered by the Energy NPSs. It is an important and relevant matter when determining if development consent should be granted and is underpinned by the principle that the development of large -scale renewable energy generation projects are needed (amongst other types of generation capacity) in order to meet the demand for energy generation in the United Kingdom, and to reduce greenhouse gas emissions from energy generation in order to meet the Government's decarbonisation targets.
- 12.4.3 Paragraph 5.10.9 of the 2011 EN-1 states that applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the land use after any future decommissioning has taken place.
- 12.4.4 Paragraph 5.10.22 states that where a proposed development has an impact upon a Mineral Safeguarding Area, the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.

Draft National Policy Statement for Energy

- 12.4.5 The Government is currently reviewing and updating the Energy NPSs and as part of the review process, the Government published a suite of Draft Energy NPSs for consultation in September 2021.
- 12.4.6 Paragraph 5.11.9 of the draft EN-1 repeats paragraph 5.10.9 of the 2011 EN-1. It makes clear that applicants should safeguard any mineral resources on the proposed site as far as possible, taking into account the long-term potential of the

land use after any future decommissioning has taken place. Likewise, paragraph 5.11.21 repeats paragraph 5.10.22 of the 2011 EN-1. It states that where a proposed development has an impact upon a Mineral Safeguarding Area, the Secretary of State should ensure that appropriate mitigation measures have been put in place to safeguard mineral resources.

Draft Policy Statement for Renewable Energy Infrastructure (EN-3)

- 12.4.7 Draft NPS EN-3 sets out additional policies for renewable energy infrastructure, including policies specific to the development of solar NSIPs.
- 12.4.8 These include matters that applicants should consider in selecting a site, how assessments should be undertaken and how mitigation should be provided. There are no specific references to mineral safeguarding in draft EN-3. However, paragraph 2.49.13 is of relevance as it states that the time-limited nature of solar farms is likely to be an important consideration for the Secretary of State when assessing impacts. Although not explicitly referenced, this could include the impacts arising from a delay to the extraction of any minerals below the surface of the site. The draft policy adds that the extent to which the site will return to its original state may also be a relevant consideration.

National Planning Policy Framework

- 12.4.9 The National Planning Policy Framework (NPPF) 2021 (ref 4), together with the accompanying Planning Practice Guidance (PPG) set out the Government's planning policies for England for the particular purpose of making development plans and deciding applications under the Town and Country Planning Act 1990.
- 12.4.10 The need to safeguard mineral resources is reflected in NPPF, in paragraph 209 it states:
- 12.4.11 *'It is essential that there is a sufficient supply of minerals to provide the infrastructure, buildings, energy and goods that the country needs. Since minerals are a finite natural resource, and can only be worked where they are found, best use needs to be made of them to secure their long-term conservation.'*
- 12.4.12 It goes on in paragraph 210 to state that planning policies should:
- 12.4.13 *'c) safeguard mineral resources by defining Mineral Safeguarding Areas and Mineral Consultation Areas; and adopt appropriate policies so that known locations of specific minerals resources of local and national importance are not sterilised by non-mineral development where this should be avoided (whilst not creating a presumption that the resources defined will be worked);'*
- 12.4.14 Mineral safeguarding areas (MSA) is the process used in the planning system to ensure that potential mineral resources are not needlessly sterilised. The presence

of a MSA does not necessarily preclude other forms of development being permitted nor confer any presumption that the mineral will be worked. It is a policy tool to raise awareness that minerals may be sterilised by proposed development and that this should be taken into account in the decision-making process.

National Planning Practice Guidance (PPG) Minerals (2014)

12.4.15 The Minerals PPG (2014) (ref 13) confirms that minerals ‘make an essential contribution to the Country’s prosperity and quality of life’. Section 3 of the Minerals PPG states that: “Mineral planning authorities are encouraged to plan for minerals extraction using Ordnance Survey-based proposals maps and relevant evidence provided by the minerals industry and other appropriate bodies. This approach will allow mineral planning authorities to highlight areas where mineral extraction is expected to take place, as well as managing potentially conflicting objective for use of land.”

12.4.16 Section 3 advises MPAs that they should plan for the steady and adequate supply of minerals, including in the following way:

“1. Designating Specific Sites – where viable resources are known to exist, landowners are supportive of minerals development and the proposal is likely to be acceptable in planning terms. Such sites may also include essential operations associated with mineral extraction...”

Local Policy

Lincolnshire Minerals Policy

12.4.17 The Cottam Project Sites all lie within Lincolnshire and therefore the relevant development plan documents include the Lincolnshire Minerals and Waste Local Plan Core Strategy and Development Management Policies (June 2016) (ref 1) which sets out the key principles to guide the future winning and working of minerals in the County up to 2031. It also sets out the development management policies against which planning applications for minerals and waste development will be considered. It also seeks to ensure the protection of mineral resources from the risk of sterilisation by development which potentially prevents future extraction. Known locations of mineral resources of national and local importance need to be protected and safeguarded to ensure the long-term security of minerals supply and to ensure their presence is factored into decisions about future land-use when proposals for other development arise. Safeguarding mineral resources does not create a presumption that the resources defined will ever be worked.

12.4.18 Lincolnshire Minerals and Waste Local Plan Core Strategy Policy M2: Providing for an Adequate Supply of Sand and Gravel states:

The County Council will ensure a steady and adequate supply of sand and gravel for aggregate purposes by making provision over the period 2014 -2031 (inclusive) for the extraction of 42.66 million tonnes of sand and gravel (2.37 million tonnes per annum). This will be divided between the three Production Areas (as shown on the Key Diagram) as follows:

18.00 million tonnes (1.00 million tonnes per annum) from the Lincoln/ Trent Valley Production Area;

9.00 million tonnes (0.50 million tonnes per annum) from the Central Lincolnshire Production Area; and

15.66 million tonnes (0.87 million tonnes per annum) from the South Lincolnshire Production Area.

The County Council will make provision for the release of sand and gravel reserves in the Site Locations Document. This will give priority to extensions to existing Active Mining Sites. New quarries will be allocated where they are required to replace existing Active Mining Sites that will become exhausted during the Plan period and where they are located in the relevant Areas of Search as shown on the Policies Map (Figure 5), namely:

- *west of Lincoln and north/ south of Gainsborough for the Lincoln/ Trent Valley Production Area;*
- *Tattershall Thorpe for the Central Lincolnshire Production Area; and*
- *West Deeping/ Langtoft for the South Lincolnshire Production Area.'*

12.4.19 Policy M4: Proposals for Sand and Gravel Extraction states that:

'Sites allocated in the Site locations Document will be granted planning permission for sand and gravel extraction for aggregate purposes provided that:

- *in the case of an extension to an existing Active Mining Site, extraction would follow on after the cessation of sand and gravel extraction from the existing areas supplying the plant site; and*
- *in the case of a new quarry, it is required to replace an existing Active Mining Site that is nearing exhaustion.*

For sites not allocated in the Site locations Document, planning permission will be granted for sand and gravel extraction for aggregate purposes where the site is required to meet:

- *a proven need that cannot be met from the existing permitted reserves; or*
- *a specific shortfall in the landbank of the relevant Production Area and either:*

(i) forms an extension to an existing Active Mining Site; or

(ii) is located in the relevant Area of Search as shown on the Policies Map (Figure 5) and will replace an existing Active Mining Site that is nearing exhaustion.

In all cases the proposal must accord with all relevant Development Management Policies and Restoration Policies set out in the Plan.'

12.4.20 Policy M11 addresses Safeguarding of Mineral resources, it states:

'Sand and gravel, blown sand and limestone resources that are considered to be of current or future economic importance within the Minerals Safeguarding Areas shown on Figure 1, together with potential sources of dimension stone for use in building and restoration projects connected to Lincoln Cathedral/Lincoln Castle within the areas shown on Figure 2, and chalk resources included on Figure 3, will be protected from permanent sterilisation by other development.

Applications for non-minerals development in a minerals safeguarding area must be accompanied by a Minerals Assessment. Planning permission will be granted for development within a Minerals Safeguarding Area provided that it would not sterilise mineral resources within the Mineral Safeguarding Areas or prevent future minerals extraction on neighbouring land. Where this is not the case, planning permission will be granted when:

- the applicant can demonstrate to the Mineral Planning Authority that prior extraction of the mineral would be impracticable, and that the development could not reasonably be sited elsewhere; or*
- the incompatible development is of a temporary nature and can be completed and the site restored to a condition that does not inhibit extraction within the timescale that the mineral is likely to be needed; or*
- there is an overriding need for the development to meet local economic needs, and the development could not reasonably be sited elsewhere; or*
- the development is of a minor nature which would have a negligible impact with respect to sterilising the mineral resource; or*
- the development is, or forms part of, an allocation in the Development Plan.'*

12.4.21 It should be noted that it has been demonstrated in Review of the Lincolnshire Minerals and Waste Local Plan (Feb 2021) (Ref 2) that Policy M11, in its current form, does not provide a practical or an efficient approach for safeguarding mineral resources. It states that the policy would therefore benefit from being updated. The

policy is generating too many consultations that fall within the exemptions to the policy and could be considered too extensive in terms of the areas covered.

- 12.4.22 Policy M12 addresses Safeguarding of Existing Mineral Sites and Associated Minerals Infrastructure it states:

'Mineral sites (excluding dormant sites) and associated infrastructure that supports the supply of minerals in the County will be safeguarded against development that would unnecessarily sterilise the sites and infrastructure or prejudice or jeopardise their use by creating incompatible land uses nearby.'

- 12.4.23 The Local Plan also states in paragraph 5.90:

'Incompatible development close to a MSA may lead to sterilisation of part of the resource. The BGS good practice advice suggests that it may therefore often be appropriate to extend the MSA beyond the resource boundary to take account of such risks, the extent of which will vary between minerals and the likely method of extraction. The County Council proposes to extend the boundary of MSAs beyond the area of the resource to prevent residential development encroaching on a mineral extraction to the extent that the amenity of residents could be affected by noise, visual intrusion or blast vibration. The resource areas shown on Figure 1 include a buffer zone of 250m around sand and gravel and blown sand resources and 500m around limestone resources to ensure an adequate safeguarding margin.'

- 12.4.24 Paragraph 5.89 states:

'It is not proposed to define MSAs for hydrocarbons as prospects can only be identified after extensive exploration activity. In any event, oil and gas deposits are found at much greater depths than other minerals exploited within the County and are therefore less threatened by surface development.'

- 12.4.25 The Lincolnshire Minerals and Waste Local Plan Site Locations (December 2017) Policy SL2 safeguards specific mineral allocations made in the plan it states:

'Allocated sites, as set out in Policy SL1, including an area of 250 metres surrounding each site, will be safeguarded against development that would unnecessarily sterilise the sites or prejudice or jeopardise their use by creating incompatible land uses nearby.'

Nottinghamshire Minerals Policy

- 12.4.26 Although all of the Sites associated with the Scheme are confined to Lincolnshire there are a number of cable corridors proposed which connect the individual Sites to the grid connection at the former Cottam Power Station site which lies within Nottinghamshire. Therefore, consideration has also given to the relevant development plan document namely the Nottinghamshire Minerals Local Plan (March 2021) (ref 3). This Plan also seeks to ensure the protection of mineral

resources from the risk of sterilisation by development which potentially prevents future extraction.

- 12.4.27 Minerals Plan Policy SP7 addresses Minerals Safeguarding, Consultation Areas and Associated Minerals Infrastructure. It states:

'Minerals Safeguarding Areas

1. Locally and nationally important mineral resources, permitted reserves, allocated sites and associated minerals infrastructure will be safeguarded from needless sterilisation by non-minerals development through the designation of minerals safeguarding areas as identified on the Policies Map.

2. Non-minerals development within minerals safeguarding areas will have to demonstrate that mineral resources will not be needlessly sterilised as a result of the development and that the development would not pose a serious hindrance to future extraction in the vicinity.

3. Where this cannot be demonstrated, and where there is a clear and demonstrable need for the non-minerals development, prior extraction will be sought where practicable.

Minerals Consultation Areas

4. District and Borough Councils within Nottinghamshire will consult the County Council as Minerals Planning Authority on proposals for nonminerals development within the designated Mineral Consultation Area, as shown on the Policies Map.

5. The Minerals Planning Authority will resist inappropriate non-minerals development within the Minerals Consultation Areas.

6. Where non-minerals development would cause an unacceptable impact on the development, operation or restoration of a permitted minerals site, mineral allocation, or associated minerals infrastructure, suitable mitigation should be provided by the applicant prior to the completion of the development.'

Resource information

- 12.4.28 The Scheme has been considered in the context of the applicable policies to each Site.
- 12.4.29 The likely mineral resource within the area has been assessed using published geological information of British Geological Society (BGS) published geological and information relevant available borehole information.
- 12.4.30 The British Geological Survey (BGS) Mineral Resource Maps (ref 6 & 7) provides the best available geological and resource information on the broad extent of minerals

resources in Lincolnshire and has been used assist the identification mineral resources in the Lincolnshire Minerals and Waste Local Plan.

12.5 Baseline Conditions

Cottam 1

- 12.5.1 The Cottam 1 Site lies between Lincoln 8 km to the southeast and Gainsborough 7 kilometres to the north west and extends to approximately 894 hectares. The Site is divided into 7 main blocks located between the B1241 to the west, the B1398 to the east and the A1500 to the south and centred around Coates.
- 12.5.2 The Site is relatively flat and is predominantly in agricultural use. The fields are generally large and typically have dividing hedgerows. The parcels making up this Site are interspersed with a number of farmsteads, roads and blocks of woodland which either adjoin or are surrounded by the Sites.
- 12.5.3 A review of BGS published geological information indicates that the eastern two thirds of the Site is underlain by the Charmouth Mudstone Formation. This sedimentary bedrock formed approximately 183 to 199 million years ago in the Jurassic Period. These deposits are shallow-marine in origin and described as detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences.
- 12.5.4 The remainder of the Site, the western most area, are underlain by the Scunthorpe Mudstone Formation. This sedimentary bedrock formed approximately 191 to 210 million years ago in the Jurassic and Triassic Periods. These sedimentary rocks are shallow-marine in origin. They are detrital and biogenic, generally comprising fine-grained sediments, with carbonate material (coral, shell fragments) forming interbedded sequences.
- 12.5.5 The Charmouth Mudstone Formation is overlain by superficial deposits comprising Mid Pleistocene Till and Alluvium. The Till deposits formed up to 2 million years ago in the Quaternary Period. They are sedimentary glacial deposits and are described as detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods.
- 12.5.6 The Till is separated up by bands of Alluvium (clay, silt, sand and gravel). The bands of Alluvium occur within most of the blocks of land which form the Cottam 1 Site. These deposits formed up to 2 million years ago in the Quaternary Period. These sedimentary deposits are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river. The Alluvium deposits run east west and north south across the site reflecting path of old river channels.

- 12.5.7 Within the southern part of block of land nearest Willingham by Stow the presence of River Terrace deposits of sand and gravel has been identified. These superficial sedimentary deposits are fluvial in origin and formed up to 3 million years ago in the Quaternary Period. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river.
- 12.5.8 The most western part of the block of land nearest Stow extends into area of superficial deposit of Mid Pleistocene Sand and Gravel. This deposit extends between Stow and Sturton by Stow, west of the B1211. It was formed up to 2 million years ago in the Quaternary Period. This sedimentary deposit is glaciofluvial in origin and described as detrital, generally coarse-grained, they form beds, channels, plains and fans associated with meltwater.
- 12.5.9 The BGS Mineral Resource Information identifies the fluvial Alluvium and the River Terrace deposits as being a potential sand and gravel mineral resource.
- 12.5.10 The BGS Mineral Resource Information does not identify any current or historic mineral workings associated with these sand and gravel deposits. The nearest identified mineral workings are an historic limestone quarry to east of Ingham and the B1298 and the Glentworth Oil wells located 1 km north and 1 km north east of the site.

Policy

- 12.5.11 Approximately 50 hectares of the Cottam 1 Site is identified in the Lincolnshire Minerals and Waste Local Plan as being within two sand and gravel mineral safeguarding areas. The first and affecting a larger part of the Site is an isolated safeguarded area lying south east of Willingham by Stow, between Normanby Gorse and Bowfield Farm. The second is also an isolated safeguarded area which lies to the east of Sturton by Stow and just clips the south western part of the Cottam 1 Site. The safeguarded areas are centred on the River Terrace Deposits identified by the BGS. Five parcels of land forming the Cottam 1 Site are partially affected.

Cottam 2

- 12.5.12 Cottam 2 lies 4.5 km east of Gainsborough and 350 metres east of Corringham and north east of the A631. It is a single block of generally level land surrounding Corringham Grange extending to 135 ha. The block is divided up into a number of fields that are predominantly in arable use.
- 12.5.13 A review of BGS published geological information indicates that the site is underlain by the Scunthorpe Mudstone Formation. This sedimentary bedrock formed approximately 191 to 210 million years ago in the Jurassic and Triassic Periods. These sedimentary rocks are shallow-marine in origin. They are detrital and

biogenic, generally comprising fine-grained sediments, with carbonate material (coral, shell fragments) forming interbedded sequences.

- 12.5.14 The bedrock is overlain by superficial deposits comprising Mid Pleistocene Till. These deposits formed up to 2 million years ago in the Quaternary Period. These sedimentary deposits are glacial in origin. They are described as detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods.
- 12.5.15 Along the north eastern edge the BGS identify a narrow strip of superficial deposit comprised of Alluvium - Clay, Silt, Sand and Gravel. These deposits formed up to 2 million years ago in the Quaternary Period. These sedimentary deposits are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river.
- 12.5.16 To the west, beyond the Site boundary and covering the area occupied by the village of Corringham and extending northwards 1.4 km towards Aisby, the BGS identify superficial Glaciofluvial Deposit of Mid Pleistocene Sand and Gravel formed up to 2 million years ago in the Quaternary Period. These sedimentary deposits are glaciofluvial in origin. They are detrital, generally coarse-grained, they form beds, channels, plains and fans associated with meltwater.
- 12.5.17 The BGS Mineral Resource Information identifies this glaciofluvial deposit, together with concealed glaciofluvial deposits immediately surrounding it as being a potential sand gravel resource.
- 12.5.18 The only mineral activity in the area that the BGS mapping identifies is the Corringham Oil and Gas Field which lies approximately 500 metres to the east of the Site.

Policy

- 12.5.19 Approximately 25 hectares of the Cottam 2 Site is identified in the Lincolnshire Minerals and Waste Local Plan as being within a sand and gravel mineral safeguarding area. The safeguarded area is an isolated deposit of sand and gravel extending from just south of Corringham to Pilham in the north. It extends eastwards across the western part of the Cottam 2 Site and included the area excluded from the Cottam 2 Site which is occupied by Corringham Grange. The safeguarded area is centred on the glaciofluvial deposits identified by the BGS.
- 12.5.20 To the east the Site is within 150 metres of the Minerals Consultation Area associated with Corringham oil field.

The Lincolnshire Minerals and Waste Local Plan does not make any allocations for future mineral extraction in the vicinity of the Site.

Cottam 3

- 12.5.21 Cottam 3 lies 5.3 km north east of Gainsborough and 200 metres north east of Blyton. The Site extends to approximately 244 hectares. Cottam 3a is centred around the former RAF Blyton airfield and adjoining land to the east. Much of the land is generally level and in agricultural use. Cottam 3b lies approximately 500 metres to the south, immediately south of the Gainsborough Immingham Railway again relatively level area in agricultural use.
- 12.5.22 A review of BGS published geological information indicates that the Site is underlain by the Scunthorpe Mudstone Formation This sedimentary bedrock formed approximately 191 to 210 million years ago in the Jurassic and Triassic Periods. These sedimentary rocks are shallow-marine in origin. They are detrital and biogenic, generally comprising fine-grained sediments, with carbonate material (coral, shell fragments) forming interbedded sequences.
- 12.5.23 In the furthest western tip of the Site the underlying bedrock is Mudstone belonging to the Penarth Group which formed approximately 201 to 210 million years ago in the Triassic Period. These sedimentary rocks are shallow-marine in origin. They are detrital, ranging from coarse- to fine-grained (locally with some carbonate content) forming interbedded sequences.
- 12.5.24 Most of the bedrock is overlain by superficial deposits comprising Mid Pleistocene Till. These deposits formed up to 2 million years ago in the Quaternary Period. These sedimentary deposits are glacial in origin. They are described as detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary.
- 12.5.25 The furthest western tip the bedrock is covered superficial Glaciofluvial Deposit of Mid Pleistocene Sand and Gravel. formed up to 2 million years ago in the Quaternary Period. These sedimentary deposits are glaciofluvial in origin. They are detrital, generally coarse-grained, they form beds, channels, plains and fans associated with meltwater.
- 12.5.26 The BGS Mineral Resource Information identifies this glaciofluvial deposit together the river terrace and alluvial deposits which extend westwards beyond the site as a potential sand gravel resource.
- 12.5.27 The only mineral activity in the area that the BGS mapping identifies is the Corringham Oil and Gas Field which lies approximately 1.25 km to the south east of Cottam 3b.

Policy

- 12.5.28 Approximately 46 hectares of the Cottam 3a Site is within an identified area of search in the Lincolnshire Minerals and Waste Local Plan (LMWLP). Therefore, there is a requirement to consider the impact of the proposed development on the proposed mineral extraction.
- 12.5.29 The Site is identified as lying partly within an Area of Search for sand and gravel referred to as 'West of Lincoln and north/south of Gainsborough for the Lincoln/Trent Valley Production Area' as shown on the Policies Map within the LMWLP. The Area of Search runs through the western third of the Site.
- 12.5.30 The Local Plan defines 'Area of Search' as '*An extensive area of land believed to contain significant, but generally unproven mineral resources within which the Mineral Planning Authority would have no objection in principle to mineral working, on at least part of the site subject to satisfactory proposals to protect the range of interests of acknowledged importance within and adjoining the area*'. The plan states that the three areas of search identified include the most viable sand and gravel resource based on a recent assessment of resources within the County carried out by the British Geological Survey (BGS) in 2010.
- 12.5.31 The County Council states in Policy M2: 'Providing for an Adequate Supply of Sand and Gravel', that it makes provision for the release of sand and gravel reserves in the Site Locations Document. This gives priority to extensions to existing Active Mining Sites. It adds that new sites will be allocated where they are required to replace existing Active Mining Sites that will become exhausted during the Plan period and where they are located in the relevant Areas of Search.
- 12.5.32 Policy M4 relates to 'Proposals for Sand and Gravel Extraction Sites allocated in the Site Locations Document' and adds that where sites are not allocated, planning permission will be granted for sand and gravel extraction for aggregate purposes where the site is required to meet a proven need that cannot be met from the existing permitted reserves; or a specific shortfall in the landbank of the relevant Production Area. Furthermore, it must be an extension to an existing Active Mining Site; or is located in the relevant Area of Search and will replace an existing Active Mining Site that is nearing exhaustion.
- 12.5.33 The Site does not include any existing workings and therefore a new proposal in the area would be considered as a new site rather than any extension to an existing working. New quarries will only be permitted where there is a proven need or to replace an almost completed site. According to the most recent monitoring report which assesses the performance of the Local Plan, the Lincolnshire Local Aggregate Assessment (reporting 2020 data). September 2021, with current permissions together with the remainder of sites allocated in the Site Locations document, there should be sufficient sand and gravel resources to last beyond the LMWLP period which extends to the end of 2031. At the end of 2020 the landbank for sand and

gravel for Lincolnshire was 9.50 years. At a sub-county level the landbank was 9.97 years in the Lincoln/Trent Valley.

- 12.5.34 Less than 1.5 hectares of the Site at the most westerly end of Cottam 3a, lies within the sand and gravel mineral safeguarding area which surrounds Blyton and beyond. The safeguarded deposit extends southwards and is within part of the allocated area of search for sand and gravel for West of Lincoln and north/south of Gainsborough. A further 4 hectares in the south west corner of Cottam 3b Site lies within the sand and gravel mineral safeguarding area which extends southwards to Ailsby and Corringham. This safeguarded area is also partially affected by the proposal on the Cottam 2 Site.

Cable Corridors

- 12.5.35 As part of the Scheme a number of proposed cable corridors are proposed within which cables would be installed to connect the Sites to the grid connection at the former Cottam Power Station site can be achieved. Some of the cable corridors affect areas of search and safeguarded sand and gravel reserves. These routes include the corridor linking Cottam 3 to 2 which runs through the sand and gravel area of search around Blyton and the sand and gravel safeguarded area around Aisby/Corringham, and corridors linking the various parcels on the western side of the Cottam 3 Site south east of Willingham by Stow. All options running west from Cottam 1 across the Trent Valley affect the Trent Valley sand and gravel area of search and sand and gravel safeguarded area within Lincolnshire and the corresponding sand and gravel safeguarded areas within Nottinghamshire.

Petroleum Exploration and Development License

- 12.5.36 Cottam 1, 2 and 3 are all within a Petroleum Exploration and Development License (PEDL) area where oil and gas extraction is licensed under the Petroleum Act 1998 by the Oil and Gas Authority. A PEDL allows the pursuit a range of oil and gas exploration activities, subject to necessary drilling/development consents and planning permission. Lincolnshire has a long history associated with the production of conventional oil and gas and there are a number well extracting oil extending north from Lincoln and around Gainsborough. The Scampton oil field which lies approximately 6 km to the east is nearest to the Cottam 3 Site. The Glentworth Oil wells are 1 km from the north eastern part of the Cottam 1 Site. The proposed development would have no implications in terms of the continued exploitation of this resource.
- 12.5.37 The British Geological survey identified a shale gas resource associated with the 'Bowland Shale' In Central Britain. The BGS study area includes the northern half of Lincolnshire, and identifies an area referred to as the 'Gainsborough Trough' as being prospective for shale gas. Whilst interest has been shown in the above area, Shale Gas development does not currently take place in Lincolnshire, and until any

exploratory wells are sought and drilled, the location and extent of any resource, and prospect for economic recovery in Lincolnshire is unknown.

- 12.5.38 There have been a number of exploratory wells sunk in the north west of Lincolnshire in the vicinity of Cottam 1, 2 and 3. Owing to commercial confidentiality there is limited information available about the results.
- 12.5.39 The method of extracting shale gas involves constructing a well to drill into the ground vertically and horizontally to reach the shale rock layer. A mixture of water, sand and chemicals is then pumped under high pressure into the bore hole to fracture the shale rock to enable the gas to flow out. This process is known as hydraulic fracturing or 'fracking'. The need for surface development is relatively limited and the ability to drill horizontally and well as vertically to extract the gas means that even if a commercially exploitable deposit of shale gas were to be found under the site it could still be exploited under the site by well located around the site.
- 12.5.40 In addition to planning permission, consent to hydraulic fracture is required from the Secretary of State under the Infrastructure Act 2015. On the 4 November 2019 the government announced an energy policy update which stated that *"On the basis of the current scientific evidence, Government is confirming today that it will take a presumption against issuing any further Hydraulic Fracturing Consents. This position, an effective moratorium, will be maintained until compelling new evidence is provided which addresses the concerns around the prediction and management of induced seismicity"*.

12.6 Assessment of Likely Impacts and Effects

Cottam 1

- 12.6.1 The safeguarded mineral reserves within this Site are two relatively small, isolated pockets of sand and gravel. Given their isolated location, limited geographic extent and existing constraints, including existing built development such as roads and residential development and in the case of the southerly safeguarded area the River Till which runs through it, working these areas is very unlikely in the foreseeable future.
- 12.6.2 The proposal is to seek authorisation for the construction and operation of solar arrays and associated infrastructure which will be decommissioned at the end of its operational life, all above ground structures will be removed and the Site restored. The Scheme does not require deep excavations or foundations and thus disturbance is limited to the surface layers rather than underlying deposits. On the basis the Scheme has an estimated lifespan of 40 years and due to it being decommissioned at the end of its operational life, any minerals would not be permanently sterilised and would be available to exploit if required at a future date. Thus, there is not considered to be any conflict with the mineral safeguarding policy.

- 12.6.3 There are no specific allocations for sand and gravel within or abutting the Site. In view of the current policies of the Mineral Planning Authority, the current sand and gravel landbank and the extensive areas covered by areas of search it seems highly unlikely that the sand and gravel reserve will need to be worked within the lifetime of the Scheme.
- 12.6.4 The Site and immediate surroundings are not currently subject to mineral working. There is no apparent evidence to suggest there has been any mineral working in the recent past within the Site or immediate area.
- 12.6.5 The nearest current mineral workings are the Glentworth Oil wells approximately 1 km north and north east of the Site. The proposal will have no impact on these.

Table 12.5: Magnitude of Impact – Cottam 1

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 12.6.6 In the case of Cottam 1, the Site does affect an identified mineral reserve which is safeguarded in the Lincolnshire Minerals and Waste Local Plan therefore the sensitivity of the Site is medium. However, given the relatively small and isolated nature of this reserve, the existing constraints to future mineral working, it is unlikely this mineral reserve will be exploited in the foreseeable future, the magnitude is negligible and therefore the overall effect is minor, which is not significant. In light of the outcome of the assessment above, no mitigation is considered necessary.

Cottam 2

- 12.6.7 The safeguarded mineral reserve within this Site is an isolated pocket of sand and gravel. Although likely to contain a sand and gravel deposit exploiting it would be difficult given the existing constraints in particular built development, both Corringham and Aisby are built directly on top of it, and it is criss-crossed by roads. Working this area is very unlikely in the foreseeable future.
- 12.6.8 As previously noted, on the basis the Scheme has an estimated lifespan of 40 years and due to it being decommissioned at the end of its operational life, any minerals would not be permanently sterilised and would be available to exploit if required at a future date. Thus, there is not considered to be any conflict with the mineral safeguarding policy.

- 12.6.9 There are no specific allocations for sand and gravel within or abutting the site. In view of the current policies of the Mineral Planning Authority, the current sand and gravel landbank and the extensive areas covered by areas of search it seems highly unlikely that the sand and gravel reserve will need to be worked within the lifetime of the Scheme.
- 12.6.10 The application site and immediate surroundings are not currently subject to mineral working. There is no apparent evidence to suggest there has been any mineral working in the recent past within the site or immediate area.
- 12.6.11 Cottam 2 Site is within 150 metres of the Minerals Consultation Area associated with Corringham oil field. The nearest oil well is approximately 500 metres from the eastern boundary. The Glentworth Oil wells are approximately 1 km north and north east of the Site. The proposal will have no impact on the operation of these oilfields.

Table 12.6: Magnitude of Impact – Cottam 2

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 12.6.12 In the case of Cottam 2, the Site does affect an identified mineral reserve which is safeguarded in the Lincolnshire Minerals and Waste Local Plan therefore the sensitivity of the Site is medium. However, given the relatively small and isolated nature of this reserve, the existing constraints to future mineral working, it is unlikely this mineral reserve will be exploited in the foreseeable future, the magnitude is negligible and therefore the overall effect is minor, which is not significant. In light of the outcome of the assessment above, no mitigation is considered necessary.

Cottam 3

- 12.6.13 The identified mineral potential for this Site is sand and gravel. The Site is partially within an extensive area of search for sand and gravel where there are likely but not proven reserves. Current assessments report that there is no need for new sites to come forward during the plan period up to 2031. There is therefore no need for further reserves for at least 10 years. The Area of Search takes a very broad-brush approach and covers an extensive area all along the Trent Valley including any settlements which clearly will not be worked. Cottam 3a encroaches a small area on the eastern edge of the area of search and therefore is not considered to have a significant impact on the potential sand and gravel resources in the County.

- 12.6.14 As previously noted, on the basis the Scheme has an estimated lifespan of 40 years and due to it being decommissioned at the end of its operational life, any minerals would not be permanently sterilised and would be available to exploit if required at a future date. Thus, there is not considered to be any conflict with the mineral safeguarding policy.
- 12.6.15 The Site and immediate surroundings are not currently subject to mineral working. There is no apparent evidence to suggest there has been any mineral working in the recent past within the Site or immediate area. There are no specific allocations for sand and gravel within or abutting the Site although the Site is within an area of search for future sand and gravel. In view of the current policies of the Mineral Planning Authority, the current sand and gravel landbank and the extensive areas covered by the area of search it seems highly unlikely that the sand and gravel reserve will need to be worked within the lifetime of the Scheme.
- 12.6.16 Cottam 3b includes a relatively small area of safeguarded mineral forming part of an isolated pocket of sand and gravel. Although likely to contain a sand and gravel deposit exploiting it would be difficult given the existing constraints in particular built development, both Corringham and Aisby are built directly on top of it, and it is criss-crossed by roads. Working this area is very unlikely in the foreseeable future.
- 12.6.17 Again, due to the temporary nature of the Scheme any minerals that are beneath the Site, will not be sterilised on a long-term basis and would be available to exploit if required at a future date. Thus, there is not considered to be any conflict with the mineral safeguarding policy.

Table 12.7: Magnitude of Impact – Cottam 3

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 12.6.18 In the case of Cottam 3, the Site does affect an identified mineral reserve and this mineral reserve has been identified as being an area of search for future minerals working to supply Lincolnshire therefore the sensitivity of the Site is medium. However, given there is not an immediate identified need for the mineral reserve and the area affected forms part of an extensive area of search extending well beyond the area of the Scheme the magnitude is low and therefore the overall effect is moderate/minor, which is not significant. In light of the outcome of the assessment above, no mitigation is considered necessary.

Cable Corridors

- 12.6.19 Although proposed cable corridors affect a significant swathe of safeguarded sand and gravel reserves, these are areas of search for a cable route. The cable route once selected will only affect a relatively small area and have no significant impact in terms of sterilising safeguarded sand and gravel deposits. Installation of the cable may disturb a small area of sand and gravel approximately 2 m wide. Even allowing a buffer of approximately 3 metres wide each side of the cable, there will be no significant impact in terms of safeguarding the sand and gravel deposits. However, the eventual cable route does have the potential to become another constraint to future mineral extraction as it will bisect known deposits. This could result in operational issues for future mineral operations which might restrict the efficient exploitation of the resource. To mitigate this potential impact, it is recommended that wherever possible cable routes follow existing infrastructure corridors such as roads, railways, drainage routes or existing pipelines or cables routes or alternatively follow the edge of significant landscape features such as woods rather than directly crossing open fields. Such an approach would avoid creating a further obstruction to the future exploitation of the mineral resource.
- 12.6.20 All of the proposed cable corridor routes are within PEDL area. There are not considered to be any significant issues associated with the cable corridors and the existence of the PEDL.

Table 12.8: Magnitude of Impact – Cable corridors

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 12.6.21 In the case of the cable corridor, the Site does affect an identified mineral reserve and this mineral reserve has been identified as being an area of search for future minerals working to supply Lincolnshire therefore the sensitivity of the Site is medium. However given there is not an immediate identified need for the mineral reserve and the area affected forms part of an extensive area of search extending well beyond the area of the Scheme the magnitude is low and therefore the overall effect is moderate/minor, which is not significant. In light of the outcome of the assessment above, no mitigation is considered necessary.

Petroleum Exploration and Development License

- 12.6.22 At the current time whilst all the Sites may contain an economic deposit of shale gas, there is an effective national moratorium on hydraulic fracturing for shale gas and

until there is change in policy the deposits will not be exploited. However recent world events have had a significant impact on global energy markets and nationally a review of future energy supplies is being undertaken, this includes a review into hydraulic fracture which could pave the way to lifting the current moratorium. Although the Minister of State for Business, Energy and Industrial Strategy stated on the 15 March 2022 *'We've always been clear that the development of shale gas in the UK must be safe and cause minimal disruption and damage to those living and working nearby sites. This is not a new position. Shale gas and new approaches could be part of our future energy mix, but we need to be led by the science and have the support of local communities. The pause on fracking implemented in November 2019 on the basis of the difficulty in predicting and managing seismic activity caused by fracking, remains in place and we will continue to be led by the science on our approach.'*

- 12.6.23 Oil and gas deposits are found at much greater depths than other minerals and therefore surface development has less potential impact in terms of exploiting the resource. Neither Lincolnshire nor Nottinghamshire have identified mineral safeguarding areas for hydrocarbons as prospects can only be identified after extensive exploration activity. Existing oil fields are identified and safeguarded with mineral consultation zone around each. None of the Cottam Sites affects an existing oil field or comes within a mineral consultation zone.
- 12.6.24 It is not considered that the proposed Scheme would have any implications for existing or proposed exploration and eventual exploitation of oil and gas resources. The solar arrays are not considered to be sensitive adjoining land uses to an oil well. Whilst together the Sites occupy a large area, they are not a single block of land and are dispersed across a large area thus there is still scope for exploratory drilling across the PEDL. The method of petrochemical extraction involves limited surface development that could be located outside the Sites and still allow extraction of the mineral beneath those sites.

12.7 Mitigation

- 12.7.1 The only part of the Scheme where mitigation is considered necessary is in relation to the cable corridors. To mitigate the potential impact, it is recommended that wherever possible cable routes follow existing infrastructure corridors or alternatively follow the edge of significant landscape features rather than directly crossing open fields. Such an approach would avoid creating a further obstruction to the future exploitation of the mineral resource.

12.8 Cumulative Impact

- 12.8.1 The process of environmental impact assessment also requires consideration of the cumulative impact of the proposed development in conjunction with other plans and proposals.

- 12.8.2 In terms of the direct impact on the mineral reserves affected by this proposal there are no other proposals that directly affect these deposits.
- 12.8.3 The associated proposed cable corridors connecting the Sites to the former Cottam Power Station site do overlap with proposed cable corridors for the West Burton Solar Project. Much of the overlap is within an area of safeguarded sand and gravel reserves associated within the Trent Valley. The Applicant is working not only with West Burton Solar Project but also with Gate Burton Energy Park, a development proposed by Low Carbon and with associated cable corridors, to minimise impacts. Without mitigation multiple cable routes across this deposit would further bisect this deposit adding further constraints to any future mineral working and whilst not actually physically sterilising any mineral deposit might make areas uneconomic to work. The Scheme will consider this impact and as far as possible ensure the number of cable routes is minimised and follows existing corridors.
- 12.8.4 Any other proposals for development that sterilise safeguarded mineral resources, particularly those also identified as Area of Search for sand and gravel referred to as 'West of Lincoln and north/ south of Gainsborough for the Lincoln/ Trent Valley Production Area' in the Lincolnshire Minerals and Waste Local Plan, could have an impact on the availability to win sand and gravel in future in particular within Lincolnshire as they look to this area as a potential for new sand and gravel supplies as well as Nottinghamshire. The potential cumulative impact is considered small as this proposal only affects a relatively small area of an extensive area of search for a temporary period.

12.9 References

Ref 1 Lincolnshire Minerals and Waste Local Plan Core Strategy and Development Management Policies (June 2016)

<https://www.lincolnshire.gov.uk/downloads/file/2361/core-strategy-and-development-management-policies>

Ref 2 Review of the Lincolnshire Minerals and Waste Local Plan (February 2021).

<https://www.lincolnshire.gov.uk/downloads/file/5053/review-of-the-lmwlp-19-2-21-accessible-version>

Ref 3 Nottinghamshire Minerals Local Plan (March 2021).

<https://www.nottinghamshire.gov.uk/media/3764136/adopted-minerals-local-plan.pdf>

Ref 4 National Planning Policy Framework. Department for Communities and Local Government (2019).

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf

Ref 5 British Geological Survey, Mineral Safeguarding in England good practice advice (2011). British Geological Survey.

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Ref 6 British Geological Survey: Mineral Resource Information in support of National, Regional and Local Planning Lincolnshire (2003). British Geological Survey.

<https://www2.bgs.ac.uk/mineralsuk/download/england/lincolnshire.pdf>

<https://www2.bgs.ac.uk/mineralsuk/download/england/lincolnshireMap.pdf>

Ref 7 British Geological Survey: Mineral Resource Information in support of National, Regional and Local Planning Nottinghamshire and City of Nottingham (2002). British Geological Survey.

<https://www2.bgs.ac.uk/mineralsuk/download/england/nottinghamshire.pdf>

<https://www2.bgs.ac.uk/mineralsuk/download/england/nottinghamshireMap.pdf>

Ref 8 British Geological Survey: A Guide to Mineral Safeguarding in England (2007). British Geological Survey.

<http://nora.nerc.ac.uk/7508/>

Ref 9 Scoping Opinion: Proposed Cottam Solar Project Case Reference: EN010133
09 March 2022 Adopted by the Planning Inspectorate (on behalf of the Secretary of State) pursuant to Regulation 10 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

Ref 10 Overarching National Policy Statement for Energy (EN-1) Department of Energy and Climate Change July 2011

Ref 11 Draft Overarching National Policy Statement for Energy (EN-1) Department for Business, Energy and Industrial Strategy, September 2021

Ref 12 Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) Department for Business, Energy and Industrial Strategy, September 2021

Ref 13 National Planning Practice Guidance Minerals Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government 17 October 2014

13 Cultural Heritage

13.1 Introduction

- 13.1.1 This chapter of the PEIR considers relevant heritage policy and guidance and sets out the methodologies and approaches intended to be used to inform the Cultural Heritage chapter of the ES for the Scheme. A discussion of the cultural heritage baseline conditions (as far as they are understood as of May 2022) is followed by a discussion of future archaeological surveys and other evaluation techniques that will further inform an understanding of the cultural heritage resource that could be affected by the Scheme proposals. This chapter includes a preliminary assessment of the likely effects of the Scheme upon the cultural heritage resource, alongside a discussion of suitable mitigation strategies. It should be noted that this is a preliminary assessment only, which will need to be refined and revisited as the scheme design progresses and the results of further evaluation become available.
- 13.1.2 In line with Section 8.4 of the Planning Inspectorate's *Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements*, this chapter has not been produced to replicate or act as a draft ES chapter, but aims to enable consultees (both specialist and non-specialist) to understand the likely environmental effects of the proposed Scheme, and helps to inform their consultation responses on the proposed Scheme during the pre-application stage.
- 13.1.3 The Scheme Sites are described in **Chapter 3** of this PEIR, whilst descriptions of the Scheme proposals are provided in **Chapter 4: Development Proposal**. Within all the Sites, each field has also been given an individual reference number, as marked on the Figures in **Appendix 3.1**.
- 13.1.4 This chapter is supported by the following appendices:
- **Appendix 13.1** Archaeological Desk-Based Assessments (DBAs)
 - **Appendix 13.2** Archaeological Geophysical Survey Reports
 - **Appendix 13.3** Heritage Scoping Reports
 - **Appendix 13.4** Geoarchaeological Desk-Based Assessment
 - **Appendix 13.5** Cultural Heritage PEIR figures

13.2 Legislation, Planning Policy and Guidance

13.2.1 The following legislative provisions, policy and guidance, as well as the EIA Regulations, provide the context for the cultural heritage assessment to be undertaken in the EIA.

13.2.2 The applicable legislative framework comprises:

- *Ancient Monuments and Archaeological Areas Act (AMAAA) 1979*, which provides specific protection for monuments of national interest;
- *Planning (Listed Buildings and Conservation Areas) Act 1990*, which provides specific protection for buildings and areas of special architectural or historic interest; and
- *Historic Buildings and Ancient Monuments Act 1953*, which makes provision for the compilation of a register of gardens and other land (parks and gardens, and battlefields).
- *Hedgerows Regulations 1997* make provision for the protection of important hedgerows, which may be afforded statutory protection should they qualify as being 'important' for, *inter alia*, historical or archaeological reasons.

13.2.3 The applicable National Policy Statements (NPS) include:

- The adopted *Overarching National Policy Statement for Energy (EN-1)* (DECC 2011). Section 5.8: The Historic Environment is the section of this document of greatest relevance to this chapter, and the key points relevant to this assessment are as follows:

'Applicant's assessment: *As part of the ES ... the applicant should provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset. As a minimum, the applicant should have consulted the relevant Historic Environment Record (or, where the development is in English or Welsh waters, English Heritage or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development's impact' (Paragraph 5.8.8).*

'Where a development site includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where

proposed development will affect the setting of a heritage asset, representative visualisations may be necessary to explain the impact’ (Paragraph 5.8.9).

‘The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents’ (Paragraph 5.8.10).

- The NPS described above is to be replaced by the emerging *Draft Overarching National Policy Statement for Energy (EN-1)* (DBEIS 2021a). Section 5.9: The Historic Environment is the section of this document of most relevance to this chapter, and the key points relevant to this assessment are as follows:

‘Applicant’s assessment: *The applicant should undertake an assessment of any likely significant heritage impacts of the proposed development as part of the EIA and describe these in the ES. This should include consideration of heritage assets above, at, and below the surface of the ground’ (Paragraph 5.9.10).*

‘As part of the ES the applicant should provide a description of the significance of the heritage assets affected by the proposed development, including any contribution made by their setting. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the applicant should have consulted the relevant Historic Environment Record¹⁰⁵ (or, where the development is in English or Welsh waters, Historic England or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development’s impact’ (Paragraph 5.9.11).

‘Where a site on which development is proposed includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where proposed development will affect the setting of a heritage asset, accurate representative visualisations may be necessary to explain the impact’ (Paragraph 5.9.12).

‘The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents. Studies will be required on those heritage assets affected by noise, vibration, light and indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected’ (Paragraph 5.9.13).

‘The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. This can include, where possible:

- *enhancing, through a range of measures such a sensitive design, the significance of heritage assets or setting affected*
- *considering measures that address those heritage assets which are at risk or which may become at risk, as a result of the scheme*
- *considering how visual or noise impacts can affect heritage assets, and whether there may be opportunities to enhance access to, or interpretation, understanding and appreciation of, the heritage assets affected by the scheme' (Paragraph 5.9.14).*

'Careful consideration in preparing the scheme will be required on whether the impacts on the historic environment will be direct or indirect, temporary or permanent' (Paragraph 5.9.15).

'Applicants should look for opportunities for new development within Conservation Areas and World Heritage Sites, and within the setting of heritage assets, to enhance or better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) should be treated favourably' (Paragraph 5.9.16).

- The adopted *National Policy Statement for Renewable Energy Infrastructure (EN-3)* (DECC2011) does not contain any policies pertaining to the impacts of solar energy production on the cultural heritage resource. However, the emerging *Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)* (DBEIS 2021b) contains *Section 2.53 - Solar photovoltaic generation impacts: cultural heritage*. Key paragraphs within this section include:

'The impacts of solar PV developments on the historic environment will require expert assessment in most cases. Solar PV developments may affect heritage assets (sites, monuments, buildings, and landscape) both above and below ground. Above ground impacts may include the effects of applications on the setting of Listed Buildings and other designated heritage assets as well as on Historic Landscape Character. Below ground impacts may include direct impacts on archaeological deposits through ground disturbance associated with trenching, cabling, foundations, fencing, temporary haul routes etc. Equally archaeological finds may be protected by a solar PV farm as the site is removed from regular ploughing and shoes or low-level piling is stipulated' (Paragraph 2.53.2).

'Applicant's assessment: It is anticipated that the applicant's assessment will be informed by a consultation with the Historic Environment Record (HER). Alternatively, the applicant may contact the local authority for this information. Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, the applicant should submit an appropriate desk-based assessment and, where necessary, a field evaluation.

These are expected to be carried out, using expertise where necessary and in consultation with the local planning authority, and should identify archaeological study areas and propose appropriate schemes of investigation, and design measures, to ensure the protection of relevant heritage assets' (Paragraph 2.53.3).

'In some instances, field studies may include investigative work such as trial trenching beyond the boundary of the proposed site to assess the impacts of any underground cabling on archaeological assets. The extent of investigative work should be proportionate to the sensitivity of, and extent of proposed cabling in, the associated study area' (Paragraph 2.53.4).

'Applications should take account of the results of historic environment assessments in their design, for instance through the sensitive planning of installations. The applicant should consider what steps can be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting. As the significance of a heritage asset derives not only from its physical presence, but also from its setting, careful consideration should be given to the impact of large-scale solar farms on such assets. Depending on their scale, design and prominence, a large-scale solar farm within the setting of a heritage asset may cause substantial harm to the significance of the asset. Visualisations may be required to demonstrate the effects of a proposed solar farm on the setting of heritage assets' (Paragraph 2.53.5).

Mitigation: *The ability of the applicants to microsite specific elements of the proposed development during the construction phase should be an important consideration by the Secretary of State when assessing the risk of damage to archaeology. Therefore, where requested by the applicant, the Secretary of State should consider granting consents which allow for the micro siting within a specified tolerance of elements of the permitted infrastructure so that precise locations can be amended during the construction phase in the event that unforeseen circumstances, such as the discovery of previously unknown archaeology, arise (Paragraph 2.53.6).*

Secretary of State decision making: *'Consistent with the generic policy on historic environmental impacts in EN1 (Section 5.9) the Secretary of State should be satisfied that solar farms and associated infrastructure have been designed sensitively taking into account known heritage assets and their status' (Paragraph 2.53.7).*

'Solar farms are generally consented on the basis that they will be time-limited in operation. The Secretary of State should therefore consider the length of time for which consent is sought when considering the impacts of any indirect effect on the historic environment, such as effects on the setting of designated heritage assets' (Paragraph 2.53.8).

- The adopted *National Policy Statement for Electricity Networks Infrastructure (EN-5)* (DECC 2011) only refers to archaeology or heritage on two occasions, both with regard to the laying of below ground electricity cables:
- *'Effects on soil, water, ecology and **archaeology** are likely to be negative, at least in the short term, requiring significant mitigation, but there is uncertainty around long term effects depending on the specific location and the sensitivity of the receiving environment. However, long term effects on landscape, townscape and visual impacts will be positive'* (Paragraph 1.7.5).
- *'... the environmental and archaeological consequences (undergrounding a 400kV line may mean disturbing a swathe of ground up to 40 metres across, which can disturb sensitive habitats, have an impact on soils and geology, and damage **heritage assets**, in many cases more than an overhead line would'* (Paragraph 2.8.9).

13.2.4 The national and local planning policy framework and associated guidance includes:

- *National Planning Policy Framework (NPPF)* - Section 16: Conserving and Enhancing the Historic Environment, paragraphs 189-208 (MHCLG 2021).
- *Planning Practice Guidance: Historic environment* (MHCLG 2019)
- *The Central Lincolnshire Local Plan* (adopted on 24 April 2017): Policy LP25: The Historic Environment
- The emerging *Bassetlaw Local Plan 2020-2037* - Policy ST42: The Historic and Environment and Policy ST43: Designated and Non-Designated Heritage Assets
- *The Core Strategy and Development Management Policies Development Plan for Bassetlaw* (adopted on 22 December 2011) - Policy DM8: The Historic Environment

13.2.5 Sectorial guidance documents relevant to the EIA include:

- Design Manual for Roads and Bridges [DMRB] (DfT 2007)
- Conservation Principles: Policies and guidance for the sustainable management of the historic environment (English Heritage 2008).
- Historic Environment Good Practice Advice in Planning 2: Managing Significance in Decision Taking in the Historic Environment (Historic England 2015)

- Historic Environment Good Practice in Planning Note 3 – The Setting of Heritage Assets (Historic England 2017)
- Historic England Advice Note 12: Statement of Heritage Significance: Analysing Significance in Heritage Assets (Historic England 2019)
- Historic England Advice Note 12: Commercial Renewable Energy Development and the Historic Environment (Historic England 2021)
- Chartered Institute for Archaeologists (CIfA) Standard and Guidance for Historic Environment Desk-based Assessment (2020).
- Lincolnshire County Council's Archaeology Handbook (Jennings 2019) which lays out the requirements for undertaking archaeological work in the County.

13.3 Consultation

13.3.1 Consultation undertaken throughout the pre-application and scoping phase informed the approach and the information provided in this chapter. A summary of the consultation of relevance to Cultural Heritage is detailed in Table 13.1 below.

Table 13.1: Consultation responses

Consultee and Date	Response	Where Consultation Comment is Addressed
Public engagement events, November 2021	Meeting to introduce the project and those involved in the archaeological and heritage assessment process moving forward. Discussion over matters relating to Conservation Areas, Listed Buildings and local history and archaeology. Heritage concerns were raised with regard to: St. Mary's Church at Stow, the Church of St. Edith at Coates by Stow, and the Thorpe Medieval Settlement Scheduled Monument.	See section 13.4 for proposals for the further assessment of impacts to the settings of designated assets and Section 13.7 for Thorpe Medieval Settlement mitigation proposals.
Meeting with Historic England 29 th Nov 2021	Briefed on the scope of the project, assessment approach and potential archaeological survey, evaluation and mitigation strategies. Highlighted need to avoid impacts to designated heritage assets	See section 13.7

Consultee and Date	Response	Where Consultation Comment is Addressed
Historic England, Scoping Opinion, 25 th February 2022	<p>Welcomed the inclusion of heritage matters in the submitted scoping report and look forwards to ongoing discussions with the applicants in respect of both setting effects upon heritage assets and direct impacts upon archaeological remains.</p> <p>Noted the iterative approach to investigations set out in the report and will look forwards to early sight of the results of cartographic, geophysical survey, lidar and aerial photographic analysis and the results of the applicant's detailed consultation with County Archaeological Curators and Historic Environment Records and Portable Antiquities Scheme Records.</p> <p>Welcomed the early inclusion of a palette of mounting techniques to allow for the avoidance of some physical impacts upon buried remains. In addition to the focus upon the impact of the panel arrays, fencing substations etc we note that this and related schemes include significant cable infrastructure for connection to grid. The significance / character / importance of assets on these cable routes will need to be well understood from an early stage such that route options can effectively be weighed and risks managed. It is important both that opportunities for reduction in harm are realised and that the time required for archaeological evaluation and reporting is allowed for. Areas of heightened risk (burial sites / wet deposits / former water courses etc) should be afforded early attention as should resources requiring particular methodological approaches such for instance as battlefields or air crash.</p>	<p>See section 13.4 for proposals for further assessment of setting effects.</p> <p>See Appendices 13.1, 13.2 and 13.4 for DBAs, Geophysical Survey reports and Geoarchaeological Assessment</p> <p>Consultations with Lincolnshire County Council are ongoing</p> <p>Assessment of the cable route corridors is ongoing. See Appendices 13.2 and 13.4 for the Geophysical Survey reports and Geoarchaeological Assessment relating to this assessment.</p> <p>See section 13.4 – 13.4 for proposals for further assessment of setting effects.</p>

Consultee and Date	Response	Where Consultation Comment is Addressed
	<p>Highlighted the following sites and their setting:</p> <p>Grade I listed Church of St Mary, Stow</p> <p>Scheduled Site of college and Benedictine abbey of St Mary, Stow</p> <p>Grade I listed Church of St Laurence, Corringham</p> <p>Scheduled Medieval Settlement and Moated Site, Coates</p> <p>Grade I listed Church of St Edith, Coates by Stow</p> <p>Scheduled Medieval Settlement, Thorpe</p> <p>Grade II* Church of Andrew, Fillingham and Conservation Area</p> <p>Grade I listed Fillingham Castle and GII Registered Park</p>	
The Planning Inspectorate, Scoping Opinion, March 2022	The Inspectorate considers that the potential for direct impacts on heritage assets should be considered. The extent of trial trenching activity should be agreed as part of a Written Scheme of Investigation with Lincolnshire County Council, where possible	Discussions with Lincolnshire County Council regarding trial trenching are ongoing
The Planning Inspectorate, Scoping Opinion, March 2022	The Inspectorate considers that indirect impacts on designated heritage assets should be scoped in as potential for impact remains from changes in drainage patterns, compaction and piling during construction and operation.	See Section 13.4
The Planning Inspectorate, Scoping Opinion, March 2022	The Inspectorate considers that indirect impacts on designated heritage assets should be scoped in as potential for impact remains from changes in drainage patterns,	This will be discussed in the ES

Consultee and Date	Response	Where Consultation Comment is Addressed
	compaction and piling during construction and operation.	
The Planning Inspectorate, Scoping Opinion, March 2022	The baseline information presented in the Scoping Report does not include the baseline information for the cable search area. Whilst the Inspectorate acknowledges that the cable route search areas are not finalised, geophysical surveys should be used to inform the design evolution of route corridors, where possible.	Geophysical surveys along the cable route corridors are under way and the results will be used to inform the routes.
The Planning Inspectorate, Scoping Opinion, March 2022	Operational impacts upon the settings of heritage assets should be scoped in to the assessment.	See section 13.4 for proposals for further assessment of setting effects.
The Planning Inspectorate, Scoping Opinion, March 2022	The ES should provide evidence to demonstrate that there would be no direct or indirect impact upon designated heritage assets before they can be scoped out of the assessment. Where possible, the evidence base should be agreed with the local planning authority.	See section 13.4 for proposals for further assessment of setting effects.
The Planning Inspectorate, Scoping Opinion, March 2022	Direct impacts to designated assets should be assessed unless the potential for effects can be ruled out through relevant surveys.	See section 13.4 for proposals for further assessment of setting effects.
The Planning Inspectorate, Scoping Opinion, March 2022	The ES should define an appropriate study area based on the extent of views to and from the Proposed Development and potential impacts on all heritage assets. This should inform the cumulative assessment.	See Section 13.4
The Planning Inspectorate, Scoping Opinion, March 2022	There is significant overlap between the cultural heritage and archaeology chapters of the Scoping Report.	These have now been amalgamated into a single Cultural Heritage chapter
The Planning Inspectorate, Scoping Opinion, March 2022	The assessment of significant effects is proposed to be undertaken for the construction and operational phases of the Proposed Development but decommissioning is not mentioned.	This will be addressed in the ES

Consultee and Date	Response	Where Consultation Comment is Addressed
	The ES should clearly set out if and how decommissioning is to be assessed and any components which may remain following decommissioning.	
Lincolnshire County Council (Historic Environment Officer) 25th February 2022	<p>Stated they had not been consulted prior to submission of this scoping report and have significant concerns on the Cultural Heritage section (section 12) of the submitted documents.</p> <p>Disappointed that the applicant has not engaged prior to this submission or to undertaking / commissioning geophysical survey work, which may not meet the standards and quality control requirements expected.</p> <p>As part of the Environmental Impact Assessment process, a scoping report should set out the proposed approach regarding Cultural Heritage, and we are concerned by the submitted suite of documents with respect to the Archaeology and Built Environment.</p> <p>An approach is needed with sufficient evaluation in order to understand the archaeological potential and to inform a reasonable appropriate mitigation strategy which will need to be submitted with the DCO application. The full suite of available desk-based information needs to be competently assessed including all available records, air photos, LiDAR and local sources. This understanding and the geophysical survey results then inform a robust programme of trial trenching to provide evidence for the site-specific archaeological potential of the development.</p>	<p>See Section 13.4 for revised approach to assessment methodology</p> <p>See Appendices 13.1, 13.2 and 13.4 for DBAs, Geophysical Survey reports and Geoarchaeological Assessment</p> <p>Discussions with Lincolnshire County Council regarding trial trenching are ongoing</p> <p>See Appendices 13.1, 13.2 and 13.4 for DBAs, Geophysical Survey reports and Geoarchaeological Assessment</p> <p>Further assessment will be submitted alongside the ES as appropriate</p>

Consultee and Date	Response	Where Consultation Comment is Addressed
	<p>The ES will require further desk-based research, non-intrusive surveys, and intrusive field evaluation for the full extent of proposed impact areas. The results should be used to minimise the impact on the historic environment through informing the project design and an appropriate programme of archaeological mitigation secured in the Development Consent Order (DCO).</p> <p>Regarding desk-based sources, the Environmental Statement will require: Full LiDAR coverage and assessment; full aerial photo coverage and assessment; archaeological reports; relevant documents from the Record Office covering each site; and the Portable Antiquities Scheme (PAS) data must also be consulted. Map regression should include all available maps to provide a reasonable understanding of the development and time depth of the sites.</p> <p>The HER search should be for at least 5km for visual impact on designated assets.</p> <p>Regarding guidance documents, the Lincolnshire Archaeology Handbook (2019) should be included which lays out the requirements for undertaking archaeological work in the County.</p> <p>EIA regulations should also be included in the Reference section and in the Legislation, Policy</p>	<p>See Section 13.4</p> <p>See Section 13.2</p> <p>See Section 13.2</p>

Consultee and Date	Response	Where Consultation Comment is Addressed
	and Guidance section and should be used as the basis for the EIA Environmental Statement.	
Lincolnshire Council Archaeologists representing Lincs and Bassetlaw 31 st March 2022	Discussion that evaluation trenching would focus on areas assessed to have archaeological potential Discussion of production of overarching WSI, the trench plans for which would be provided in stages for agreement and appended to WSI Discussion of overarching geophysical survey WSI methodology for cable route	Discussions with Lincolnshire County Council regarding trial trenching are ongoing
Lincolnshire Council Archaeologists representing Lincs and Bassetlaw 28th April 2022	Understanding that Lincs happy with methodology of the overarching WSI Requested additional trenches in areas in which geophysical survey or other available sources had not identify archaeological remains Stated that they were going to undertake a site visit in May to further their knowledge of the sites.	Discussions with Lincolnshire County Council regarding trial trenching are ongoing
Site Visit with Historic England 13 th May 2022	Visit to Cottam 1 to initially assess the Thorpe le Fallows Scheduled Monument (deserted medieval village earthworks) Historic England (HE) agreed that they would have no objection to the proposals within Cottam 1, but they might request some offset of development from immediately adjacent to the northern edge of the SM. This would be subject to further assessment of the nature and significance of the relationship between SM remains and the fields and field boundaries to the immediate north. No other objections were stated in relation to the Cottam 2 and 3 sites.	See Section 13.7, Table 13.24.

13.4 Assessment Methodology

Study Area

Non-designated heritage assets

- 13.4.1 For non-designated heritage assets, a 1km study area surrounding each of the three proposed Sites has been adopted for the Desk Based Assessments that are being prepared as part of the baseline to inform the ES. This PEIR will make reference to these wider study areas, but will focus more keenly upon those assets within the boundaries of the land parcels associated with each of the three Sites, as it is these assets that would be directly affected by the proposals.
- 13.4.2 In addition, further assessment is required for those areas within the cable route options that extend beyond the study areas for the DBAs. These include a c.4km long route corridor to the east of Springthorpe, Sturgate and Heapham between the study areas for Cottam 1 and Cottam 2, and an approximately 8km long corridor between the Cottam 1 study area and Cottam Power Station. Geophysical surveys are currently being undertaken within these areas, and HER data will also be assessed in order to inform route options.

Designated heritage assets

- 13.4.3 For designated heritage assets, Historic England in its role as statutory consultee provided a Scoping Response which highlighted the following sites and settings for consideration in the assessment:
- The Scheduled Site of college and Benedictine abbey of St. Mary, Stow (NHLE 1012976)
 - The Scheduled Medieval Settlement and moated site, Coates (NHLE 1016979)
 - The Scheduled Medieval settlement, Thorpe (NHLE 1016978)
 - Grade I listed Church of St. Mary, Stow (NHLE 1146624)
 - Grade I listed Church of St. Lawrence, Corringham (NHLE 1064162)
 - Grade I listed Church of St. Edith, Coates by Stow (NHLE 1146742)
 - Grade II* listed Church of St. Andrew, Fillingham (NHLE 1359847) and Fillingham Conservation Area
 - Grade I listed Fillingham Castle (NHLE 1166045)
 - Grade II Registered Park and Garden at Fillingham Castle (NHLE 1000977).

- 13.4.4 However, it was also stated that this advice was given '*Without prejudice to the results of analysis (which will benefit from use of our GPA Setting of Heritage Assets)*'. These assets range in distance from immediately adjacent to a Site (e.g. *Thorpe Medieval settlement*) to assets c.2.45km distant to the east on the Lincoln Cliff (e.g. *Fillingham Castle*).
- 13.4.5 The Scoping Opinion provided by PINS also highlighted that the 2km study area adopted for Built Heritage in the Scoping Report is inconsistent with the 5km study area adopted for the LVIA chapter. It further noted the location of heritage assets along the Lincoln Cliff more than 2km to the east of Cottam 1 that could potentially have lines of site to both the Cottam and West Burton Sites. It concluded that the ES should define an appropriate study area based upon the views to and from the Scheme, and potential impacts to all heritage assets, and that this should inform the cumulative assessment.
- 13.4.6 Consequently, this PEIR will identify all designated assets 'of the highest significance' within a 5km radius of each of the three Sites under consideration. It is proposed that the assets thus identified will then be taken forward for further assessment in accordance with the methodology detailed in *The Setting of Heritage Assets* (Historic England 2017). This will involve a 'sifting' exercise at Step 1 whereby a suite of techniques will be utilised to 'scope out' from further assessment those assets where it is considered that views from, or towards, would not be affected by the proposals. Such techniques would include the use of Zone of Theoretical Visibility (ZTV) maps, viewshed analysis from selected receptors, analysis of online aerial and street view imagery, as well as on-site 'ground-truthing' where this is deemed appropriate (and where access is possible). It is considered likely that this would greatly reduce the quantity of designated assets that would require more detailed analysis in subsequent stages of the assessment.
- 13.4.7 For Grade II Listed Buildings, which are considered to be of 'medium' value (see Table 13.6 below), it is proposed that these will be assessed in more general terms (for example as clusters within a Conservation Area or settlement) rather than as individual assets. This is in accordance with the guidance provided within *The Setting of Heritage Assets* which states: '*Local planning authorities are encouraged to work with applicants in order to minimise the need for detailed analysis of very large numbers of heritage assets. They may give advice at the pre-application stage (or the scoping stage of an Environmental Statement) on those heritage assets, or categories of heritage asset, that they consider most sensitive as well as on the level of analysis they consider proportionate for different assets or types of asset. Where spatially extensive assessments relating to large numbers of heritage assets are required, Historic England recommends that local planning authorities give consideration to the practicalities and reasonableness of requiring assessors to access privately owned land.*' (Historic England 2017, 9).

- 13.4.8 There are 158 Grade II Listed Buildings within the combined 5km study area, many of which are private residences, where it would not be practicable to gain access to undertake a full assessment. It is therefore proposed that the assessment of Grade II Listed Buildings within 2km of the Cottam Sites previously included in the Scoping Report is used as the basis further assessment. This will be bolstered by 'ground-truthing' visits and photography where this is feasible, and the resultant evidence base will be agreed with the local authority, if possible, in accordance with comment 3.8.2 in the PINS Scoping Opinion.

Sources of Information

- 13.4.9 The following sources of information have been consulted to inform this PEIR:
- The draft DBAs that have been produced for each of the Cottam 1, 2 and 3 Sites.
 - The Geophysical Survey reports/plots produced as of May 2022, which comprise the following:
 - Draft interpretive geophysical survey plot for Cottam 1
 - Cottam Solar Project, Cottam 2, Lincolnshire: Geophysical Survey (Archaeological Services WYAS Report no. 3769, May 2022)
 - Cottam Solar Project, Cottam 3, Lincolnshire: Geophysical Survey (Archaeological Services WYAS Report no. 3769, April 2022)
 - Oxford Archaeology North's Cottam Solar Farm, Lincolnshire: Geoarchaeological Assessment Report (Rutherford 2022).
 - The Archaeology and Built Heritage chapters of the Cottam Solar Project Environmental Impact Assessment Scoping Report prepared by Lanpro (January 2022).
 - A search of Historic England's National Heritage List for England (NHLE) for within a combined 5km search area of the three Scheme Sites was also undertaken to inform the proposed scope of further assessment.

Impact Assessment Methodology

Introduction

- 13.4.10 The the *Cottam Solar Project Environmental Impact Assessment Scoping Report* included proposed methodologies for assessing Archaeology and Built Heritage in the ES, but the PINS' Scoping Opinion identified inconsistencies in the matrices used for determining 'significant' effects. Consequently, it is proposed that the methodology

that will be adopted in the ES chapter for assessing predicted impacts and effects upon the cultural heritage resource will follow the guidance provided in the Highways Agency's (DfT 2007) *Design Manual for Roads and Bridges (DMRB)*. This methodology was designed for the assessment of impacts and effects resulting from road construction, but it is also a useful approach to the assessment of other development schemes. The original methodology was developed in consultation with the key historic environment stakeholders in the UK, including English Heritage (now Historic England), Historic Scotland (now Historic Environment Scotland), Cadw, The Environment and Heritage Service of Northern Ireland, and the Institute for Archaeologists (now the Chartered Institute for Archaeologists - CIfA). The original methodology has also been adapted for this assessment to take cognisance of the updated national planning policy contained within the NPPF, and more recent guidance concerning assessment of significance and impacts to setting (e.g. English Heritage 2008; Historic England 2017).

- 13.4.11 It should be noted that a new updated version of the DMRB has been published, and *LA106 Cultural Heritage Assessment* (Highways England 2020) supersedes the former *HA 208/07 Cultural Heritage document* (DfT 2007). However, this updated methodology does not address deficiencies identified by Historic England in the previous document in terms of its failure to comply with *NPPF*'s definition of heritage 'assets of the highest significance'. It also adopts a more simplified, generic, assessment methodology which removes the detail contained in the original document with regard to the assessment of the cultural heritage 'sub-topics'. Consequently, the original *DMRB* assessment methodology for cultural heritage (as adapted to comply with the *NPPF*) has been retained for use in this assessment.
- 13.4.12 The original methodology (DfT 2007) identified three cultural heritage 'sub-topics', each with its own assessment methodology: Archaeological Remains, Historic Buildings and Historic Landscape, as described in detail below.

Assessing the Magnitude of Change

- 13.4.13 The scale and magnitude of change to cultural heritage assets can be assessed using the five-tier grading system for each of the sub-topics as presented in Tables 13.2 - 13.4.

Table 13.2: Factors in the Assessment of the Magnitude of Change for Archaeological Remains

Magnitude	Description
Major	<ul style="list-style-type: none"> Changes to most or all key archaeological elements, such that the resource is totally altered Comprehensive changes to setting (where this affects the significance of the asset).
Moderate	<ul style="list-style-type: none"> Changes to many key archaeological elements, such that the resource is clearly modified

Magnitude	Description
	<ul style="list-style-type: none"> Considerable changes to setting (where this affects the significance of the asset)
Minor	<ul style="list-style-type: none"> Changes to key archaeological elements, such that the asset is slightly altered Slight changes to setting (where this affects the significance of the asset).
Negligible	<ul style="list-style-type: none"> Very minor changes to elements or setting (where this affects the significance of the asset)
No change	<ul style="list-style-type: none"> No change

Table 13.3: Factors in the Assessment of the Magnitude of Change for Historic Buildings

Magnitude	Description
Major	<ul style="list-style-type: none"> Changes to key historic building elements such that the resource is totally altered Comprehensive changes to setting (where this affects the significance of the asset).
Moderate	<ul style="list-style-type: none"> Changes to many key historic building elements, such that the resource is significantly modified Changes to the setting of an historic building, such that it is significantly modified (where this affects the significance of the asset).
Minor	<ul style="list-style-type: none"> Changes to key historic building elements, such that the asset is slightly different Changes to the setting of an historic building, such that it is noticeably changed (where this affects the significance of the asset)
Negligible	<ul style="list-style-type: none"> Slight changes to historic building elements or setting that hardly affect the significance of the asset.
No change	<ul style="list-style-type: none"> No change

Table 13.4: Factors in the Assessment of the Magnitude of Change for Historic Landscapes

Magnitude	Description
Major	Change to most or all key historic landscape elements, parcels or components; Extreme visual effects; Gross change of noise or change to sound quality; Fundamental changes to use or access; Resulting in total change to historic landscape character unit
Moderate	<ul style="list-style-type: none"> Changes to many key historic landscape elements, parcels or components;

Magnitude	Description
	<ul style="list-style-type: none"> Visual change to many key aspects of the historic landscape; Noticeable differences in noise or sound quality; Considerable changes to use or access; Resulting in moderate changes to historic landscape character.
Minor	<ul style="list-style-type: none"> Changes to few key historic landscape elements, parcels or components; Slight visual changes to few key aspects of historic landscape; Limited changes to noise levels or sound quality; Slight changes to use or access; Resulting in limited changes to historic landscape character.
Negligible	<ul style="list-style-type: none"> Very minor changes to key historic landscape elements, parcels or components; Virtually unchanged visual effects; Very slight changes in noise levels or sound quality; Very slight changes to use or access; Resulting in a very small change to historic landscape character.
No change	<ul style="list-style-type: none"> No change

Assessing the Value of Heritage Assets

- 13.4.14 In order to assess the significance of the different magnitudes of change resulting from the Scheme, the above factors have to be weighed against the value of each cultural heritage asset. This 'value' is broadly equivalent to an asset's significance in NPPF terminology, but the term 'value' has been retained here in order that this is not confused with the 'significance of effects' which is discussed in paragraphs 13.4.19 – 13.4.20 below. The DMRB tables 13.5-13.6 below have also been modified to bring them into accordance with the NPPF paragraph 200 which states that heritage assets 'of the highest significance' include Scheduled Monuments, Protected Wreck Sites, Battlefields, grade I and II* Listed Buildings, grade I and II* Parks and Gardens, as well as World Heritage Sites. Consequently, all of these assets have been grouped into the single category of 'high' value rather than 'high' and 'very high' (for World heritage Sites) as in the original DMRB methodology.
- 13.4.15 In addition to the DMRB methodology with regards to assigning 'value', reference will also be made to 'heritage significance' as described in the *National Planning Policy Framework (NPPF)*, which is defined as the '*value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting*' (MHCLG 2021, 71-72).
- 13.4.16 These three heritages 'interests' are described more fully in the *Planning Practice Guidance: Historic environment* document (MHCLG 2019, Paragraph 006):

- **archaeological interest:** As defined in the Glossary to the National Planning Policy Framework, there will be archaeological interest in a heritage asset if it holds, or potentially holds, evidence of past human activity worthy of expert investigation at some point.
- **architectural and artistic interest:** These are interests in the design and general aesthetics of a place. They can arise from conscious design or fortuitously from the way the heritage asset has evolved. More specifically, architectural interest is an interest in the art or science of the design, construction, craftsmanship and decoration of buildings and structures of all types. Artistic interest is an interest in other human creative skill, like sculpture.
- **historic interest:** An interest in past lives and events (including pre-historic). Heritage assets can illustrate or be associated with them. Heritage assets with historic interest not only provide a material record of our nation's history but can also provide meaning for communities derived from their collective experience of a place and can symbolise wider values such as faith and cultural identity.

13.4.17 Reference will also be made to the 'heritage values' described in the guidance regarding the assessment of significance contained within *Conservation Principles* (English Heritage 2008). This states that the significance of heritage assets derives from the 'heritage values' that they possess, which may be *evidential*, *historical* (either *illustrative* or *associative*), *aesthetic* or *communal*.

13.4.18 Cultural heritage assets can include archaeological assets, historic buildings/built environment, and/or historic landscapes, and different criteria are provided in the *DMRB* guidance for establishing a 'value' for each of these assets, as tabulated in Tables 13.5-13.7.

Table 13.5: Factors for assessing the value of archaeological assets

Value	Description
High	<ul style="list-style-type: none"> • World Heritage Sites (including nominated sites) • Assets of acknowledged international importance • Assets that can contribute significantly to acknowledged international research objectives • Scheduled Monuments (including proposed sites) • Undesignated assets of schedulable quality and importance • Assets that can contribute significantly to acknowledged national research objectives
Medium	<ul style="list-style-type: none"> • Designated or undesignated assets that contribute to regional research objectives
Low	<ul style="list-style-type: none"> • Designated and undesignated assets of local importance • Assets compromised by poor preservation and/or poor survival of contextual associations

Value	Description
	<ul style="list-style-type: none"> Assets of limited value, but with potential to contribute to local research objectives
Negligible	<ul style="list-style-type: none"> Assets with very little or no surviving archaeological interest
Unknown	<ul style="list-style-type: none"> The importance of the asset cannot be ascertained

Table 13.6: Factors for assessing the value of the historic built environment

Value	Description
High	<ul style="list-style-type: none"> Standing structures inscribed as of universal importance as World Heritage Sites Other buildings of recognised international importance Scheduled Monuments with standing remains Grade I and Grade II* Listed Buildings Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association Conservation Areas containing very important buildings Undesignated structures of clear national importance
Medium	<ul style="list-style-type: none"> Grade II Listed Buildings Historic unlisted buildings that can be shown to have exceptional qualities in their fabric or historical associations Conservation Areas containing buildings that contribute significantly to its historic character Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including Street furniture and other structures)
Low	<ul style="list-style-type: none"> 'Locally Listed' buildings Historic (unlisted) buildings of modest quality in their fabric or historical association Historic Townscape or built up areas of limited historic integrity in their buildings, or built settings (e.g. including Street furniture and other structures)
Negligible	<ul style="list-style-type: none"> Buildings of no architectural or historical note; buildings of an intrusive character
Unknown	<ul style="list-style-type: none"> Buildings with some hidden (i.e. inaccessible) potential for historical significance

Table 13.7: Factors for assessing the value of the historic landscapes

Value	Description
High	<ul style="list-style-type: none"> World Heritage Sites inscribed for their historic landscape qualities Historic landscapes of international value, whether designated or not Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s)

Value	Description
	<ul style="list-style-type: none"> • Designated historic landscapes of outstanding interest • Undesignated historic landscapes of outstanding interest • Undesignated landscapes of high quality and importance, and of demonstrable national value • Well preserved historic landscapes, exhibiting considerable coherence, time-depth, or other critical factors
Medium	<ul style="list-style-type: none"> • Designated special historic landscapes • Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value • Averagely well-preserved historic landscapes with reasonable coherence, time-depth, or other critical factor(s)
Low	<ul style="list-style-type: none"> • Robust undesignated historic landscapes • Historic landscapes with importance to local interest groups • Historic landscapes whose sensitivity is limited by poor preservation and/or poor survival of contextual associations
Negligible	<ul style="list-style-type: none"> • Landscapes with little or no significant historical interest

The Significance of Effects

13.4.19 The ES chapter will classify the effect of the Scheme (both positive and negative impact) using the following measures:

- Very Large beneficial
- Large beneficial
- Moderate beneficial
- Slight beneficial
- Neutral
- Slight adverse
- Moderate adverse
- Large adverse
- Very Large adverse.

13.4.20 Table 13.8 below has been adapted from the DMRB 'Significance of Effects' matrix to accord with the terminology described above, and with the definition of 'heritage assets of the highest significance' provided in the NPPF (MHCLG 2021, 57). It is considered that 'significant' effects are those that are scored as *Moderate* or higher.

Table 13.8: The Significance of Effects Matrix

Value/Sensitivity	High	Neutral	Slight	Slight / Moderate	Moderate/ Large	Large/ V. Large
	Medium	Neutral	Neutral/ Slight	Slight	Moderate	Moderate/ Large
	Low	Neutral	Neutral/ Slight	Neutral/ Minor	Slight	Slight / Moderate
	Negligible	Neutral	Neutral	Neutral/ Slight	Neutral/ Slight	Slight
		No change	Negligible	Minor	Moderate	Major
Magnitude of change (Beneficial or adverse)						

- 13.4.21 In making the decision, the Secretary of State will identify whether any identified 'significant' effects constitute 'substantial harm'.
- 13.4.22 Paragraph 5.8.14 of NPS EN1 states: *'There should be a presumption in favour of the conservation of designated heritage assets and the more significant the designated heritage asset, the greater the presumption in favour of its conservation should be. Once lost heritage assets cannot be replaced and their loss has a cultural, environmental, economic and social impact. Significance can be harmed or lost through alteration or destruction of the heritage asset or development within its setting. Loss affecting any designated heritage asset should require clear and convincing justification. Substantial harm to or loss of a grade II listed building park or garden should be exceptional. Substantial harm to or loss of designated assets of the highest significance, including Scheduled Monuments; registered battlefields; grade I and II* listed buildings; grade I and II* registered parks and gardens; and World Heritage Sites, should be wholly exceptional'.*
- 13.4.23 Paragraph 5.8.15 goes on to state: *'Any harmful impact on the significance of a designated heritage asset should be weighed against the public benefit of development, recognising that the greater the harm to the significance of the heritage asset the greater the justification will be needed for any loss. Where the application will lead to substantial harm to or total loss of significance of a designated heritage asset the IPC should refuse consent unless it can be demonstrated that the substantial harm to or loss of significance is necessary in order to deliver substantial public benefits that outweigh that loss or harm.*
- 13.4.24 The Secretary of State may also consider the NPPF policy on substantial harm as a material consideration in his decision making.

The Settings of Heritage Assets

13.4.25 The methodology that will be employed for the setting assessment follows Historic England's *Good Practice Advice Note* (GPAN 3), (Historic England 2017), which recommends a 5-stage approach to the assessment of impacts to settings of heritage assets:

- Step 1: identify which heritage assets and their settings are affected.
- Step 2: Assess the degree to which these settings and views make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated.
- Step 3: Assess the effects of the proposed development, whether beneficial or harmful, on the significance or on the ability to appreciate it.
- Step 4: Explore ways to maximise enhancement and avoid or minimise harm.
- Step 5: Make and document the decision and monitor outcomes.

13.4.26 As discussed above, it is envisaged that Step 1 of the assessment process will eliminate many of the designated heritage assets within the 5km study area, and a much smaller quantity would then require more detailed assessment in Steps 2-5.

Cumulative Impact Assessment

13.4.27 Cumulative impacts are defined as the additional changes caused by a proposed development in conjunction with other similar developments, or as a combined effect of a set of developments taken together.

13.4.28 Table 13.9 below provides a summary of relevant current cumulative schemes that will be discussed within the Cumulative Impacts section of the Cultural Heritage chapter within the ES.

Table 13.9: Current cumulative schemes

Scheme	Status	Distance from the Scheme
West Burton Solar Project	DCO Same timescales as Cottam Solar Project	1.5km south of Cottam 1
Gate Burton Energy Park 500MW Solar and Energy Storage (Battery)	DCO Scoping opinion issued 20.12.21 Likely submission Q4 2022	1 km west of Cottam 1
Demolition of Cottam Power Station	Approved on 02.03.22	c.3km west of Cottam 1.

Cottam Power Station Proposed Redevelopment. Comprehensive Masterplan and design code to be prepared.	Emerging local plan policy ST6: Cottam Priority Regeneration Area.	c.3km west of Cottam 1.
Automotive Research and Development Centre, including garaging, circuit viewing facilities, 2 no wind turbines and ground mounted solar panels. Land at Blyton Park Driving Centre.	Application approved 03.03.2022	Immediately south of Cottam 1
Site Allocation Strategic Policy LP8 Employment Site Land at Lincolnshire Showground (Central Lincolnshire Local Plan 2017)	LDO/Masterplan – no details in public domain or approved	5.1km southeast from Cottam 1
Sustainable Urban Extension Policy 48 Gainsborough Northern Neighbourhood SUE Allocation (Central Lincolnshire Local Plan 2017)	Outline planning permission granted in 2011	3.5km west from Cottam 2

13.5 Existing Baseline Conditions

Archaeology

Designated Archaeological Assets

- 13.5.1 The combined 5km study area surrounding the Cottam 1, 2 and 3 sites contains 21 Scheduled Monuments, as detailed in Table 8 below. None of these Scheduled Monuments are within any of the Sites, although the *Thorpe Medieval settlement* (NHLE1016978) is directly abutting the southern edge of Cottam 3. The locations of these assets are depicted on Figures 13.1 and 13.2 in **Appendix 13.5**, and indicative distances from each of the Scheduled Monuments to each of the three Sites is provided in the final column in the table.

Table 13.10: Scheduled Monuments within the combined Cottam 5km study area

NHLE	Name	Distance to Cottam Sites
1003570	Deserted village of North Ingleby	c.3.03km to SW of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1004922	Owmby Roman settlement	c.3.32km to E of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1004996	Deserted village of Dunstall	>5km from Cottam 1 c.740m to NE of Cottam 2 c.1.85km to SE of Cottam 3
1005041	Roman villa W of Scampton Cliff Farm	c.3.95km to SE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1007689	Site of medieval preceptory and settlement remains, Temple Garth	>5km from Cottam 1 c.3.63km to E Cottam 2 c.3.51km to SE of Cottam 3
1008685	Site of Heynings Priory	c.3.8 km to WNW of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1011456	Monks Garth moated site	>5km from Cottam 1 c.4.45km to E of Cottam 2 >5km from Cottam 3
1012976	Site of a college and Benedictine Abbey, St Mary's Church	c.1.01 to W of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1019229	The medieval bishop's palace and deer park, Stow Park	c.2.8 km to WNW of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1016110	Hermit Dam moated site	c.4.93km to NW of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1016794	Southorpe medieval settlement and cultivation remains	>5km from Cottam 1 c.2.12km to NE Cottam 2 c.1.34km to ESE of Cottam 3
1016795	Gilby medieval settlement and cultivation remains	>5km from Cottam 1 c.1.53km to ENE Cottam 2 c.1.85km to SE of Cottam 3
1016797	Broxholme medieval settlement and cultivation remains	c.2.65km to S of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1016920	Moated manorial complex immediately north west of Elm Tree Farm	c.3.95km to NW of Cottam 1 c.2.18km to S of Cottam 2 >5km from Cottam 3
1016978	Thorpe medieval settlement	c.0 m to S of Cottam 1 >5km from Cottam 2

NHLE	Name	Distance to Cottam Sites
		>5km from Cottam 3
1016979	Coates medieval settlement and moated site	c.580 m to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1018288	Cross in St Cuthbert's churchyard	c.2km to SE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1018290	Cross in All Saints churchyard	>5km from Cottam 1 c.2.18km to SSE of Cottam 2 >5km from Cottam 3
1018291	Cross in St Martin's churchyard	>5km from Cottam 1 c.3.45km to NW Cottam 2 c.0.95km to ESE of Cottam 3
1019068	Harpwell Hall: a post-medieval house and gardens overlying medieval settlement remains immediately south of Hall Farm	c.2.88km to N of Cottam 1 c.4.54 to SE from Cottam 2 >5km from Cottam 3
1020196	Dovecote at Elm Tree Farm	c.3.93 to NW of Cottam 1 c.2.55 to SSE of Cottam 2 >5km from Cottam 3

Non-Designated Archaeological Assets

- 13.5.2 The baseline for non-designated assets has been derived thus far from the HER search results undertaken for the DBAs for each of the Sites, and the results of the geophysical surveys currently available.

Cottam 1

- 13.5.3 There are 95 non-designated archaeological assets within the wider 1km study area surrounding Cottam 1. Of these, 12 refer to assets within Site boundary. These are listed in Table 13.11 below, and their locations are depicted on Figure 13.3 in **Appendix 13.5**.

Table 13.11: HER entries within the Cottam 1 Site boundary

HER Ref	Asset Name	Description	Period
MLI51104	Site of a Romano-British settlement south-west of Turpin Farm	Site of a possible late Romano-British site seen after deep ploughing at Turpin Farm, Fillingham in 1936. In 1964 it was reported that the farm foreman had ploughed up pot fragments from 1936 onwards in this area. An abundance of stone in the first few years suggested a settlement site. He retained samples of	Roman

HER Ref	Asset Name	Description	Period
		pottery only long enough for Ethel Rudkin to identify as Romano-British. No finds have been made in recent years. (Located in Parcel C).	
MLI52107	Ridge and furrow, Cammeringham	Site of earthwork ridge and furrow which is probably of late medieval date. (Located in Parcel D).	Medieval
MLI52438	Silver Penny	Find spot of silver penny of Cnut (1016-35). (Located in Parcel F).	Early medieval
MLI52445	Normanby by Stow Shrunken Medieval Village	Township of Normanby extends in a narrow strip along the north boundary of Stow. The earthworks are fragmentary but sufficient survives to suggest that Normanby in Stow was a planned village consisting of a rectangular block divided axially by a central north to south street. Associated remains include probable shrunken medieval earthwork crofts, hollow ways, field system and boundaries and medieval ridge and furrow. (Located partially in Parcel F)	Medieval
MLI52516	Stone ford	There is a stone ford across the River Till at this point. (Located in Parcel D)	Undated
MLI52520	Ridge and furrow	Probable late medieval ridge and furrow earthwork. (Located in Parcel D).	Medieval
MLI52526	Ridge and furrow	Site of ridge and furrow earthwork.	Medieval
MLI52527	Ridge and furrow	Probable late medieval ridge and furrow earthwork. (Located in Parcel D).	Medieval
MLI89097	Early Medieval pottery scatter on land north of East Farm, Normanby by Stow	Find spot of a small assemblage of fourteen sherds of primarily Middle Saxon to Saxo-Norman pottery. (Located in Parcel F).	Early medieval
MLI89098	Two sherds of Romano-British pottery found at East Farm, Normanby by Stow	Find spot of two sherds of Roman pottery. (Located in Parcel F).	Roman
MLI116510	Unnamed farmstead, Stow	Site of a demolished 19 th century outfarm. (Located in Parcel D).	19 th century
MLI118759	Unnamed farmstead, Sturton By Stow	Site of a demolished 19 th century farmstead. (Located in Parcel D).	19 th century

- 13.5.4 **Geophysical survey results:** The following is an initial assessment of the geophysical interpretation results, and an updated summary can be produced once the geophysical survey report becomes available. Linear and discrete anomalies have been recorded in the western area of Parcel C, which abut or adjoin to each other to form an unrecorded interconnecting enclosure system suggestive of Romano-British settlement activity. This likely relates to HER MLI51104. In the eastern area of Parcel C, linear anomalies categorised as possible archaeology have been recorded, which are suggestive of possibly unmapped former field boundaries.
- 13.5.5 In the eastern and central areas of Parcel D, linear, curvilinear and discrete anomalies have been detected that are possibly indicative of unrecorded Late Prehistoric or Romano-British activity. While in Parcel F and G, further linear and curvilinear anomalies have been detected that possibly represent unrecorded enclosure systems of unknown date, however, the anomalies to the east of Parcel F are in close proximity to Normanby by Stow Shrunken Medieval Village (MLI52445), possibly suggesting they represent further Medieval activity.
- 13.5.6 Linear anomalies on numerous alignments have been detected across the site that are synonymous with ridge and furrow cultivation, with some of these regimes in the survey area recorded by Lincolnshire HER (MLI52107, MLI52520, MLI52526 & MLI52527). While numerous linear anomalies have been detected that align with former mapped field boundaries, illustrative of the historical agricultural landscape which the site is located.

Cottam 2

- 13.5.7 There are 18 non-designated archaeological assets recorded on the HER within the wider 1km study area surrounding Cottam 2. Of these, two refer to assets within Cottam 2 Site boundary. These are listed in Table 13.12 below, and their locations are depicted on Figure 13.4 in **Appendix 13.5**.

Table 13.12: HER entries within the Cottam 2 Site boundary

HER Ref	Asset Name	Description	Period
MLI54038	Ridge and Furrow	Probable late Medieval earthwork of ridge and furrow.	Post-Medieval
MLI98190	Ridge and Furrow	Probable late Medieval earthwork of ridge and furrow.	Post-Medieval

- 13.5.8 **Geophysical survey results:** The following is a summary of the geophysical results for *Cottam Solar Project, Cottam 2, Lincolnshire: Geophysical Survey* (Archaeological Services 2022). To the southwest of survey area H2, weak positive linear and curvilinear anomalies have been detected, as well as weak positive curvilinear anomalies to the west of survey area H3 and east of H10. All these have been

categorised as possible archaeology of unknown origin due to either their weak magnetic signature or isolated position. Similarly, to the north of H6, a series of curvilinear anomalies, P3, have been recorded that possibly represent unrecorded ring ditches.

- 13.5.9 Rectilinear anomalies have been recorded to the northwest of survey area H5 (A1, A2, A3 & P3). These anomalies possibly represent previously unrecorded enclosure systems of unknown date, yet they have a similar morphology, suggesting a similar provenance. While in the northeast of survey area H8, linear anomalies, A4 and P4, appear to be an unrecorded enclosure system suggestive of settlement activity of unknown date. Magnetically strong land drains intersect the anomalies, which has impeded interpretation, yet they appear to form a coherent group.
- 13.5.10 Linear anomalies on numerous alignments have been detected across the site that are synonymous with ridge and furrow cultivation, with some of these regimes in the survey area recorded by Lincolnshire HER (MLI54038). While numerous linear anomalies have been detected that align with former mapped field boundaries, illustrative of the historical agricultural landscape which the site is located.

Cottam 3

- 13.5.11 There are 28 non-designated archaeological assets recorded on the HER within the wider 1km study area surrounding Cottam 3. Of these, three refer to assets within the Cottam 3 Site boundary. These are listed in Table 13.13 below, and their locations are depicted on Figure 13.5 in **Appendix 13.5**.

Table 13.13: HER entries within the Cottam 3 Site boundary

HER Ref	Asset Name	Description	Period
MLI54074	RAF Blyton	Site of Blyton Airfield which was opened in November 1942 and closed in 1945.	Modern
MLI54075	Part of a medieval ridge and furrow field system	Remains of ridge and furrow.	Medieval
MLI117386	Blyton Field, Blyton	Site of Blyton Field, a demolished 19 th century outfarm.	19 th century

- 13.5.12 **Geophysical survey results:** The following is a summary of the geophysical results for *Cottam Solar Project, Cottam 3, Lincolnshire: Geophysical Survey* (Archaeological Services WYAS 2022b). Across the site, a numerous anomalies have been recorded that relate to the previous use of the site as an airfield, RAF Blyton (MLI54074). Anomalies have been detected that possibly represent runway and calibration features. Further anomalies suggestive of unrecorded settlement activity have also been detected within the site, with possible Romano-British activity recorded in

survey area K18. Rectilinear, curvilinear and linear anomalies, A2 and A3, are suggestive of enclosure systems with a similar morphology and due to their vicinity to a Romano-British farmstead/settlement (MLI54147) could be Romano-British in date.

- 13.5.13 To the west of K14, curvilinear and rectilinear anomalies, A1, have been detected, which form a further possible unrecorded enclosure system of unknown date. Linear anomalies, P4, are recorded to the east of K14 that share alignment with the enclosure system but have been categorised as possible archaeology as they also share orientation with anomalies indicative of ridge and furrow cultivation.
- 13.5.14 Further anomalies classified as possible archaeology have been recorded in survey area K7, K9 and K11. These linear anomalies are on a different orientation to surrounding agricultural anomalies/features, therefore, could possibly be either archaeological or agricultural in origin. As anomalies, P2, are in close proximity to a farmstead named, Blyton Field (MLI117386), recorded by Lincolnshire HER. While in survey area K1, a curvilinear anomaly, P1, suggestive of a possible unrecorded ring ditch has been detected, yet due its isolated position and vicinity to an extant field boundary producing magnetic disturbance this interpretation is cautious.
- 13.5.15 In between survey areas J2 and J3, as series of linear anomalies, A4, suggestive of a possibly unrecorded enclosure or field system has been identified. These anomalies have a stronger magnetic signal than surrounding linear anomalies indicative of ridge and furrow on a similar alignment.
- 13.5.16 Linear anomalies on numerous alignments have been detected across the site that are synonymous with ridge and furrow cultivation. While numerous linear anomalies have been detected that align with former mapped field boundaries, illustrative of the historical agricultural landscape which the site is located.

Cable Route corridors

- 13.5.17 There are 8 non-designated archaeological sites or findspots recorded on the HER within the cable route corridors, as listed in Table 13.14.
- 13.5.18 Geophysical surveys along the cable route corridors are still ongoing, and the results of these, once available, will help to further inform the course of the proposed cable routes within these corridors.

Table 13.14: HER entries within the Cottam cable route corridors

HER Ref	Asset Name	Cable route
MLI54077	Medieval ridge and furrow	Cottam 2 – Cottam 3
MLI54076	Medieval ridge and furrow	Cottam 2 – Cottam 3
MLI54272	Medieval ridge and furrow	Cottam 1 –Cottam 2

MLI54142	Ridge and Furrow, Low Field Farm, Glentworth	Cottam 1 –Cottam 2
MLI52445	Normanby by Stow Shrunken Medieval Village	Cottam 1 –Cottam 2
MLI84314	Romano-British settlement, Marton Road, Stow	Cottam 1 – West Burton 1
MLI82761	Silver Roman brooch, Manor Farm	Cottam 1 - West Burton 1
MLI118122	Unnamed farmstead, Willingham	Cottam 1 – West Burton 1

Cottam Geoarchaeological Assessment

- 13.5.19 An initial geoarchaeological assessment of the Sites and cable route corridors has been produced by Oxford Archaeology North (Rutherford 2022). The assessment aimed to investigate and characterise the geoarchaeological potential of the Sites and associated cable route corridors in order to identify areas of enhanced geoarchaeological interest that could be targeted by further, more detailed characterization work.
- 13.5.20 The assessment identified that the development lies within the wider Trent Valley, an area known for its rich floodplain archaeology, with evidence of fish traps, log boats, historical mills and bridges, all recovered from post glacial sands and gravel deposits, sealed beneath thick, fine-grained alluvium. Low-lying broad river valleys provide access to riverine resources and have previously produced evidence of both ritual and settlement activity. These environments can offer excellent preservation potential for significant archaeological and palaeoenvironmental remains.
- 13.5.21 The assessment identified that there is the potential for features such as palaeochannels and gravel islands to exist within the proposed development areas. Data generation for future deposit models could be obtained from future engineering interventions especially if consideration is given to positioning interventions in areas likely to yield archaeological information.

The Historic Built Environment

Designated built heritage assets (of the highest significance)

- 13.5.22 The combined 5km study area surrounding the Cottam 1, 2 and 3 sites contains 35 Grade I and Grade II* Listed Buildings, as detailed in Table 13.15 below. None of these Listed Buildings are located within the Cottam 1, 2 or 3 Sites. The locations of these assets are depicted on Figure 13.1 and 13.3 in **Appendix 13.5**, and indicative distances from each of the Listed Buildings to each of the three Sites is provided in Table 13.15.

- 13.5.23 At the Scoping stage it was proposed that a number of these assets should be scoped out of further assessment, but the PINS' Scoping Opinion requested that further evidence be presented in the ES to demonstrate no direct or indirect impacts to these receptors.

Table 13.15: Grade I and II* Listed Buildings within the combined Cottam 5km study area

NHLE	Name	Grade	Distance to Cottam Sites
1063342	Church of St Michael and All Angels, Cammeringham	II*	c.1.50km to E of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1063348	Glentworth Hall, Glentworth	II*	c.1.74km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1063375	Church of St Alkmund, Blyborough	I	>5km from Cottam 1 c.5km to E of Cottam 2 >5km from Cottam 3
1063376	Blyborough Hall, Blyborough	II*	>5km from Cottam 1 c.4.79km to E of Cottam 2 >5km from Cottam 3
1063378	Church of St Cuthbert, Brattleby	II*	c.2km to SE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1064048	Church of All Saints, Heapham	I	c.4.11km to NW of Cottam 1 c.3.05km to S of Cottam 2 >5km from Cottam 3
1064070	Church of St Luke, North Carlton	II*	c.3.99km to SSE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1064133	Church of St Peter, Scotter	I	>5km from Cottam 1 >5km from Cottam 2 c.4.07km to NE of Cottam 3
1064134	The Old Manor House, Scotter	II*	>5km from Cottam 1 >5km from Cottam 2 c.4.30km to NE of Cottam 3
1064137	Manor House, Scotter	II*	>5km from Cottam 1 >5km from Cottam 2 c.4.14km to NW of Cottam 3
1064159	Church of St Martin, Blyton	I	>5km from Cottam 1 c.3.94km to NW of Cottam 2 c.0.90km to SW of Cottam 3
1064162	Church of St Lawrence, Corringham	I	>5km from Cottam 1 c.0.60km to W of Cottam 2 >5km from Cottam 3
1146616	Church of St Lawrence and St George, Springthorpe	I	>5km from Cottam 1 c.1.92km to SW of Cottam 2

NHLE	Name	Grade	Distance to Cottam Sites
			>5km from Cottam 3
1146624	Church of St Mary, Stow	I	c.1.15km to W of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1146742	Church of St Edith, Stow	I	c.0.69km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1146810	Church of All Saints, Upton	II*	c.2.99km to NNW of Cottam 1 c.4.90km to SSW of Cottam 2 >5km from Cottam 3
1147235	North Carlton Hall, North Carlton	I	c.3.68km to SSE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1147274	Gateway at Scampton House Farm in Field to West of House, Scampton	I	c.2.76km to SSE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1165812	Church of St John The Baptist, Northorpe	I	>5km from Cottam 1 c.4.22km to NNE of Cottam 2 c.1.78km to NNE of Cottam 3
1165912	Church of St Genwys, Scotton	I	c.2.64km to NW of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1165919	Manor House, Cammeringham	II*	c.1.59km to E of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1166045	Fillingham Castle, Fillingham	I	c.2.49km to NEE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1166242	Church of All Saints, Hemswell	II*	c.4.28km to N of Cottam 1 c.4.01km to SE of Cottam 2 >5km from Cottam 3
1309029	Church of St Chad, Harpswell	I	c.3.28km to NE of Cottam 1 c.4.89km to SE of Cottam 2 >5km from Cottam 3
1309078	Church of St Michael, Glentworth	II*	c.1.78km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1309113	Monument 10 Yards South of Chancel of Church of St Andrew, Fillingham	II*	c.1.61km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1309134	Gateway, Entrance Lodges and Wall to Fillingham Castle, Fillingham	II*	c.3.59km to E of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1317137	Church of All Saints, Pilham	II*	>5km from Cottam 1 c.2.18km to NW of Cottam 2 c.1.42km to SW of Cottam 3

NHLE	Name	Grade	Distance to Cottam Sites
1317208	Church of All Saints, Laughton	I	>5km from Cottam 1 >5km from Cottam 1 c.1.68km to NW of Cottam 3
1359458	Gate Burton Hall, Gate Burton	II*	c.4.61km to W of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1359484	Church of St. Margaret of Antioch, Marton	I	c.4.42km to W of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1359490	Church of St Botolph, Saxilby with Ingleby	I	c.4.66km to W of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1359492	Church of St John The Baptist, Scampton	II*	c.2.97km to SE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1359493	Church of St John The Baptist and Monson Mausoleum, South Carlton	I	c.5km to SE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
1359847	Church of St Andrew, Fillingham	II*	c.1.63km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3

13.5.24 In addition to the above, there are seven Conservation Areas within the combined 5km study area for the Cottam Solar Project. These are listed in Table 13.16 below, and a value is assigned to each using the criteria provided in Table 13.6 above.

Table 13.16: Conservation Areas within the combined Cottam 5km study area

Name	Value	Distance to Cottam Sites
Brattleby	High	c.1.92km to ESE of Cottam 1 >5km from Cottam 2 >5km from Cottam 3
Fillingham	High	c.3.89km to N of Cottam 1 c.3.86km to ESE of Cottam 2 >5km from Cottam 3
Glentworth	High	c.1.70km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 2
Hemswell	High	c.1.70km to NE of Cottam 1 >5km from Cottam 2 >5km from Cottam 2
Ingham	Medium	c.1.38km to SE of Cottam 1 >5km from Cottam 2 >5km from Cottam 2
South Carlton	High	c.4.95km to SE of Cottam 1

Name	Value	Distance to Cottam Sites
		>5km from Cottam 2 >5km from Cottam 3
Springthorpe	High	c.4.91km to NE of Cottam 1 c.1.83km to SW of Cottam 2 >5km from Cottam 3

Grade II Listed Buildings within 2km and on-Site non-designated built heritage assets

- 13.5.25 Currently, there is no Local Lists of Heritage Assets in Lincolnshire, but Heritage Lincolnshire is leading the Local Heritage List Campaign in partnership with Lincolnshire County Council, having received funding from the Ministry of Housing, Communities and Local Government (MHCLG).

Cottam 1

- 13.5.26 There are 51 Grade II Listed Buildings within the 2km study area surrounding the Cottam 1 Site, as listed in Table 13.17 below. At the Scoping stage, it was proposed that many of these should be scoped out of further assessment, but the PINS' Scoping Opinion requested that further evidence be presented in the ES to demonstrate no direct or indirect impacts to these receptors.

Table 13.17: Grade II Listed buildings within the 2km study area for Cottam 1

NHLE	Name	Location
1064093	Stables At Aisthorpe Hall	Aisthorpe
1063335	Brattleby Hall	Brattleby
1063336	Stable Block At Brattleby Hall	Brattleby
1063337	Gate Piers At Brattleby Hall	Brattleby
1063338	The Old Rectory	Brattleby
1063341	Lodge Cottage	Brattleby
1359845	Garage At The Old Post Office	Cammeringham
1359846	Gate Piers To Manor House	Cammeringham
1063343	5, Chapel Lane	Fillingham
1063344	3, Chapel Lane	Fillingham
1063345	Lake House	Fillingham
1063346	Gateway	Fillingham
1166037	The Old Rectory	Fillingham
1309085	Manor House	Fillingham
1359848	Village Hall	Fillingham
1063349	12, Church Street	Glentworth
1166094	Nos 1 To 4 Hall Cottages (Stable Block At Glentworth Hall)	Glentworth
1309058	Northlands House	Glentworth

NHLE	Name	Location
1359850	The Old Vicarage	Glentworth
1063355	Grange Farmhouse	Ingham
1063356	School And Attached School House	Ingham
1146541	Applegarth House	Ingham
1166375	Church Of All Saints	Ingham
1308905	The Generous Britain Public House	Ingham
1359422	Jubilee Terrace Cottages	Ingham
1359816	33, The Green	Ingham
1359479	2, Glenworth Road	Kexby
1064075	Till Bridge Farm Cottages	Scampton
1064062	Whipping Post	Stow
1064063	Threshing Barn At Church End Farm	Stow
1064064	21, Church Lane	Stow
1064065	Monument 3 Yards South Of Church Of St Edith	Stow
1064066	6, Sturton Road	Stow
1146735	Stables And Pigeoncote At Church End Farm	Stow
1146755	9, Ingham Road	Stow
1146761	Wesleyan Chapel	Stow
1359486	Manor Farmhouse	Stow
1064067	Subscription Mill	Sturton By Stow
1064068	Lych Gate and Wall of Church of St Hugh of Avalon	Sturton By Stow
1146766	Brickyard Cottages	Sturton By Stow
1146772	Church of St Hugh Of Avalon	Sturton By Stow
1146778	Old Hall	Sturton By Stow
1359487	Barn at Bransby House for Retired Horses	Sturton By Stow
1359488	Old Rectory Home for the Elderly	Sturton By Stow
1308921	Thorpe in the Fallows Farmhouse	Thorpe in the Fallows
1064029	20, Fillingham Road	Willingham
1064030	1 and 3, Stow Road	Willingham
1146826	Church of St Helen	Willingham
1146841	Old Rectory	Willingham
1308795	Grange Farmhouse	Willingham
1359509	Willingham House	Willingham

- 13.5.27 There are no non-designated built heritage assets recorded on the HER within the Cottam 1 Site boundaries, although those historic buildings identified in Table 13.18 below are wholly surrounded by elements of the Site, and therefore would be experienced as being 'within' the development. Other non-designated built heritage assets requiring assessment might also be identified.

Table 13.18: HER built environment entries surrounded by the Cottam 1 Site

HER Ref	Asset Name	Description	Period
MLI118739	Blackthorn Hill, Cammeringham	Location of Blackthorn Hill, a redeveloped 19 th century farmstead.	19 th century
MLI118742	Cold Harbour, Cammeringham	Location of Cold Harbour, a redeveloped 19 th century farmstead.	19 th century
MLI118748	The Grange, Thorpe in the Fallows	Location of The Grange, a partially extant 19 th century farmstead.	19 th century
MLI118047	Turpin Farm, Fillingham	Location of Turpin Farm, a partially extant 19 th century farmstead.	19 th century

Cottam 2

- 13.5.28 There are seven Grade II Listed Buildings within the 2km study area surrounding the Cottam 2 Site, as listed in Table 13.19 below. At the Scoping stage, it was proposed that five of these Listed Buildings should be scoped out of further assessment, but the PINS' Scoping Opinion requested that further evidence be presented in the ES to demonstrate no direct or indirect impacts to these receptors.

Table 13.19: Grade II Listed buildings within the 2km study area for Cottam 2

NHLE	Name	Location
1064163	Mill at Mill House Farm	Corringham
1165535	Old Hall	Corringham
1165563	Lychgate at Church of St Lawrence	Corringham
1165585	Mill House Farmhouse Stables And Barn	Corringham
1317241	1, High Street	Corringham
1359417	Corringham Windmill	Corringham
1064061	20, Hill Road	Springthorpe

- 13.5.29 There are no non-designated built heritage assets recorded on the HER within the Cottam 2 Site boundary, although the historic farmstead identified in Table 13.20 below is wholly surrounded by elements of the Site, and therefore would be experienced as being 'within' the development.

Table 13.20: HER built environment entries surrounded by the Cottam 2 Site

HER Ref	Asset Name	Description	Period
MLI117364	Corringham Grange (Corringham Grange Farm), Corringham	Corringham Grange, a partially extant 19 th century farmstead.	19 th century

Cottam 3

- 13.5.30 There are 16 Grade II Listed Buildings within the 2km study area surrounding the Cottam 3 Site, as listed in Table 13.21 below. At the Scoping stage, it was proposed that 14 of these Listed Buildings should be scoped out of further assessment, but the PINS' Scoping Opinion requested that further evidence be presented in the ES to demonstrate no direct or indirect impacts to these receptors.

Table 13.21: Grade II Listed buildings within the 2km study area for Cottam 3

NHLE	Name	Location
1165509	Matt Hall	Blyton
1359454	Old Railway Station	Blyton
1359455	The Old Windmill	Blyton
1064166	4, Church Road	Laughton
1317186	Mount Pleasant Farmhouse	Laughton
1317236	Outbuilding at Laughton Post Office Formerly Number 2 Church Road	Laughton
1359420	Laughton Hall Farmhouse	Laughton
1064172	Rose Cottage	Northorpe
1064173	Village Hall	Northorpe
1064174	Northorpe Hall	Northorpe
1165830	Manor House	Northorpe
1165840	Northorpe Old Hall	Northorpe
1359421	6, Monson Road	Northorpe
1064132	Lime Cottage	Pilham
1064175	Church Gate and Railings	Pilham
1309162	Firs Farm	Pilham

- 13.5.31 There are no non-designated built heritage assets recorded on the HER within the Cottam 3 Site boundary, although the historic farmsteads identified in Table 13.22 below would be surrounded on three sides by elements of the Site, and therefore would be experienced as being 'within' the development.

Table 13.22: HER built environment entries surrounded by the Cottam 3 Site

HER Ref	Asset Name	Description	Period
MLI117211	Cold Harbour, Laughton	Location of Cold Harbour, a partially extant 19th century farmstead.	19 th century
MLI117385	Blyton Grange, Blyton	Location of Blyton Grange, a partially extant 19th century farmstead.	19 th century

The Historic Landscape

Designated Landscapes

- 13.5.32 There is one designated historic landscape within the 5km study area, comprising *Fillingham Castle* Grade II Registered Park and Garden (NHLE 1000977). This is located on the Lincoln Cliff, c.1.91km to the east of Parcel B at Cottam 1. Cottam 2 is located c.8.5km to the north-west of this asset, and Cottam 3 is located c.11.95km to the north-west. The location of this asset is depicted on Figure 13.1 and 13.2 in **Appendix 13.5**.

Historically Important Hedgerows

- 13.5.33 Under the *Hedgerow Regulations* 1997, hedgerows are afforded statutory protection should they qualify as being 'important' for, *inter alia*, historical or archaeological reasons. The historical and archaeological criteria include;
- Hedgerows which mark pre-1850 parish boundaries;
 - Hedgerows which incorporate or are within Scheduled Monuments or sites listed on an SMR/HER;
 - Hedgerows which mark the boundary of a pre-1600 estate or manor;
 - Hedgerows which are an integral part of a field system pre-dating the Enclosure Acts (meaning an Enclosure Act mentioned in the Short Titles Act; the earliest of these was made in 1845).
- 13.5.34 Further assessment will enable a plan to be produced that will identify all hedgerows within the Sites and along the cable routes that are considered to be 'historically important', in order that impacts to these protected historic landscape elements can be minimised.

Historic Landscape Characterisation

- 13.5.35 The ongoing country-wide Historic Landscape Characterisation (HLC) is being carried out under the auspices of Historic England, and the HLC for Lincolnshire was completed and published in 2011 (Lord and Mackintosh 2011). The three Cottam Sites are all located within Character Area *TVL1: The Trent Valley*, which is located within *The Northern Cliff Foothills* Character Zone. In addition, a small area towards the eastern edge of Parcel B at Cottam 1 falls within Character Area *NCL3: The Cliff Edge Airfields*, which is located within *The Northern Cliff* Character Zone.

Cottam 1, 2 and 3

- 13.5.36 The detailed HLC types for the Cottam 1, 2 and 3 Sites and the cable route corridors will be obtained from the Lincolnshire Historic Environment Record (HER), these will be assessed as part of the ES in accordance with the methodology detailed in section 13.4 above.
- 13.5.37 Further assessment to be completed to inform the baseline for the ES.

Archaeology

Cottam 1, 2 and 3

- 13.5.38 Further research and evaluation at the Cottam 1, 2 and 3 Sites will provide a greater understanding of the baseline conditions and inform future mitigation strategies in consultation with Historic England and the local authority's archaeological advisors.
- 13.5.39 The DBAs for the three Sites will be updated, to include evidence from historic map regression, LiDAR analysis and aerial photo mapping. This evidence, alongside the geophysical survey and geoarchaeological sampling results, will inform a scheme of further evaluation including targeted trial trenching in any areas where this is deemed appropriate. Other techniques such as fieldwalking might also be considered, but this would be contingent upon cropping cycles.
- 13.5.40 Further geoarchaeological sampling is proposed alongside the archaeological evaluation and/or geotechnical investigations undertaken within the Sites and along the cable route corridors. This will potentially allow for the identification of the locations of gravel islands and palaeochannels that could be targeted for further assessment or mitigated for by design.
- 13.5.41 For impacts to the settings of Scheduled Monuments, further assessment in accordance with the methodology outlined in *The Setting of Heritage Assets* (Historic England 2017) will be undertaken, and options for minimising harm and/or maximising enhancement will be explored. Key to this assessment will be consideration of views west from the Lincolnshire Cliff across the Trent floodplain, and any cumulative impacts with the proposed West Burton Solar Project and any other relevant large developments that have planning permission or are currently in the planning system.

Cable Routes

- 13.5.42 Geophysical surveys are currently being undertaken to evaluate the cable route corridors. These surveys, carried out alongside appropriate desk-based research and bolstered by targeted evaluation trenching and geoarchaeological sampling will help to identify cable routes that will minimise impacts upon buried archaeological remains. Historic Impact Assessment undertaken in accordance with the

methodology outlined in *The Setting of Heritage Assets* (Historic England 2017) will also seek to identify any temporary impacts to the settings of Scheduled Monuments that might occur.

Built Heritage

Cottam 1, 2 and 3

- 13.5.43 For impacts to the settings of Listed Buildings and Conservation Areas, further assessment in accordance with the methodology outlined in *The Setting of Heritage Assets* (Historic England 2017) will be undertaken, including a discussion of any options for minimising harm and/or maximising enhancement through design. This will also include a discussion of impacts to non-designated built heritage assets in close proximity to the Sites.
- 13.5.44 Key to this assessment will be consideration of views west from the Lincolnshire Cliff across the Trent floodplain, and any cumulative impacts with the proposed West Burton Solar Project and any other relevant large developments that have planning permission or are currently in the planning system.

Cable Routes

- 13.5.45 Historic Impact Assessment undertaken in accordance with the methodology outlined in *The Setting of Heritage Assets* (Historic England 2017) will also seek to identify any temporary impacts to the settings of elements of the historic built environment that might occur.

The Historic Landscape

Cottam 1, 2 and 3

- 13.5.46 Historic Impact Assessment undertaken in accordance with the methodology outlined in *The Setting of Heritage Assets* (Historic England 2017) will also identify any effects upon the designated landscape at *Fillingham Castle* Grade II Registered Park and Garden (NHLE 1000977).
- 13.5.47 The initial DBAs that have been produced will be updated to include a discussion of the long term, (though temporary and largely reversible) effects upon Historic Landscape Character and discuss both the adverse and potentially beneficial effects that could occur as a result of the Scheme proposals.

Cable Routes

- 13.5.48 The ES will also include a discussion of the potential effects that the cable routes (and any associated infrastructure, site compounds etc.) could have on historic

landscape character, and historic landscape elements such as any historically important hedgerows that might be affected.

Future baseline

- 13.5.49 Consideration will be given to the future baseline in the ES (i.e. changes which may occur during the time period over which the Scheme will be in place and also changes which may occur in any event, in the absence of the Scheme).
- 13.5.50 Changes to the archaeological baseline which might occur during the lifespan of the Scheme; and in the absence of the Scheme are considered likely to be minimal. They would be limited to erosion and degradation of buried archaeological assets. This is unlikely to significantly alter the current baseline scenario.
- 13.5.51 In addition, it is not considered likely that significant numbers of designated built heritage assets will be added to the baseline in the future and as such, the built heritage baseline is unlikely therefore to undergo significant change.

13.6 Preliminary Impact Assessment and Proposed Mitigation

- 13.6.1 The full impact assessment has yet to be undertaken and will be included in the ES once all of the results of further evaluation has been completed and the final design of the Scheme has been established. Table 13.23 below provides a list of the potential on-site impacts to currently known archaeological remains, and the proposed further evaluation strategy which will help to inform the mitigation by design. For on-site archaeological remains, this would comprise the avoidance of sensitive archaeological areas by removing panels entirely, and/or the installation of concrete feet for the panels, which would preserve the archaeological remains *in situ*.
- 13.6.2 Table 13.23 lists the designated assets where it is expected that there will be potential impacts and provides details of the mitigation by design that has been discussed with Historic England. This mitigation includes reducing or eliminating impacts upon setting by relocating panels away from sensitive areas, or by placing panels on concrete footings in order to protect upstanding or buried archaeological remains associated with designated assets.
- 13.6.3 Further research undertaken as part of the assessment in accordance with *The Setting of Heritage Assets* (Historic England 2017) could identify further impacts during the assessment process, which will be discussed in the ES. At this stage it is considered that, in the absence of agreed mitigation, there is the potential for significant effects at the *Thorpe Medieval settlement* Scheduled Monument. However, with appropriate mitigation in place these effects could be reduced or eliminated. It is considered that significant effects at designated assets within the wider study areas surrounding the Sites are unlikely, although such effects at a small number of

assets cannot be totally discounted at this stage and will be considered within the ES.

- 13.6.4 Effects upon non-designated buried and upstanding archaeological remains have the potential to be significant in those areas where regionally or nationally important assets would be directly impacted. However, in reality these effects are unlikely to be significant once the mitigation strategies (by design) that are currently being formulated have been incorporated into the design of the Scheme.

Table 13.23: Preliminary impact assessment and proposed mitigation (on-site archaeology)

Site	HER ref	Asset Name	Potential impact	Proposed mitigation
Cottam 1	MLI51104	Site of a Romano-British settlement south-west of Turpin Farm	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 1	MLI52107	Ridge and furrow, Cammeringham	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	None
Cottam 1	MLI52438	Silver Penny	Findspot only, no known associated features therefore no known impact	None
Cottam 1	MLI52445	Normanby by Stow Shrunken Medieval Village (SMV)	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 1	MLI52516	Stone ford	Unlikely to be impacted	None
Cottam 1	MLI52520	Ridge and furrow	Possible direct impacts to buried archaeological	None

Site	HER ref	Asset Name	Potential impact	Proposed mitigation
			remains from piles to secure for solar panels, cables and other Site infrastructure	
Cottam 1	MLI52526	Ridge and furrow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	None
Cottam 1	MLI52527	Ridge and furrow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	None
Cottam 1	MLI89097	Early Medieval pottery scatter on land north of East Farm, Normanby by Stow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure, should any archaeological remains be associated with this scatter	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 1	MLI89098	Two sherds of Romano-British pottery found at East Farm, Normanby by Stow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure, should any archaeological remains be associated with this scatter	Targeted evaluation trenching and mitigation by design should this be warranted

Site	HER ref	Asset Name	Potential impact	Proposed mitigation
Cottam 1	MLI116510	Unnamed farmstead, Stow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 1	MLI118759	Unnamed farmstead, Sturton By Stow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 1	N/A	Geophysical anomalies indicative of possible Late Prehistoric or Romano-British settlement and fields systems and possible medieval remains associated with Stow SMV	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 2	MLI54038	Ridge and Furrow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	None
Cottam 2	MLI98190	Ridge and Furrow	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	None

Site	HER ref	Asset Name	Potential impact	Proposed mitigation
Cottam 2	N/A	Geophysical anomalies representing rectilinear and curvilinear ditches of unknown date	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 3	MLI54074	RAF Blyton	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 3	MLI54075	Part of a medieval ridge and furrow field system	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted
Cottam 3	MLI117386	Blyton Field, Blyton	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Mitigation by design
Cottam 3	N/A	Geophysical anomalies indicative of possible Late Prehistoric or Romano-British settlement and fields systems and features associated with RAF Blyton airfield	Possible direct impacts to buried archaeological remains from piles to secure for solar panels, cables and other Site infrastructure	Targeted evaluation trenching and mitigation by design should this be warranted

Table 13.24: Preliminary assessment of impact to designated heritage assets (Scheduled Monuments)

Site	NHLE ref	Asset Name	Potential impact	Proposed mitigation
Cottam 1	1016978	Thorpe medieval settlement	Impacts to setting due to proximity of solar panels	Mitigation by design: In consultation with Historic England, panels are to be set back from the scheduled area. This will be informed by evaluation trenching in the fields to the north of the monument
Cottam 1, 2 & 3	Various	Various other designated assets within the vicinity of the Cottam Sites	Impacts to setting due to intervisibility with solar panels in views to and from the assets	Further detailed assessment in accordance with HE's GPA 3 will identify any further impacts. Mitigation by design could include proposed planting of trees, shelterbelts and woodland

13.6.5 Preliminary assessment of designated built heritage assets and Historic Landscape Characterisation is not feasible at this stage, but assessment of these assets will be undertaken as part of the ES.

13.7 Cumulative Impacts

13.7.1 A list of the potential cumulative schemes that will be assessed as part of the ES is set out Table 13.9 above. Key to this assessment will be the assessment of views westwards from the Lincoln Edge escarpment, where a number of schemes may have cumulative impacts on views of the spires of Grade I and II* Listed churches, for example. There is the possibility that significant cumulative effects could be identified for some of these assets, although based on the information currently available this is considered unlikely, as the spires would remain prominently visible in these views. These cumulative impacts will be assessed in more detail in accordance with the guidance provided in Historic England's *The Setting of Heritage Assets* (Historic England 2017), and this assessment report will be appended to the ES

13.8 Summary and Conclusions

- 13.8.1 This chapter of the PEIR has identified the existing cultural heritage resource and identified future assessment work that will be undertaken. The main objective is to provide as much relevant information at this stage in the project. Preliminary mitigation measures are provided, but it is not possible at this stage to identify all the significant likely environmental effects anticipated or identify residual impacts, but this will be provided in the ES.

14 Transport and Access

14.1 Introduction

- 14.1.1 This chapter of the PEIR reports the preliminary findings of the likely significant effects on Transport and Access as a result of the Scheme.
- 14.1.2 Solar farm developments do not generate significant traffic flows once operational. Typically, there will be only a handful of trips per month by Transit Van (or similar) for maintenance purposes. Therefore, all operational effects are negligible in significance. In addition, it is not anticipated that the effects associated with decommissioning will be worse than during the construction phase. Therefore, the focus of this Chapter is on the construction phase.
- 14.1.3 This chapter is not intended to be read as a standalone assessment and, where relevant, cross references are included to other chapters within this PEIR. This chapter is supported by the following Appendices:
- **Appendix 14.1:** Outline Construction Traffic Management Plan (CTMP) (prepared by Transport Planning Associates).
 - **Appendix 14.2:** Abnormal Indivisible Load Access to Cottam Solar Project Substations – High Level Summary Document & Desktop review (prepared by Wynns).

14.2 Policy Context

- 14.2.1 This Chapter has been prepared with consideration to 'Guidance on Transport Assessments', prepared by the Department for Transport (DfT) in March 2007 (which is now archived but still considered relevant), 'Guidelines for the Environmental Assessment for Road Traffic', Institute of Environmental Management and Assessment (IEMA) and the 'Design Manual for Roads and Bridges (DMRB)', National Highways.
- 14.2.2 The proposals have also been considered in the context of the following documents:
- National Policy Statement EN-1 (2011);
 - National Policy Statement EN-3 (2011)
 - National Policy Statement EN-5 (2011);
 - National Planning Policy Framework (2021);
 - Central Lincolnshire Local Plan (2017), which covers the West Lindsey District;

- Draft Bassetlaw District Draft Local Plan 2020-2037 (August 2021).

National Planning Statements EN-1, EN-3 and EN-5

- 14.2.3 National Planning Policy Statement (NPS) EN-1 is the overarching policy statement for Energy. NPS EN-3 is focused on Renewable Energy and NPS EN-5 is focused on Electricity Network Infrastructure.
- 14.2.4 Section 5.13.2 of NPS EN-1 states that *“the consideration and mitigation of transport impacts is an essential part of Government’s wider policy objectives for sustainable development”*.
- 14.2.5 Paragraph 5.13.3 of NPS EN-1 states that *“if a project is likely to have significant transport implications, the applicant’s ES should include a transport assessment”*.
- 14.2.6 Paragraph 5.13.6 of NPS EN-1 states that *“A new energy NSIP may give rise to substantial impacts on the surrounding transport infrastructure and the [Secretary of State] should therefore ensure that the applicant has sought to mitigate these impacts, including during the construction phase of the development”*.

National Planning Policy Framework (2021)

- 14.2.7 Paragraph 111 of the National Planning Policy Framework states that, “Development should only be prevented or refused on highways grounds if there would be an unacceptable impact on highway safety, or the residual cumulative impacts on the road network would be severe”.
- 14.2.8 Paragraph 113 of the NPPF states, “All developments that will generate significant amounts of movement should be required to provide a travel plan, and the application should be supported by a transport statement or transport assessment so that the likely impacts of the proposal can be assessed”.

Central Lincolnshire Local Plan (2017)

- 14.2.9 Policy LP19 of the Central Lincolnshire Local Plan (2017) states that “...Proposals for non-wind renewable technology will be assessed on their merits, with the impacts, both individual and cumulative, considered against the benefits of the scheme...” The policy states that assessment should take account of “safety, including ensuring no adverse highway impact”.

Draft Bassetlaw District Local Plan 2020-2037 (August 2021).

- 14.2.10 Policy ST51 of the draft Bassetlaw Local Plan 2020-2037 (August 2021) states that, *“Development that generates, shares, transmits and/or stores renewable and low carbon energy, including community energy schemes, will be supported subject to the provision of details of expected power generation based upon yield or local self-consumption of*

electricity and by demonstrating the satisfactory resolution of all relevant wider impacts...". The impacts include, "existing highway capacity and highway safety".

14.3 Stakeholder Engagement

- 14.3.1 An EIA Scoping Report was submitted to the Secretary of State for Business, Energy and Industrial Strategy in January 2022, with a Scoping Opinion received from the Planning Inspectorate and other Stakeholders in March 2022. Separately, a Transport Scoping Note has been submitted to Lincolnshire County Council.
- 14.3.2 Table 14.1 provides a summary of the transport and access related comments made by relevant stakeholders and how these responses have been addressed in this PEIR.

Table 14.1 Summary of Consultation

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
The Planning Inspectorate	"The Applicant proposes to scope out effects during the operational phase as "there are anticipated to be only a handful of visits to the Site per month by vehicle for maintenance". The number of movements required either for each solar array Site or the Proposed Development as a whole are not quantified".	Operational phase movements are quantified in this PEIR Chapter. There will be a handful of trips a month for maintenance purposes (less than one a day on average)	Section 14.6 of this Chapter
	"Scoping Report paragraph 14.4.2 states that further detail to support this will be provided in the ES. The Inspectorate agrees to scope this matter out subject to confirmation that the frequency and type of maintenance visits and vehicles, with reference to relevant thresholds (e.g. as set out in the Guidelines for Environmental Assessment of Road Traffic, 1993)	This is agreed. Operational phase movements are quantified in this PEIR Chapter. There will be less than one per day on average, which will not give rise to any significant effects, in line with the relevant thresholds set out in Guidelines for Environmental Assessment of Road Traffic, 1993.	Section 14.6 of this Chapter

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
	would not give rise to a significant effect, taking account of any potential cumulative traffic effects".		
	<p>"The Scoping Report states that "the majority of the non-local workforce will stay at local accommodation and be transported to the Site by minibuses to minimise the impact on the strategic and local highway network". No indication is given of the expected total workforce during construction, consequently it is unclear what the impact of the traffic movements associated with the local workforce will be.</p> <p>The ES should quantify the number of construction workers and vehicle movements required and explain, with reference to relevant thresholds, whether this is likely to result in significant traffic effects"</p>	Information on the workforce is provided in this PEIR Chapter	Section 14.6 of this Chapter
	<p>"The Proposed Development Site will affect a number of PRoW but no surveys are proposed to understand the baseline use of these PROWs.</p> <p>Surveys should be undertaken to provide baseline data in relation to the use of the PROWs affected by the Site, where</p>	Information on the PROWs that are affected by the Scheme is provided in this PEIR Chapter and will be in the CTMP.	Section 14.5 of this Chapter

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
	appropriate, to define the change in characteristics of tourism and recreational use of PRoW as is required to define receptor sensitivity in Table 21.3 and the magnitude of change in Table 21.4".		
	<p>"The Inspectorate would expect to see a Decommissioning Plan, agreed with the Local Authority, secured through the inclusion of an Outline Decommissioning Plan or similar with the Application. The ES should clearly set out if and how decommissioning is to be assessed and any components which may remain following decommissioning".</p>	<p>Decommissioning will not occur for 40 years. Baseline traffic flows cannot be accurately forecast for over 40 years in the future. The transport and access effects are likely to be equal, or less than the construction phase.</p> <p>The measures set out within the CTMP will be similar to that for the decommissioning phase.</p> <p>This will be confirmed through an Outline Decommissioning Plan to be secured through a requirement of the DCO.</p>	Section 14.6 of this Chapter
	<p>"Scoping Report Figures 14.1 and 14.2 demonstrate that accesses to Cottam one are mostly off rural roads e.g. Stow Lane; many of which are subject to weight restrictions. The ES should take account of such restrictions in the baseline description and choice of construction traffic routes, assessing any significant impacts where relevant".</p>	<p>Weight restriction states "except for Access" Vehicles will not be through traffic</p>	

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
Nottinghamshire County Council	“The EIASR confirms that a Transport Assessment (TA), Construction Traffic Management Plan (CTMP), and a Construction Environment Management Plan will form part of the Environmental Impact Assessment to be submitted in support of the proposal. The scope of the TA and CTMP will include the GCC. The CTMP should also include a chapter on construction worker travel patterns and measures to encourage travel by alternative modes to single occupancy vehicle”.	Construction worker travel patterns will be included within the TA	Section 14.6 of this Chapter
	“The Transport Assessment (TA) methodology will be based on the Guidance for Transport Assessments (GTA), 2007. Although this has been archived, the methodology in the GTA complies with National Planning Practice Guidance and is therefore considered to be acceptable. The scope of the TA should include all main junctions within Nottinghamshire that would ‘that would be likely to experience an increase in traffic greater than 30 two-way peak hour movements (based on passenger car units (PCU))’.	There will not be an increase in traffic greater than 30 two-way peak hour movements at a single junction during the construction phase or the operational phase. Information of traffic flows associated with the construction phase are set out in this PEIR chapter.	Section 14.6 of this Chapter
	“It is crucial that a full analysis of any affected public rights of ways is	Information on the PRowS that are affect by the Scheme is provided	Section 14.6 of this Chapter

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
	undertaken once the cabling routes are known. If temporary closures are necessary during the construction phase it is requested that these closures, wherever practicable, are employed sensitively to optimise the connectivity of the wider PROW network. In order to fully consider the PROW network and the impact of the proposal on the network, the applicant should undertake a full assessment of the PROW network and apply for a search of the Definitive Map for Public Rights of Way. The Nottinghamshire County Council Rights of Way team would welcome discussions regarding the enhancement and improvements to the Public Rights of Way network”.	in this PEIR Chapter and will be in the CTMP	
Canal and River Trust	“The River Trent is a commercial waterway, where the transport of equipment may be possible which could help to minimise the need to utilise the Highway Network. We advise that the use of the Trent should be included within the Transport and Access chapter, so as to ensure that every possibility to reduce the impact on highway is considered”.	To be considered as part of the ES.	
Network Rail	“With reference to the protection of the railway,	Glint and Glare assessment and	

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
	the Environmental Statement should consider any impact of the scheme upon the railway infrastructure and upon operational railway safety. In particular, it should include a Glint and Glare study assessing the impact of the scheme upon train drivers (including distraction from glare and potential for conflict with railway signals). It should also include a Transport Assessment to identify any HGV traffic/haulage routes that may utilise railway assets such as bridges and level crossings during the construction and operation of the Site".	Transport Assessment/Construction Traffic Management Plan to be provided as part of ES.	
North Lincolnshire Council	"Having considered Chapter 14 of the EIASR, it is noted that the likely residual effects would be negligible. The proposed Site is located in Lincolnshire and as such NLC do not envisage the proposals have a significant impact on the highway network in North Lincolnshire. Therefore, NLC do not have any objections to the approach set out in the EIASR at this stage".	Noted and Agreed	
Sturton by Stow Parish Council	"Ingham Road has a weight limit of 7.5t therefore problems are likely with the road structure - the crane that went into the ditch caused many problems".	Weight restriction state "except for Access" Vehicles will not be through traffic	

Consultee	Summary of Response	How Response has been Addressed	Reference to Further Information
Environmental Hazards and Emergencies Department	"It is noted that the IEMA GEART guidelines are to be used and as such the operational phase is to be scoped out. The remainder of the traffic and transport assessment should consider impacts on pedestrians, cyclists and any horse riding activities".	Noted	
West Lindsey District Council	"Cumulative impacts (14.7.24) should include the Gate Burton Solar Project".	Cumulative effects are set out in this PEIR Chapter. Gate Burton has not yet been specifically assessed, as sufficient data is not currently available	Section 14.7 of this Chapter
West Lindsey District Council	"We note the low movements that would be generated during the operational phase, and do not object to this being 'scoped out'".	Noted	

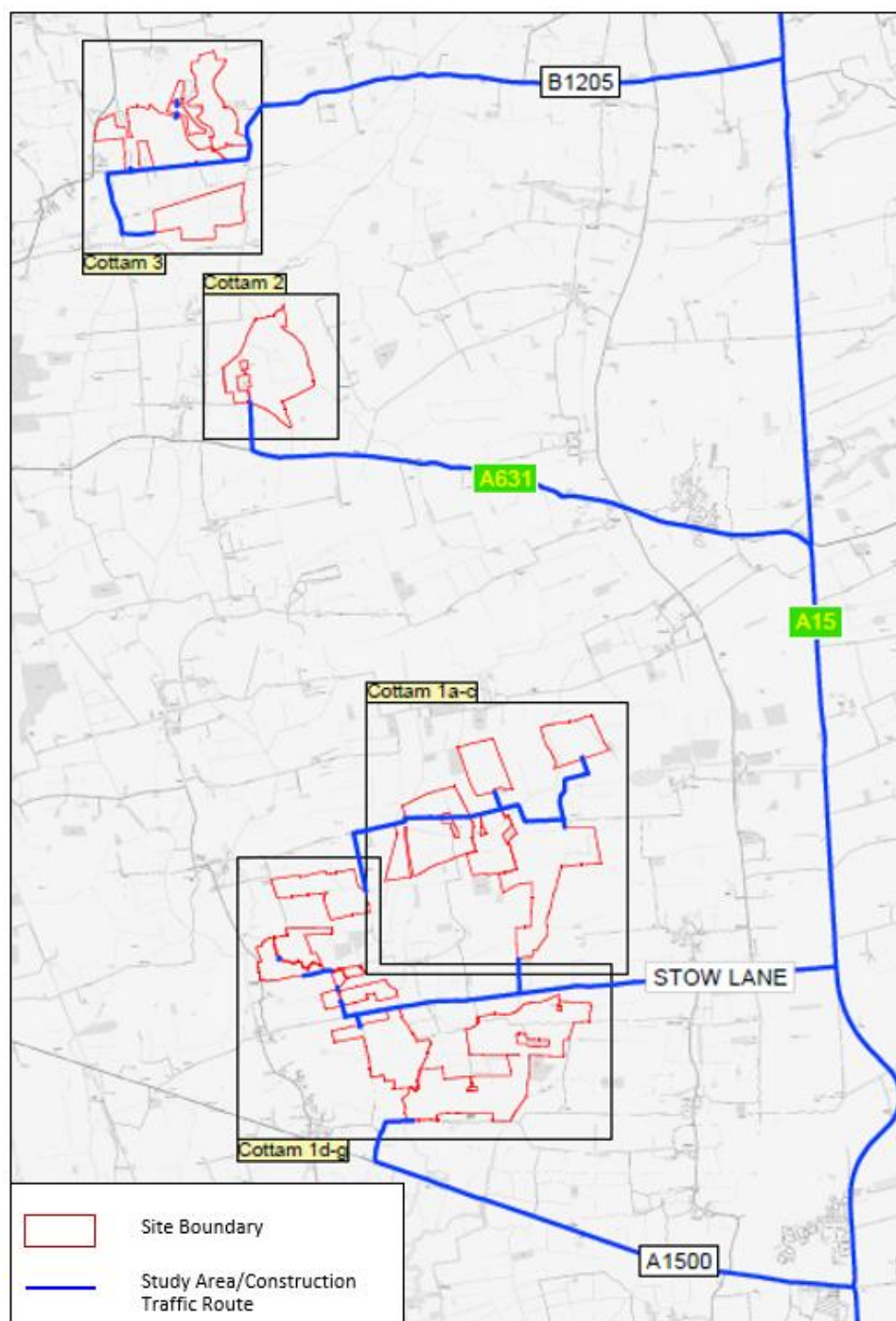
14.4 Assessment Methodology and Significance Criteria

- 14.4.1 This section sets out the assessment methodology. It sets out the study area, types of effects that will be assessed, the significance criteria and any limitations to the assessment.

Study Area

- 14.4.2 The study area, including the identified receptors within the study area, are shown in Figure 14.1.

Figure 14.1: Study Area



Sources of Information

- 14.4.3 The following sources of information have been used in the assessment of transport and access effects:

- Automatic Traffic Count (ATC) Surveys;
- Department for Transport (DfT) 'Road Traffic Statistics' Database
- Personal injury accident data;
- Highway boundary information;
- OS Mapping; and
- Topographical surveys.

Types of Effect

14.4.4 In accordance with the IEMA Guidelines for assessment, of the environmental effects of road traffic, the following criteria has been considered in this assessment:

- Accidents and Safety;
- Severance;
- Driver Delay;
- Pedestrian Delay;
- Pedestrian Amenity (including Fear and Intimidation); and
- Hazardous Loads.

14.4.5 A description of each impact is provided below.

Accidents and Safety

14.4.6 The IEMA Guidelines do not include any definition in relation to the assessment of effects on accidents and safety, advising that professional judgement should be used to assess the implications of local circumstance, or factors which may increase or decrease the risk of accidents.

Severance

14.4.7 The IEMA Guidelines define severance as 'the perceived division that can occur within a community when it becomes separated by a major traffic artery' (paragraph 4.27) that 'separates people from places', for example, difficulties crossing existing roads or the physical barrier of the road itself.

14.4.8 There are no predictive formulae which give simple relationships between traffic factors and levels of significance. Nevertheless, there are a range of indicators for

determining significance of the relief from severance. The IEMA Guidelines suggest that 'changes in traffic flow of 30%, 60% and 90% are regarded as producing slight, moderate and substantial changes in severance respectively' (paragraph 4.31). The guidance also suggests that 'marginal changes in traffic flows are, by themselves, unlikely to create or remove severance'.

Driver Delay

- 14.4.9 The IEMA Guidelines state that 'delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system' (paragraph 4.34). As such, the impact of a proposed development on driver delay is typically considered in relation to background traffic. Junction assessment modelling can be used to estimate increased vehicle delays at junctions, if necessary.

Pedestrian Delay (to include cyclists)

- 14.4.10 The IEMA Guidelines state that 'changes in the volume, composition or speed of traffic may affect the ability of people to cross roads. In general, increases in traffic levels are likely to lead to increases in delay' (paragraph 4.35). There are a range of local factors that affect pedestrian (and cyclist) delay, including the level of pedestrian (and cyclist) activity, visibility and general physical conditions of the Site. However, the IEMA Guidelines do not set out thresholds for judging the significance of changes in levels of delay and suggest that the assessor uses their judgement to determine whether pedestrian delay is a significant impact.

Pedestrian Amenity (Including Fear and Intimidation and to include cyclists)

- 14.4.11 Pedestrian (and cyclist) amenity is broadly described in the IEMA Guidelines as 'the relative pleasantness of a journey (paragraph 4.39) and can be affected by traffic flow, composition and footway widths. This definition includes pedestrian (and cyclist) fear and intimidation and can be considered a much broader category when considering the overall relationship between pedestrians (and cyclists) and traffic. The IEMA Guidelines suggest that a threshold for judging this would be 'where the traffic flows (or its lorry component) is halved or doubled' (paragraph 4.39).

Hazardous Loads

- 14.4.12 The IEMA Guidelines state that some developments include hazardous loads, and that this should be recognised by the assessment.
- 14.4.13 Some deliveries to the Site during the construction phase will be regarded as 'hazardous loads'. These include the deliveries of lithium-ion batteries, transformer oil and insulation gas. All regulations for the movement of hazardous loads will be followed, and the appropriate documentation will be obtained.

- 14.4.14 Whilst not hazardous, there will be abnormal loads to transport the transformers for the substation. An abnormal load is one where the vehicle exceeds 44 tonnes, the width is over 2.9m or the length is more than 18.65m. Further information will be set out in the ES Chapter and CTMP.

Assessment of Significance

- 14.4.15 The assessment of the Scheme's potentially significant effects has taken into account the construction phase. The effects for the decommissioning phase are likely to be equivalent to the construction phase. The significance level attributed to each effect (set out above) has been assessed based on the sensitivity of the affected receptor to change, and the magnitude of change as a result of the Scheme.

Sensitivity of Receptor and Magnitude of Change

- 14.4.16 The IEMA Guidelines set out two rules which will be used as threshold impacts to define the scale and extent of the assessment, as follows:
- Rule 1: Include highway links where traffic flows will increase by more than 30% (or where the number of HGVs will increase by more than 30%); and
 - Rule 2: Include any other specifically sensitive areas where traffic flows have increased by 10% or more.
- 14.4.17 It is notable that, on roads where baseline traffic flows are low, any increase in traffic flow may result in a predicted increase that would be higher than the two rules set out in the IEMA Guidelines. However, it is important to consider any overall increase in road traffic in relation to the capacity of the road.
- 14.4.18 The IEMA Guidelines state that 'For many effects there are no simple rules or formulae which define the thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed up by data or quantified information wherever possible', and 'those preparing the Environmental Statement will need to make it clear how they have defined whether a change is considered significant or not' (paragraph 4.5).
- 14.4.19 The IEMA Guidelines identify general thresholds for traffic flow increases of 10% and 30%. Where the predicted increase in traffic / HGV flow is lower than these thresholds, then the significance of the effects should be considered to be low or not significant and further detailed assessment is not required. However, to ensure a robust assessment of the increase in traffic flows in environmental terms, the following criteria defined in Tables 14.2 and 14.3 will be used to determine magnitude of impact and receptor sensitivity respectively.

Table 14.2: Sensitivity/Importance of Identified Receptor

Sensitivity	Definition
High	Receptors of greatest sensitivity to traffic flows, such as schools, playgrounds, accident blackspots, retirement homes, areas with no footways with high pedestrian footfall, congested areas
Medium	Receptors with some sensitivity to traffic flow, such as conservation areas, listed buildings, tourist attractions, and residential areas
Low	Receptors with low sensitivity to traffic flows, and those distant from affected roads
Negligible	Receptors with no material sensitivity to traffic flows

Table 14.3: Magnitude of Change

Sensitivity	Definition
High	Changes to peak or 24hr traffic within the Study Area by 30% or more
Medium	Changes to peak or 24hr traffic within the Study Area by between 10% and 30%
Low	Changes to peak or 24hr traffic within the Study Area by between 5% and 10%
Negligible	Changes to peak or 24hr traffic within the Study Area up to 5%
Neutral	No Change (+/- daily Variation)

Significance of Effect

14.4.20 The magnitude of change and receptor sensitivity have been compared to determine the overall significance of effects. This is shown in Table 14.4.

14.4.21 There are four categories demonstrating the significance of the effect. These can be adverse or beneficial:

- Negligible – Very little change from baseline conditions;
- Minor – A minor shift away from baseline conditions;
- Moderate – A material shift away from the baseline conditions; and
- Major –Substantial alteration to baseline conditions.

Table 14.4: Significance of Potential Effects

Magnitude of Change	Sensitivity of Receptor				
		High	Medium	Low	Negligible
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor/Moderate	Negligible
	Low	Moderate	Minor/Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

14.4.22 It is considered that only moderate and major effects are significant for the purpose of this assessment.

14.4.23 The effects can be temporary or permanent and short, medium or long term in duration. The duration of these effects are considered to be as follows:

- A short term effect – an effect that will be experienced for 0-5 years;
- A medium term effect – an effect that will be experienced for 5-15 years; and
- A long term effect – an effect that will be experienced for 15 years or longer.

Limitations and Assumptions

14.4.24 A number of assumptions are made when forecasting the traffic generation of the Scheme, both during construction and operation. However, these forecasts have been developed by the Applicant and their consultants based on professional judgement and derived from experience with other developments similar in scale and nature to the Development. Therefore, they are considered to represent a realistic estimation of traffic generation.

14.5 Baseline Conditions

The Site and Context

14.5.1 The Site is split into three areas; Cottam 1, 2, and 3. Each area encompasses a number of separate land parcels.

14.5.2 The electricity generated by the Scheme will be imported and exported via new underground cables to the National Grid at the existing substation at Cottam Power Station. At present, the final cable route is yet to be determined. However, a cable corridor has been identified. The corridor shown is wider than is required but it is still subject to on-going assessment work which will be used to refine the cable route which will inform the route proposed in the DCO application submission.

- 14.5.3 These elements will be refined prior to submission of the DCO application. Therefore, the assessment work undertaken for the cable route to date is in general less advanced than for the three Solar Panel Sites.
- 14.5.4 Cottam 1 is the largest of the three areas and comprises of a number of individual land parcels. The area is located to the north of the A1500, a single carriageway road running in an east to west alignment, whereby the national speed limit applies. A number of more rural roads also operate throughout the Site, including the B1398, Stow Lane and Willingham Road.
- 14.5.5 Cottam 2 is located to the north of the A631. Again, this is a single carriageway road running in an east to west alignment, whereby the national speed limit applies.
- 14.5.6 Cottam 3 is located to the north of the B1205 Kirton Road and the east of Blyton village. The B1205 is also a single carriageway road running in an east to west alignment, whereby the national speed limit applies.

Walking and Cycling

Walking

- 14.5.7 Due to the rural nature of many of the access roads that make up the study area, there are limited pedestrian specific facilities. The pedestrian features are summarised below:
- Cottam 1 – There are no footways present on the A1500 Till Bridge Lane, Stow Lane, Ingham Road, Fillingham Lane, Willingham Road and South Lane. A footway is located on the east side of Thorpe Lane to the north of the A1500 junction
 - Cottam 2 – There are no footways present on the A631, nor on the unnamed rural road that connects to the Site.
 - Cottam 3 - There are no footways present on the B1205. Station Road does have a footway on one side of the carriageway.

Public Rights of Way

- 14.5.8 There are a number of public rights of way that run through or nearby each area. These are summarised in Table 14.5.

Table 14.5: Public Rights of Way

Public Right of Way	Cottam Area	Route
Bridleway – TLF/31/2	Cottam 1	Ingham Road south towards Thorpe Lane.
Bridleway – Fill/85/1 and Fill/767/1	Cottam 1	This route heads goes from Glentworth Grange to Willingham Road
Bridleway – Fill/86/1	Cottam 1	This route goes from Willingham Road to Long Lane by Ingham.
Footpath Corr/22/1	Cottam 2	This route goes from the unnamed rural road south of Aisby to Mill Mere Road.
Footpath – Pilh/20/1	Cottam 3	This route goes from Station Road to the unnamed rural road west of Bonsdale.

Cycling

- 14.5.9 There is no dedicated cycling infrastructure in the area surrounding any of the areas that make up the Site and Study Area.

Public Transport

Bus

- 14.5.10 There are a number of bus services operating within the vicinity of the Site. A summary of the existing bus services can be found in Table 14.6.

Table 14.6 Summary of Existing Bus Services

Route Number	Nearest Bus Stop	Nearest Area	Route
103	Post Office	Cottam 2	Lincoln – Kirton in Lindsey
354	Harpwell Grange	Cottam 2	Gainsborough - Lincoln
367	Old Station House	Cottam 3	Gainsborough – Kirton in Lindsey
601	Monson Road	Cottam 3	Scunthorpe - Gainsborough
906	Till Bridge Lane Lane End	Cottam 1	Welton – Saxilby

- 14.5.11 Table 14.6 shows that there are a range of bus services located near to all areas of the Site.

Rail

- 14.5.12 The nearest railway stations are Saxilby Train Station and Gainsborough Train Station. Saxilby Train Station is located approximately six miles west of Lincoln and is managed by Northern Rail. The station has services running approximately every 30 minutes to destinations such as Leeds, Peterborough and Lincoln.
- 14.5.13 Gainsborough Train Station is located approximately 14 miles south of Scunthorpe and is also managed by Northern Rail. The station has services running approximately every 30-60 minutes to destinations such as Lincoln, Retford and Leeds.

Local Highway Network

- 14.5.14 An overview of the local highway network is provided below.

A15

- 14.5.15 The A15 is a single carriageway two-way road subject to the national speed limit which connects the M180 to the north with the A46 to the south. The road has a predominantly straight alignment throughout.

A1500 Till Bridge Lane

- 14.5.16 The A1500 is subject to the national speed limit and generally has a straight alignment. It connects the A15 to the east to the village of Sturton by Stow to the west.

Thorpe Lane

- 14.5.17 Thorpe Lane is a rural single lane road that has no central markings. It has a footway running along the eastern side of the road and is subject to the national speed limit.

Stow Lane

- 14.5.18 Stow Lane is a rural single lane road that has no central markings and is subject to the national speed limit. Stow Lane connects Ingham Lane to the east to Ingham Road to the west.

Ingham Road

- 14.5.19 Ingham Road, is a rural single lane road that has no central markings and is subject to the national speed limit. Ingham Road connects Stow Lane to the east to the village of Stow to the west.

Fleets Lane

- 14.5.20 Fleets Lane is a narrow rural single lane road that has no central markings and is subject to the national speed limit. Ingham Road connects Ingham Road to the north to Fleets Road to the south.

South Lane

- 14.5.21 South Lane is a rural narrow single lane road that has no central markings and is subject to the national speed limit.

Fillingham Lane

- 14.5.22 Fillingham Lane is a rural single lane road that generally has a straight alignment. The road has no central markings and is subject to the national speed limit.

Willingham Road

- 14.5.23 Willingham Road is a rural single lane road that generally has a straight alignment. The road has no central markings and is subject to the national speed limit. Willingham Road connects the village of Fillingham to the east to Fillingham Lane to the west.

A631

- 14.5.24 The A631, is a single carriageway where the national speed limit applies. The A631, connects the A157 to the east, to the A630 to the west.

Unnamed Rural Road north of A631

- 14.5.25 The unnamed rural road that lies north of the A631, is a narrow road with no central markings where the national speed limit applies.

B1205

- 14.5.26 The B1205 is a single carriageway where the national speed limit applies. The B1205 connects the A15 to the east to the village of Blyton to the west.

Station Road

- 14.5.27 Station Road is a single lane road that has a footway located on the eastern side. It connects Pilham Lane to the south to Kirton Road to the north.

Traffic Flows

- 14.5.28 Automatic Traffic Count Surveys have been undertaken for all roads within the Study Area. These were undertaken between 2nd November 2021 and 8th November

2021. At the time, there were no Covid-19 restrictions in place. In addition, DfT data has been reviewed for the strategic road network, including the A15 and A631. The average weekday two-way traffic count for the main roads within the vicinity of the Site is set out in Table 14.7.

Table 14.7: Baseline Traffic Flows – Average Weekday (24 hr), Two-Way

Link	Cottam Area	Total Vehicles	%HGV
A15	Cottam 1,2,3	12,661	17%
Ingham Road	Cottam 1	759	20%
Fleets Lane	Cottam 1	63	25%
East of Coates	Cottam 1	8	23%
Willingham Road	Cottam 1	122	25%
Stow Lane	Cottam 1	688	25%
Thorpe Lane	Cottam 1	83	37%
A631	Cottam 2	9,958	6%
Corringham (North of A631)	Cottam 2	70	3%
Pilham Lane	Cottam 3	92	18%
Kirton Road	Cottam 3	1,606	19%
Station Road	Cottam 3	2,159	18%

- 14.5.29 The traffic flows in Table 14.7 show that HGVs are already present on all local roads, which demonstrates a precedent for HGV use, and shows that they are suitable for construction traffic.

Road Safety

- 14.5.30 Statistics showing Personal Injury Collisions on the local road network have been obtained for the most recent five-year period up to and including 2021.
- 14.5.31 A breakdown of the accidents is shown in Table 14.8.

Table 14.8 Personal Injury Accident Data

Location	Incident Severity		
Junction	Slight	Serious	Fatal
Cottam 1			
A15/Till Bridge Ln Junction	0	1	0
A1500 from A15 to Thorpe Lane	4	1	0
A1500/Thorpe Lane Junction	0	0	0
Thorpe Lane	0	0	0
A15/Ingham Lane Junction	2	0	0
Ingham Lane from A15 to B1398	0	0	0
Ingham Lane/B1398 Junction	0	0	0

B1398/Stow Lane/Ingham Road from Ingham Lane to Fleets Lane	2	0	0
Ingham Road/Fleets Lane Junction	0	0	0
South Lane	0	0	0
South Lane/Fillingham Lane Junction	0	0	0
Fillingham Lane from South Lane to Willingham Road	0	0	0
Willingham Road from Fillingham Lane to Site access	0	0	0
Cottam 2			
A631/A15 Junction	1	0	0
A631 from A15 to unnamed rural road	15	4	1
Unnamed Rural road from A631 to Site access	0	0	0
Cottam 3			
B1205/A15 Junction	0	0	0
B1205 from A15 to Station Road	15	5	2
B1205/Station Road Junction	0	0	0
Station Road	0	0	0

- 14.5.32 Table 14.8 indicates a total of 39 slight incidents, 11 serious and three fatal accidents occurred on the junctions/link roads surrounding the Site. Based on the information available, there is no identified pattern of accidents.

Future Baseline

- 14.5.33 There are currently no planned highway works within the study area.
- 14.5.34 Traffic flows may change slightly as a result of cumulative developments in the area. This is discussed further in the 'Cumulative Effects' section of this chapter.

14.6 Identification and Evaluation of Key Effects

Construction Phase

- 14.6.1 This section summarises the likely significant effects associated with the movement of vehicles during the construction phase. Whilst it is expected that the total construction period will be between 18 and 24 months, the transport chapter and CTMP's assume a worst case scenario of an 18 month period (78 weeks). Therefore, all effects will be short-term and temporary.

Traffic Flows

- 14.6.2 Construction activities are likely to be carried out Monday to Friday 07:00-18:00 and between 08:00 and 13:30 on Saturdays. However, some activities may be required outside of these times (such as the delivery of abnormal loads, night time working for cable construction works in public highways or horizontal direction drilling activities). Where possible, construction deliveries will be coordinated to avoid HGV

movements during the traditional AM peak hour (08:00-09:00) and PM peak hour (17:00-18:00)

- 14.6.3 The construction phase for the solar element of the Scheme includes the preparation of the Site, installing the access tracks, erection of security fencing, assembly and erection of the PV arrays, installation of the inverters/transformers and grid connection.
- 14.6.4 The construction of the energy storage system element of the Scheme will include the preparation of the Site, installation of the access roads, erection of security fencing, assembly of the battery system, and installation of the switch-room and grid connection.
- 14.6.5 The components which are required to construct the solar farm element of the Scheme will arrive by 16.5m long articulated and 10m rigid vehicles. Based on experience, there is typically around 18 HGV deliveries per MW installed for the construction of a solar farm. Based on this, the forecast HGV trips are set out in Table 14.9 below.

Table 14.9 Forecast Construction Vehicle Trip Generation (HGV)

Area	Forecast Construction Vehicle Movements	Average per Day*
Cottam 1	10,800 (21,600 two way)	23 (46 two way)
Cottam 2	1,440 (2,880 two way)	3 (6 two way)
Cottam 3	1,800 (3,600 two way)	4 (8 two way)
Total	14,040 (28,080 two way)	30 (60 two way)

* Based on a 78 week construction period, equating to 468 working days (six working days per week)

- 14.6.6 At this stage, it is envisaged that there will be approximately 30 HGV deliveries per day over the construction period (60 two-way movements) across all three areas that make up the Site.
- 14.6.7 A temporary construction compound will be provided in each area, and will provide storage, parking for contractors and turning for HGVs.
- 14.6.8 Up to 400 construction workers are anticipated to be on Site during an average day throughout the construction period. The location of where staff will travel from is unknown at this stage, as this will depend on the appointed contractor. However, it is envisaged that the majority of the non-local workforce will stay at local accommodation and be transported to the Site by minibuses to minimise the impact on the strategic and local highway network. In addition, a construction worker Travel

Plan will form part of the CTMP. This will set out measures to encourage workers to travel to the Site as sustainably as possible (e.g. minibuss, car share etc.).

- 14.6.9 As a robust judgement, it is assumed that there could be 200 vehicle arrivals and 200 vehicle departures associated with construction workers per day by car/LGV (400 two-way trips). These are broken down by area on a proportional basis in Table 14.10

Table 14.10 Forecast Construction Vehicle Trip Generation (Construction Workers - LGV)

Area	Forecast Construction Worker Movements Average per Day (LGV)
Cottam 1	150 (300 two way)
Cottam 2	22 (44 two way)
Cottam 3	28 (56 two way)
Total	200 (400 two way)

- 14.6.10 Where possible, construction deliveries will be coordinated to avoid HGV movements during the traditional AM peak hour (08:00-09:00) and PM peak hour (17:00-18:00). Due to the construction hours (07:00-18:00) at the Site, construction worker travel will occur outside of the peak hours. As such, there is unlikely to be many, if any, peak hour trips associated with the Site. More information on this is set out within the CTMP.
- 14.6.11 The grid connection element of the construction phase will involve the installation of a cable into a trench in the highway. This element will not generate significant traffic flows.
- 14.6.12 During the temporary construction phase, the following construction access points will be required.
- Cottam 1: 11 access junctions including:
 - 1 from Thorpe Lane;
 - 1 from Stow Lane;
 - 1 from Ingham Road;
 - 2 from Fleets Lane;
 - 1 from South Lane;
 - 3 from Willingham Road;

- 2 from an existing farm track to the west of Coates.
- Cottam 2: 1 access junction from the A631 to the east of Corringham;
- Cottam 3: 2 access junctions from the B1205, to the east of Blyton.

14.6.13 Where construction vehicle accesses utilise existing agricultural access points or tracks, the access points will be formalised and widened if necessary. Swept path analysis will be included within the CTMP to demonstrate that they can operate safely.

14.6.14 All construction vehicles will access the Site via the A15, from either the M180 Motorway to the north, or the A46 to the south. From the A15, construction vehicles will take the following routes to the Site:

- Cottam 1 – either the A1500 Til Bridge Lane or Ingham Lane/Stow Lane;
- Cottam 2 – A631;
- Cottam 3 – B1205.

14.6.15 The construction traffic generation set out in Table 14.9 and Table 14.10 has been applied to the baseline traffic flows set out in Table 14.7 to determine the effect of construction traffic on the links within the study area. To account for construction worker trips, 100 two-way trips have also been added to the baseline traffic flows. These will be car/LGV trips and not HGV trips.

14.6.16 The baseline and baseline plus construction traffic flows are shown in Table 14.11.

Table 14.11: Baseline Two-Way Traffic Flows (AADT) plus Construction Traffic

Cottam Area	Link	Baseline			Baseline plus Construction			% Change from Baseline	
		AAD T	HGVs	HGV %	AAD T	HGVs	HGV %	AADT	HGVs
1	A15	12,661	2,116	17%	12,891	2,146	17%	2%	1%
1	Ingham Road	759	153	20%	798	157	20%	5%	3%
1	Fleets Lane	63	16	25%	89	20	22%	41%	25%
1	Road East of Coates	8	2	25%	21	5	24%	163%	150%
1	Willingham Road	122	30	25%	161	34	21%	32%	13%

		Baseline			Baseline plus Construction			% Change from Baseline	
Cottam Area	Link	AAD T	HGVs	HGV %	AAD T	HGVs	HGV %	AADT	HGVs
1	Stow Lane	688	170	25%	766	174	23%	11%	2%
1	Thorpe Lane	83	31	37%	96	35	36%	16%	13%
2	A631	9,958	597	6%	9,980	599	6%	1%	1%
2	Corringham (North of A631)	70	2	3%	92	3	3%	31%	50%
3	Pilham Lane	92	17	18%	101	18	18%	10%	6%
3	Kirton Road	1,606	301	19%	1,634	302	18%	2%	1%
3	Station Road	2,159	391	18%	2,168	393	18%	1%	1%

- 14.6.17 As stated in the Sensitivity of Receptor and Magnitude of Change section, the two rules set out in the IEMA Guidelines require further assessment where traffic flows/HGVs increase by more than 30% (or 10% for a sensitive area).
- 14.6.18 As shown in Table 14.11, the addition of 200 car/LGV movements plus 30 HGV movements to the highway network over a daily period will not exceed this threshold on the A15, Ingham Road, Stow Lane, Thorpe Lane, A631, Pilham Lane, Kirton Road and Station Road. Therefore, there will not be a significant environmental effect as a result of construction vehicle traffic on these roads and therefore, no further assessment is required.
- 14.6.19 On Fleets Lane, Road east of Coates, Willingham Road and Corringham Road north of the A631, there could be up to larger increases in AADT from a baseline. However, these links have a low number of baseline movements, which results in a high percentage change with any increase in traffic volumes.
- 14.6.20 A review of the likely significant environmental effects in relation to transport and access during the Scheme's construction phase is set out below.

Accidents and Safety

- 14.6.21 During the most recent five-year period (up to and including 2021), there have been a total of 53 Personal Injury Collisions (PICs). Of these three were fatal, 39 were

'slight' and 11 were 'serious'. Based on the information available, there is no identified pattern of accidents. This is set out in detail in Table 14.8.

- 14.6.22 Given the low number of additional trips to the network during the construction phase, as detailed in Table 14.11, there is unlikely to be a material effect on accidents and safety. In light of this, the likely significant effect of the construction traffic on accidents and safety in the study area is considered to be negligible and temporary, which is not significant.

Severance

- 14.6.23 None of the roads used are considered to act as a barrier that separate communities. The addition of construction traffic will not change this.
- 14.6.24 Therefore, the likely significant effect on severance during the construction phase is considered to be negligible and temporary which is not significant.

Driver Delay

- 14.6.25 The IEMA Guidelines state that 'delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system'.
- 14.6.26 Capacity assessment on local junctions are not proposed as part of the assessment. However, through the CTMP, construction vehicles will be coordinated to avoid peak hour travel, the period where capacity constraints may occur, and, where possible, there will be no construction traffic on roads within the study area between 08:00-09:00 or 17:00-18:00.
- 14.6.27 As such, the likely significant effect of the construction traffic on driver delay is considered to be negligible and temporary, which is not significant.

Pedestrian Delay (to include Cyclists)

- 14.6.28 The level of pedestrian and cyclist activity on the roads surrounding the Site is low. Public rights of way will remain open during the construction phase. There may be some slight delay to pedestrian and cyclist movement if a construction vehicle is crossing the public right of way, but this is not likely to be material, an only in isolated locations.
- 14.6.29 Therefore, the likely significant effect of the construction traffic on pedestrian delay is considered to be negligible and temporary, which is not significant.

Pedestrian Amenity (including Fear and Intimidation and to include Cyclists)

- 14.6.30 As set out above, the level of pedestrian activity on the roads surrounding the Site is very low meaning that the sensitivity receptor is low. However, it is acknowledged that the addition of HGVs to the network will affect the relative pleasantness of any pedestrian and cyclist journeys in the area. It is also acknowledged that a number of Public Rights of Way operate through the Site.
- 14.6.31 Whilst these will remain open during the construction phase, there will be some effect on the relevant pleasantness of pedestrian journeys in these locations.
- 14.6.32 In light of this, it is considered that the likely significant effect of the construction traffic to pedestrian and cyclist amenity will be minor adverse and temporary, which is not significant.

Hazardous Loads

- 14.6.33 Some deliveries to the Site during the construction phase will be regarded as 'hazardous loads'. These include the deliveries of lithium-ion batteries, transformer oil and insulation gas. All regulations for the movement of hazardous loads will be followed, and the appropriate documentation will be obtained.
- 14.6.34 There will be some abnormal loads to transport the transformer for the 132kv substation. An abnormal load is one where the vehicle exceeds 44 tonnes, the width is over 2.9m or the length is more than 18.65m. These movements will be managed so that the potential effects are mitigated appropriately. Additional details will be provided in the ES and CTMP. An initial Abnormal Loads report has been prepared by Wynns Limited (see Appendix 14.2).
- 14.6.35 Overall, it is considered that the likely significant effect of the construction traffic on hazardous loads will be negligible and temporary, which is not significant.

Summary of Effects during Construction

- 14.6.36 The likely significant effects of the Development during the construction phase, prior to the implementation of mitigation measures, are summarised in Table 14.12.

Table 14.12: Summary of Effects during the Construction Phase

Criteria	Significant of Effect for all roads surrounding the different Sites	Duration
Accidents and Safety	Negligible	Short Term/Temporary
Severance	Negligible	Short Term/Temporary

Criteria	Significant of Effect for all roads surrounding the different Sites	Duration
Driver Delay	Negligible	Short Term/Temporary
Pedestrian Delay	Moderate	Short Term/Temporary
Pedestrian Amenity	Minor Adverse	Short Term/Temporary
Hazardous Loads	Negligible	Short Term/Temporary

Operational Phase

- 14.6.37 During the Development's operational phase, there are anticipated to be approximately two visits to the Site per month for maintenance (less than one a day on average). These would typically be made by light van or 4x4 type vehicles. Whilst the Site compound will have been removed during the construction phase, space will remain within the Site on the access tracks for such a vehicle to turn around to ensure that reversing will not occur onto the highway.
- 14.6.38 In light of this, effects on accidents and safety, severance, driver delay, pedestrian delay and amenity and hazardous loads during the operational phase of the Development are considered to be negligible or no significant effect. The effects will be long-term, as the design life of the Development is anticipated to be 40 years.

Management/Mitigation Measures

Construction Phase

- 14.6.39 An initial Outline CTMP is submitted with the PEIR at **Appendix 14.1** and will continue to evolve following statutory consultation and for the DCO application stage. The CTMP will be secured by a requirement of the DCO. The outline CTMP will provide a framework for the management of construction vehicle movements to and from the Site, to ensure that the effects of the temporary construction phase on the local highway network are minimised. The outline CTMP will set out construction access arrangements, construction vehicle routing, construction vehicle trip generation, and the management/mitigation measures. Any requirements for abnormal loads to be delivered to the Sites during construction (for elements such as transformers), will be determined through the design process, in consultation with the appropriate statutory consultees, and addressed in the ES.
- 14.6.40 A number of mitigation measures will be set out within the outline CTMP and ES Chapter. These will include, but will not be limited to the following:

- Signs to direct construction vehicles associated with the development will be installed along the agreed construction traffic route. Delivery drivers, contractors and visitors will be provided with a route plan in advance of delivering to Site to ensure that vehicles follow the identified route;
- Advisory signs informing contractors and visitors that parking is not permitted on-street in the vicinity of the Site or on the Site access road;
- All signage on the designated route will be inspected twice daily by the Site Manager (once in the morning and once at lunchtime), to ensure they are kept in a well maintained condition and located in safe and appropriate locations;
- A compound area for contractors will be set up on-Site including appropriate parking spaces. Contractors and visitors will be advised that parking facilities will be provided on-Site in advance of visiting the Site and that they should not park on-street;
- A wheel wash facility will be provided ahead of exiting the Site allowing vehicles to be hosed down so that no construction vehicles will take mud or debris onto the local highway network;
- A road sweeper will be provided for surrounding local roads along the designated route to alleviate any residual debris generated during the construction phase, as required;
- The Site will be secured at all times with Heras fencing;
- A requirement for engines to be switched off on-Site when not in use;
- spraying of areas with water supplied as and when conditions dictate to prevent the spread of dust;
- Vehicles carrying waste material off-Site to be sheeted;
- Banksman will be provided at the Site access junctions to indicate to construction traffic when it is safe for them to enter and exit the Site;
- All residents in the vicinity of the Site along the designated route will be provided with contact details of the Site Manager, which will also be provided on a Site-board at the Site access and egress junctions; and
- Agreement to a Road Condition Survey with the local highway authority.

Operational Phase

- 14.6.41 No additional mitigation is required during the operational phase of the Scheme due to the negligible transport effect of Site maintenance.

Residual Effects

Construction Phase

- 14.6.42 For the construction phase of the Scheme temporary negligible residual effects are anticipated on accidents and safety, severance, pedestrian and driver delay and hazardous loads, which is not significant. Temporary minor adverse residual effects on pedestrian amenity are also anticipated, which is not significant.

Operational Phase

- 14.6.43 For the operational phase of the Development, residual negligible effects are anticipated on accidents and safety, severance, pedestrian delay and amenity, driver delay and hazardous loads, which is not significant.

Decommissioning Phase

- 14.6.44 As stated in the 'Likely Significant Effects' section, the Scheme will have an estimated design life of 40 years. At the end of its operational life the Scheme will be decommissioned. The number of vehicles associated with the decommissioning phase is not anticipated to exceed the number set out for the construction phase, as set out in Table 14.9 and Table 14.10. An Outline Decommissioning Plan will be prepared and submitted to the relevant local planning authority for approval. This will be secured by a requirement of the DCO.
- 14.6.45 In light of this, effects on accidents and safety, severance, driver delay, pedestrian delay and amenity and hazardous loads prior to the implementation of mitigation measures for the decommissioning phase are considered to be the same as shown in Table 14.12, as a worst-case assessment. The effects will also be short term and temporary. Mitigation during the decommissioning phase will broadly follow what is set out for the construction phase. For the decommissioning phase of the Development, temporary negligible residual effects are anticipated on accidents and safety, severance, pedestrian and driver delay and hazardous loads, which is not significant. Temporary minor adverse residual effects on pedestrian amenity are also anticipated, which is not significant.

14.7 Cumulative Effects

- 14.7.1 The following developments have been identified by reviewing planning applications from the host authorities, along with the NSIP's on the Planning Inspectorate and any comments from the scoping opinions for projects considered to be relevant in

the assessment of cumulative effects. The developments and their associated constructions routes and traffic flows are summarised below.

14.7.2 The following developments, which are considered to have a transport effect on the Study Area, have been reviewed for the cumulative assessment:

- West Burton Solar Project
- Gate Burton Energy Park
- EDF West Burton C
- Decommissioning of West Burton A
- Saxilby Heights
- Development at Land off Sturton Road
- Blyton Driving Centre
- Wood Lane Solar Farm

14.7.3 The following assessment only includes applications anticipated to generate trips on the links in the study area at the same time as the Scheme, as these are considered to be the developments with the most potential to give rise to cumulative effects.

14.7.4 Traffic figures for the Gate Burton proposal are currently not available but will be fully assessed in the ES.

West Burton Solar Project

14.7.5 West Burton project has four associated Sites, a substation and a cable corridor.

14.7.6 All construction vehicles will access the West Burton Solar Project Site via the A15, from either the M180 Motorway to the north, or the A46 to the south. From the A15, construction vehicles will take the following routes to the West Burton Solar Project Site:

14.7.7 The proposed construction vehicle routes to each area are summarised below:

- West Burton 1 and 3 – via the A15 and A1500;
- West Burton 2 – via the A46, A57 and B1241; and
- West Burton 4 – via the A1(M), A614 and A631.

- 14.7.8 The associated 24-hour Traffic Flows that may impact the highway network used in the Scheme, for West Burton Solar Project are shown in Table 14.13.

Table 14.13 West Burton Solar Project Traffic Flows

Link	Cottam Area	AADT	HGV	%HGV
A15	WB1,2,3, 4	30	30	100%
A631	WB 2	22	2	10%

EDF West Burton C 299MW gas fired generating capacity

- 14.7.9 All construction vehicles will access EDF West Burton C via the existing West Burton Power Station entrance off of Gainsborough Road. All HGVs will then use the following route:

- EDF West Burton C - Gainsborough Road, Sturton Road, Gainsborough Road and Saundby Road.

- 14.7.10 The associated 24-hour Traffic Flows that may impact the highway network used in the Cottam Solar project, for EDF West Burton C are shown in Table 14.14. This data was obtained from Appendix 7A of the Transport Assessment (April 2019) prepared by AECOM.

Table 14.14 EDF West Burton C Traffic Flows

Link	AADT	HGV	%HGV
A631	226	56	25%

Wood Lane Solar Farm

- 14.7.11 All construction vehicles will access the Site via the following route:

- A620; A631; A631; A638

- 14.7.12 The associated 24-hour Traffic Flows that may impact the highway network used in the Cottam Solar project, for Wood Lane Solar Farm are shown in Table 14.15. This data was obtained from the associated Transport Assessment.

Table 14.15 Wood Lane Solar Farm Traffic Flows

Link	AADT	HGV	%HGV
A631	40	40	100%
A631	40	40	100%

- 14.7.13 The cumulative construction traffic generation set out in Tables 14.13 – 14.15 has been applied to the baseline traffic flows set out in Table 14.7 and baseline plus construction flows set out in Table 14.11, to determine the cumulative effect of the construction traffic for the Scheme on the links within the study area, in combination with the schemes identified as having the potential to generate cumulative effect.
- 14.7.14 The baseline and baseline plus cumulative effects traffic flows are shown in Table 14.16.

Table 14.16 Baseline plus Cumulative Effects on Traffic Flows

Cottam Area	Link	Baseline			Baseline plus Cumulative			% Change from Baseline	
		AADT	HGVs	HGV %	AADT	HGVs	HGV %	AADT	HGVs
1	A15	12,661	2,116	17%	12,921	2,176	17%	2%	3%
1	Ingham Road	759	153	20%	798	157	20%	5%	3%
1	Fleets Lane	63	16	25%	89	20	22%	41%	25%
1	Road East of Coates	8	2	25%	21	5	24%	163%	150%
1	Willingham Road	122	30	25%	161	34	21%	32%	13%
1	Stow Lane	688	170	25%	766	174	23%	11%	2%
1	Thorpe Lane	83	31	37%	96	35	36%	16%	13%
2	A631	9,958	597	6%	10,308	737	7%	4%	23%
2	Corringham (North of A631)	70	2	3%	92	3	3%	31%	50%
3	Pilham Lane	92	17	18%	101	18	18%	10%	6%
3	Kirton Road	1,606	301	19%	1,634	302	18%	2%	1%
3	Station Road	2,159	391	18%	2,168	393	18%	1%	1%

- 14.7.15 As stated in the 'Assessment of Significance' section, the two rules set out in the IEMA Guidelines require further assessment where traffic flows/HGVs increase by more than 30% (or 10% for a sensitive area).
- 14.7.16 As shown in Table 14.16, the addition of 200 car/LGV movements plus 30 HGV movements to the highway network over a daily period will not exceed this threshold on the A15, Ingham Road, Stow Lane, Thorpe Lane, A631, Pilham Lane, Kirton Road and Station Road. Therefore, based on the data available, there will not be a significant environmental effect as a result of construction vehicle traffic on these roads and therefore, no further assessment is required.
- 14.7.17 On Fleets Lane, Road east of Coates, Willingham Road and Corringham Road north of the A631, there could be up to larger increases in AADT from a baseline. However, these links have a low number of baseline movements, which results in a high percentage change with any increase in traffic volumes.
- 14.7.18 A review of the likely significant environmental effects in relation to transport and access during the Scheme's construction phase, taking into account cumulative effects, is set out in the sections below.

Accidents and Safety

- 14.7.19 A total of 53 PICs were recorded over the most recent five-year period. Of these three were fatal, 39 were 'slight' and 11 were 'serious'. Based on the information available, there is no identified pattern of accidents. This is set out in detail in Table 14.8
- 14.7.20 Given the low number of additional trips to the network during the construction phase, as detailed in Table 14.9, there is unlikely to be a material effect on accidents and safety, even when taking into account cumulative schemes. In light of this, the likely significant effect of the construction traffic on accidents and safety in the study area is still considered to be negligible and temporary.

Severance

- 14.7.21 None of the roads used are considered to act as a barrier that separate communities. The addition of construction traffic will not change this.
- 14.7.22 Additional traffic associated with the cumulative scheme will not change, the likely significant effect of the on severance during the construction phase. Therefore, it is considered to be negligible and temporary, which is not significant.

Driver Delay

- 14.7.23 The IEMA Guidelines state that ‘delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system’.
- 14.7.24 Capacity assessment on local junctions are not proposed as part of the assessment. However, through the CTMP, construction vehicles will be coordinated to avoid peak hour travel, the period where capacity constraints may occur, and there will be no construction traffic on roads within the study area between 08:00-09:00 or 17:00-18:00.
- 14.7.25 As such, the likely cumulative effect on driver delay is considered to be negligible, which is not significant.

Pedestrian Delay (to include Cyclists)

- 14.7.26 The level of pedestrian and cyclist activity on the roads surrounding the Site is low. Public rights of way will remain open during the construction phase. There may be some slight delay to pedestrian and cyclist movement if a construction vehicle is crossing the public right of way, but this is not likely to be material, and only in isolated locations. Traffic associated with cumulative schemes is unlikely to have a significant effect on pedestrian and cyclist delay.
- 14.7.27 Therefore, the likely cumulative effect on pedestrian and cyclist delay is considered to be negligible, which is not significant.

Pedestrian Amenity (including Fear and Intimidation and to include Cyclists)

- 14.7.28 As set out above, the level of pedestrian and cyclist activity on the roads surrounding the Site is very low meaning that the sensitivity receptor is low. However, it is acknowledged that the addition of HGVs to the network and additional traffic associated with the cumulative schemes will affect the relative pleasantness of any pedestrian and cyclist journeys in the area. It is also acknowledged that a number of Public Rights of Way operate through the Site. Whilst the intention is for these Public Rights of Way to remain open during the construction phase, there will be some effect on the relevant pleasantness of pedestrian and cyclist journeys in these locations.
- 14.7.29 In light of this, it is considered that the likely cumulative effect to pedestrian and cyclist amenity will be minor adverse, which is not significant.

Hazardous Loads

- 14.7.30 Some deliveries to the Site during the construction phase will be regarded as ‘hazardous loads’. These include the deliveries of lithium-ion batteries, transformer oil and insulation gas. All regulations for the movement of hazardous loads will be followed, and the appropriate documentation will be obtained. There are likely to

be some hazardous loads associated with other energy schemes, such as West Burton. All regulations for these deliveries will have to be followed.

- 14.7.31 There will be some abnormal loads to transport the transformer for the 132kv substation. An abnormal load is one where the vehicle exceeds 44 tonnes, the width is over 2.9m or the length is more than 18.65m. These movements will be managed. Additional details will be provided in the ES and CTMP. Other energy development, in particular West Burton Solar Project and Gate Burton Solar Project, will also have infrequent abnormal load movements that will be managed.
- 14.7.32 Overall, as all regulations will be followed, and there is no identified highway safety issue on the routes to the Site, it is considered that the likely significant cumulative effects on hazardous loads will be negligible, which is not significant.

Summary of Cumulative Effects during Construction

- 14.7.33 The likely significant effects of the Scheme during the construction phase, prior to the implementation of mitigation measures, are summarised in Table 14.17.

Table 14.17: Summary of Effects during the Construction Phase

Criteria	Significant of Effect for all roads surrounding the different Site	Duration
Accidents and Safety	Negligible	Short Term/Temporary
Severance	Negligible	Short Term/Temporary
Driver Delay	Negligible	Short Term/Temporary
Pedestrian Delay	Negligible	Short Term/Temporary
Pedestrian Amenity	Minor Adverse	Short Term/Temporary
Hazardous Loads	Negligible	Short Term/Temporary

14.8 Summary of Effects

- 14.8.1 Table 14.18 contains a summary of the likely significant effects of the Scheme.

Table 14.18: Summary of Likely Significant Effects

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate / Minor) (Beneficial/ Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects	Cumulative Effects
				I	UK	E	R	C	B	L		
Construction/Decommissioning Phase												
Effects on Accidents and Safety	Temporary	Negligible	Implementation of CTMP							X	Negligible	Negligible
Effects on Severance	Temporary	Negligible	Implementation of CTMP							X	Negligible	Negligible
Effects on Driver Delay	Temporary	Negligible	Implementation of CTMP							X	Negligible	Negligible
Effects on Pedestrian Delay	Temporary	Negligible	Implementation of CTMP							X	Negligible	Negligible
Effects on Pedestrian Amenity	Temporary	Minor Adverse	Implementation of CTMP							X	Minor Adverse	Minor Adverse
Effects on Hazardous Loads	Temporary	Negligible	Implementation of CTMP							X	Negligible	Negligible
Operational Phase												
Effects on Accidents and Safety	Permanent	Negligible	Not required							X	Negligible	Negligible
Effects on Severance	Permanent	Negligible	Not required							X	Negligible	Negligible
Effects on Driver Delay	Permanent	Negligible	Not required							X	Negligible	Negligible

Effects on Pedestrian Delay	Permanent	Negligible	Not required							X	Negligible	Negligible
Effects on Pedestrian Amenity	Permanent	Negligible	Not a required							X	Negligible	Negligible
Effects on Hazardous Loads	Permanent	Negligible	Not required							X	Negligible	Negligible

* Geographical Level of Importance

I = International; UK = United Kingdom; E = England; R = Regional; C = County; B = Borough; L = Local

15 Noise and Vibration

15.1 Introduction

15.1.1 This chapter of the PEIR evaluates the likely significant effects of the Scheme as described in **Chapter 4: Development Proposal** on nearby noise and vibration sensitive receptors during construction, operation and decommissioning. The aim of this assessment is to predict the levels of noise and assess these against relevant guidelines.

15.1.2 This chapter is supported by the following Appendices:

- **Appendix 15.1:** Noise Survey Information
- **Appendix 15.2:** Acoustic Terminology

15.1.3 This chapter includes the following elements:

- Policy Content
- Assessment Methodology and Significance Criteria
- Baseline Conditions
- Identification and Evaluation of Key Effects
- In-combination Effects
- Cumulative Effects
- Mitigation Measures
- Residual Effects

15.2 Consultation

15.2.1 A summary of consultee comments relevant to this chapter, along with information about how comments have been responded to is outlined in Table 15.1.

Table 15.1: Summary of Consultation Responses

Date	Consultee and Response	Action
March 2022	PINS Scoping Opinion	
	The ES should assess noise impacts from construction traffic where significant effects are likely to occur; the noise assessment should characterise noise impacts based on the volume of traffic, percentage of HGVs and distance from the source using a recognised methodology such as BS5228.	At this stage details of HGV movements associated with the construction phase of the scheme are not known. Therefore, the assessment of construction traffic noise will be included in the ES.
	Scoping Report paragraph 15.4.6 states that there would be no significant sources of vibration during operation. Considering the nature of the Proposed Development during operation, the inspectorate is content to scope this matter out. The ES should describe the potential sources of vibration arising from the operation of e.g. substation and battery storage infrastructure and any measures to control emissions.	Assessment of construction vibration is discussed in section 15.7 of this report
May 2022	Scoping Report section 4.2 identifies that the type of panel to be used is not yet determined and tracking panels may be used. Should this type of panel be used, the ES should assess the potential for significant noise effects on ecological and human receptors during operation.	Should tracking panels be selected, the ES will assess the potential for significant noise effects on receptors.
	EHO and Planning Officer, West Lindsey District Council	
	Tetra Tech contacted WLDC to discuss the assessment methodology for the assessment. Scoping report was provided along with background monitoring	WLDC to confirm methodology.

	locations. It discussed use of absolute noise levels when existing background noise levels are very low.	
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15.3 Legislative and Policy Content

- 15.3.1 This section provides an overview of the legislative and planning policy framework against which the Scheme will be considered for noise and vibration. These policies identify the need for a site-specific noise assessment to consider the impacts of construction and operational phase noise on local noise-sensitive receptors.

Legislation

Control of Pollution Act 1974

- 15.3.2 The Control of Pollution Act 1974 (CoPA) requires that Best Practicable Means (BPM), as defined in Section 72 of the CoPA, are adopted to control construction noise on any given site. Sections 60 and 61 of the CoPA provide the main legislation regarding enabling works and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the Local Authority with instructions to cease work until specific conditions to reduce noise have been adopted.
- 15.3.3 Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, this provides a defence for any contravention of a Section 60 notice provided the agreed conditions are maintained on-site.
- 15.3.4 Prior to the commencement of any phase of the Scheme a Construction Environmental Management Plan (CEMP) will be submitted to and approved by the relevant planning authority, and this will be secured by a requirement in the DCO. The CEMP for each phase will be in accordance with the Outline CEMP which will be submitted as part of the DCO application. This will ensure the potential construction impacts are minimised including how the project will seek to manage noise generated during construction. A draft Outline CEMP is submitted as part of the PEIR and can be found in **Appendix 4.3**.

Environmental Protection Act 1990

- 15.3.5 The Environmental Protection Act 1990 (EPA) prescribes a statutory nuisance as noise (and vibration) emitted from premises (including land) that is prejudicial to health or a nuisance.

15.3.6 Local Authorities are required to investigate any public complaints of noise, and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served on the person responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be carried out, or it prohibits or restricts the activity.

15.3.7 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law as no statutory noise limits currently exist for defining a statutory nuisance. Demonstrating the use of BPM to minimise noise levels is an accepted defence against failure to comply with a noise abatement notice.

15.3.8 The DCO Application will include a Statement of Statutory Nuisance, which will be informed by the noise and vibration chapter of the Environmental Statement.

National Planning Policy

15.3.9 The following planning policy, legislation, guidance and standards are of particular relevance to operational noise.

- Overarching National Policy Statement for Energy (EN-1);
- National Policy Statement on Renewable Energy Infrastructure (EN-3);
- Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)
- National Planning Policy Statement for Electrical Networks (EN-5);
- The National Planning Policy Framework (NPPF);
- The Noise Policy Statement for England (NPSE); and
- BS4142:2014 Methods for rating and assessing industrial and commercial sound.

15.3.10 The overarching NPS for Energy (EN-1) was adopted in July 2011 and sets out the overall national energy policy for delivering major energy infrastructure.

15.3.11 Section 5.11.4 of EN-1 deals with effects from noise and vibration, and states;

“Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:

- *a description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive, tonal, impulsive or low frequency characteristics of the noise;*

- *identification of noise sensitive premises and noise sensitive areas that may be affected;*
- *the characteristics of the existing noise environment;*
- *a prediction of how the noise environment will change with the proposed development;*
- *in the shorter term such as during the construction period;*
- *in the longer term during the operating life of the infrastructure;*
- *at particular times of the day, evening and night as appropriate;*
- *an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and*
- *measures to be employed in mitigating noise."*

15.3.12 The information required above is detailed within sections 15.5 (Baseline Conditions), 15.6 (Embedded Design Mitigation) and 15.7 (Identification and Evaluation of Key Effects) of this chapter.

15.3.13 Paragraph 5.11.6 of EN-1 refers to the need to assess operational noise using the principles of the relevant British Standards, for example BS 4142 'Method for rating and assessing industrial and commercial sound'.

15.3.14 With regards to the decision-making process, EN-1 states (as paragraph 5.11.8) that the project should;

- Demonstrate good design through selection of the quietest cost-effective plant available;
- Containment of noise within buildings wherever possible;
- Optimisation of plant layout to minimise noise emissions; and, where possible
- Use landscaping, bunds or noise barriers to reduce noise transmission.

15.3.15 The overarching NPS for Energy (EN-3) was adopted in July 2011 and sets out the overall national energy policy for delivering renewable energy infrastructure.

15.3.16 Paragraph 2.4.2 of EN-3 refers to the need renewable energy infrastructure proposals to demonstrate noise mitigation in the design and refers to EN-1 for guidance on the undertaking of the noise and vibration assessment.

- 15.3.17 The National Policy Statement on Electricity Networks Infrastructure 5 (EN-5) was adopted in July 2011. Whilst EN-5 principally covers above-ground electricity lines of 132 kV and above, paragraph 1.8.2 confirms that EN-5 will also be relevant if the electricity network constitutes an associated development for which consent is sought, such as a generating station. EN-5 is therefore relevant to the Scheme, as a grid connection is proposed.
- 15.3.18 Noise and vibration is considered in Section 2.9 of EN-5 and refers to Section 5.11 of EN-1 with regard to generic noise considerations.
- 15.3.19 Section 2.9.7 of EN-5 states that audible noise effects can arise from substation equipment such as transformers, quadruple boosters and switched capacitors.
- 15.3.20 Section 2.9.12 of EN-5 suggests that applicants should have considered the following mitigation measures:
- The positioning of lines;
 - Ensuring that the appropriately sized conductor arrangement is used to minimise potential noise;
 - Avoiding damage to overhead line conductors which can increase potential noise effects; and
 - Ensuring conductors are kept clean and free of surface contaminants during stringing / installation.

The National Planning Policy Framework (NPPF)

- 15.3.21 The NPPF (updated July 2021) sets out the Government's planning policies for England, providing a framework within which local policies can be developed. The key principle of the NPPF is a presumption in favour of sustainable development (paragraph 11). With regards to noise, section 15, *Conserving and enhancing the natural environment* of the National Planning Policy Framework provides the following guidance in relation to noise impacts.

"174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans..."

“185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...”

“187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.”

The Noise Policy Statement for England (NPSE)

15.3.22 The NPSE (published March 2010) sets out the role and purpose of noise policy, together with the Government’s Noise Policy Vision and Aims, consistent with the NPPF.

15.3.23 The aims of the NPSE (paragraph 1.7) require that:

- Significant adverse effects on health and quality of life are avoided, while taking into account the guiding principles of sustainable development;
- Adverse effects on health and quality of life are mitigated or minimised; and
- Where possible, noise management should seek to improve health and quality of life within the context of Government policy on sustainable development.

15.3.24 Paragraph 2.24 of the NPSE states that in relation to minimising and mitigating adverse effects:

"...all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur."

15.3.25 At paragraphs 2.20 and 2.21, the NPSE introduces the following concepts with regard to noise effects:

- No Observed Effect Level (NOEL) – This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- Lowest Observed Adverse Effect Level (LOAEL) – This is the level above which adverse effects on health and quality of life can be detected but are not necessarily significant.
- Significant Observed Adverse Effect Level (SOAEL) – This is the level above which significant adverse effects on health and quality of life occur.

15.3.26 Paragraph 2.15 of the NPSE recognises that it is not possible to have a single set of noise levels relating to the above categories which are applicable to all sources of noise in all situations, and it is acknowledged that further research is required to increase the understanding of what may constitute a significant adverse effect on health and quality of life from noise.

Planning Practice Guidance – Noise

15.3.27 The Planning Practice Guidance – Noise (PPGN) (updated July 2019) sets out guidance on how planning can manage potential noise effects in a new development.

15.3.28 In terms of how to recognise when noise could be a concern, PPGN provides a table outlining perception, outcomes, effect level and action required. This table is reproduced in Table 15.2.

Table 15.2: Operational Noise Significance Criteria

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No Specific Measures Required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No Specific Measures Required
Lowest Observed Adverse Effect Level (LOAEL)			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid

Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent
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BS4142:2014 Methods for rating and assessing industrial and commercial sound

- 15.3.29 BS4142:2014 describes methods for rating and assessing sound in order to provide an indication its likely effect upon nearby premises (typically residential dwellings).
- 15.3.30 When considering the level of effect, BS4142:2014 emphasises the importance of the context in which a sound occurs. The standard therefore takes great care in the use of the words 'sound' and 'noise'. Sound can be measured by a sound level meter or other measuring system, whereas noise is related to a human response and is routinely described as unwanted sound, or sound that is considered undesirable or disruptive.
- 15.3.31 The specific sound emitted from the Scheme (dB, LAeq) is rated by taking into account both the level and character (i.e., tonal elements, impulsivity, intermittency and distinctiveness) of the sound. This is achieved by applying appropriate corrections to the specific sound level externally at the receptor location, which gives the rating level of the sound in question. This is then assessed against the existing prevailing background sound level (dB, LA90) at that location in order to determine a likely level of effect.
- 15.3.32 The level by which the rating level exceeds the prevailing background sound level indicates the following potential effects:
- A difference of 10 dB or more is likely to be an indication of a significant adverse effect, depending on the context;
 - A difference of around 5 dB is likely to be an indication of an adverse effect, depending on the context; and
 - Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low effect, depending on the context.

15.4 Assessment Methodology and Significance Criteria

Construction Assessment Methodology

Noise

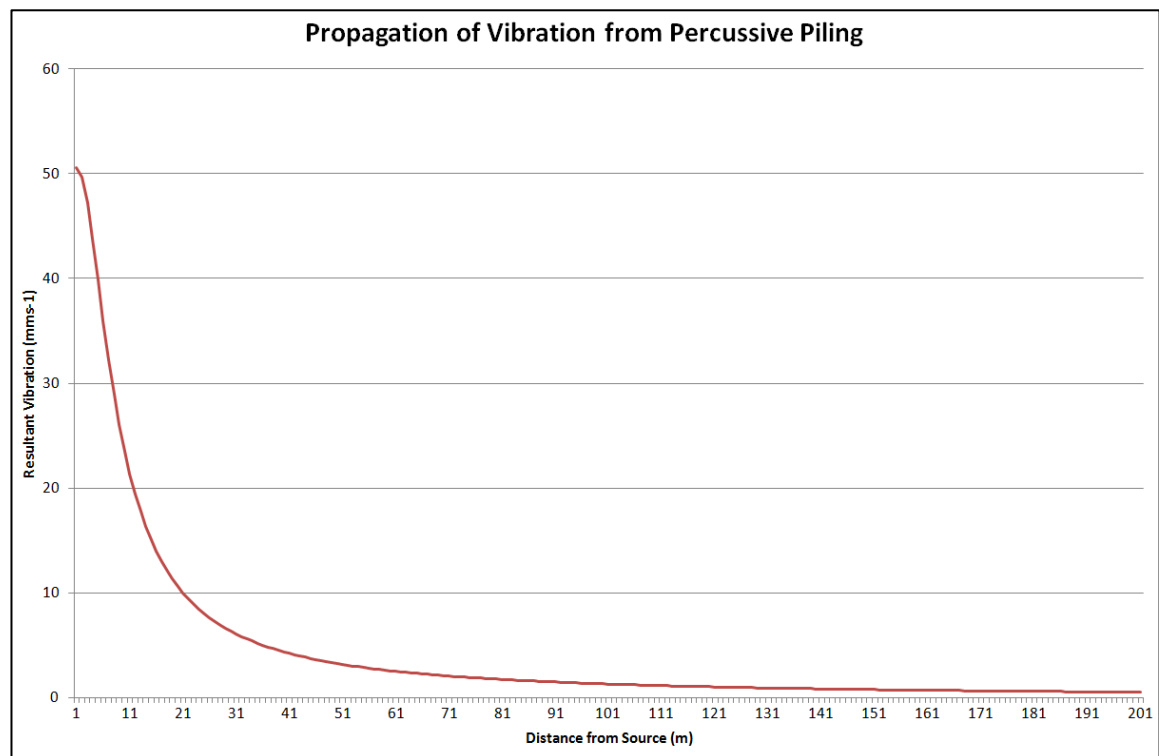
- 15.4.1 An assessment of the potential effects of noise during construction will be carried out for the closest, and therefore most noise sensitive, residential properties and ecological designations as identified in **Appendix 15.1**. An assessment of construction noise will be based on the ABC method of assessment using the methodology set out in British Standard 5228. The assessment is based upon typical solar farm construction activities and types and numbers of plant.
- 15.4.2 Under the ABC method, a threshold value noise level is determined by establishing the existing ambient noise level at each assessment location. This measured ambient noise level is then rounded to the nearest 5dB and the threshold value for each receptor is then established from Table E.1 of the standard (reproduced below as Table 15.3). This threshold value is then the L_{Aeq} noise level that should not be exceeded at the assessment location by construction activities.
- 15.4.3 The following construction activities are considered to be those with the most potential to result in adverse noise effects:
- Construction of tracks and hardstanding areas;
 - Installation of mounting frames (vibratory piling);
 - Installation of panels; and
 - Construction of the substation.
- 15.4.4 The distance between each noise sensitive receptor and the closest point at which each construction activity (excluding construction traffic on public roads) would occur will be identified and used to calculate worst case noise levels using the source data and methodology described in BS 5228-1:2014. These predicted levels will then be assessed against significance criteria derived from those suggested in BS 5228-1:2014.

Vibration

- 15.4.5 The construction activities considered are those with most potential to result in adverse vibratory effects, namely:
- Vibratory piling of PV panel framework; and
 - Vibratory compaction of tracks/hardstanding areas.

- 15.4.6 All other construction activities are considered to produce negligible levels of vibration and as such, do not require detailed assessment.
- 15.4.7 The levels of vibration at the specified receptors have been predicted using the formulae provided in Table E.1 of BS 5228-2:2009+A1:2014. The methodology for predicting vibration at each receptor uses the distance to the construction activity and a scaling factor based on the probability of the predicted value being exceeded. The propagation of ground-borne vibration is highly complex and is depended upon the specific geology of the propagation path from source to receptor. However, the formulae provide a reasonable estimation of the level of vibration likely to be experienced in practice. The formulae give a peak particle velocity (PPV) which can be compared to significance criteria derived from levels specified in BS 5228-2.

Graphical representation of the propagation of vibration from percussive piling



Construction Significance Criteria

Construction Noise Significance Criteria

- 15.4.8 The most notable impacts due to increases in noise and vibration during construction would be during periods of earthworks and construction of site

infrastructure. In addition to on-site sources, increased noise may be caused by HGV movements travelling to and from the site during construction.

- 15.4.9 Noise levels from potential construction activity associated with the Scheme will be assessed in accordance with BS 5228-1:2009 + A1 2014 criteria which indicate if a significant effect is likely to occur at noise sensitive properties. In order to ensure that the assessment is worst case, it is assumed that all proposed construction activity is occurring simultaneously.
- 15.4.10 In accordance with ABC method of assessment outlined in BS 5228-1:2009+A1 2014, a significant effect is deemed to occur if the site noise level exceeds the threshold level for the category appropriate to the Ambient Noise level. As shown in **Appendix 15.1** all nearby noise sensitive premises included in this assessment are currently exposed to ambient noise levels which comply with Category A.

Table 15.3: Construction Noise Thresholds at Residential Dwellings

Assessment category and threshold value period	Threshold Value $L_{Aeq,T}$ dB(A) – free-field		
	Category A (a)	Category B (b)	Category C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends (d)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
<p>NOTE 1: A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the Application Site exceeds the threshold level for the category appropriate to the ambient noise level.</p> <p>NOTE 2 If the ambient noise level exceeds the Category C threshold values given in the table (<i>i.e.</i> the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.</p> <p>NOTE 3: Applies to residential receptors only.</p>			
<p>(a) Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values.</p> <p>(b) Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as Category A values.</p> <p>(c) Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than Category A values.</p> <p>(d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.</p>			

15.4.11 Table 15.4 below gives noise criteria levels in respect to the ABC method of assessment.

Table 15.4: Noise Level Criteria (Construction Noise Assessment)

Effect Level	Assessment	Noise Level Criteria	Action / Justification
No Observed Adverse Effect Level	Construction Noise Assessment	ABC Method Site L_{Aeq} noise levels are 10dB below the relevant threshold values	No Action Required Complaints Relating to Plant Noise Unlikely
Lowest Observed Adverse Effect Level (LOAEL)	Construction Noise Assessment	ABC Method Site L_{Aeq} noise levels are equal/ below the relevant threshold values	Mitigate to achieve site noise levels below relevant category threshold
Significant Observed Adverse Effect (SOAEL)	Construction Noise Assessment	ABC Method Site L_{Aeq} noise levels are higher than the relevant threshold values Or Construction activities cause noise levels to increase by more than 3dB (where ambient noise levels exceed threshold Values)	Mitigate to achieve site noise levels below relevant category threshold
Unacceptable Observed Adverse Effect	Construction Noise Assessment	ABC Method Site L_{Aeq} noise levels are higher than the relevant threshold values Or Construction activities cause noise levels to increase by more than 10dB (where ambient noise levels exceed threshold Values)	Mitigate to achieve site noise levels below relevant category threshold

Construction Vibration Significance Criteria

- 15.4.12 BS 5228:2009-2+A1:2014 provides guidance on the effects of vibration, including vibration levels at which effects are be perceptible to human receptors. Table 15.5 summarises this guidance.

Table 15.5: Vibration Significance Criteria

Vibration Level (mms ⁻¹)	Effect
0.3	Vibration might just be perceptible in residential environments.
1.0	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.0	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

- 15.4.13 It is considered that the above guidance translates into the following magnitude criteria for the purposes of this assessment.

Table 15.6: Magnitude of Effect - Vibration

Magnitude of Effect	Criteria	Action / Justification
Negligible	< 0.3 mm/s	No Action Required. Complaints relating to vibration unlikely
Moderate	≥ 0.3 to < 1.0 mm/s	Mitigate to achieve vibration levels below relevant category threshold.
Major / Moderate	≥ 1.0 to < 10 mm/s	Mitigate to achieve vibration levels below relevant category threshold.
Major	≥ 10 mm/s	Mitigate to achieve vibration levels below relevant category threshold.

- 15.4.14 The recommended PPV vibration limits for transient vibration, above which cosmetic damage could occur for different types of buildings are provided in BS 5228-2 and presented in Table 15.7. For these limits, 'minor damage' is possible at vibration magnitudes that are greater than twice those given in Table 15.8, and 'major damage' can occur at values greater than four times the tabulated values. Consequently, the significance of effect has been provided based on the sensitivity of a building to vibration induced cosmetic damage.

Table 15.7: Transient Vibration Guide Values for Cosmetic Damage

Type of Building	Peak Component Particle Velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Residential or Light Commercial Type Buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 50 Hz and above

- 15.4.15 In this instance, Moderate or Major effects are regarded as being significant in terms of the EIA Regulations.

Construction Traffic Assessment Methodology

Noise

- 15.4.16 Noise from construction traffic on public roads will be assessed on the basis of the change in traffic noise levels due to the addition of traffic associated with construction of the Scheme. Baseline traffic flows for each location will be sourced from **Chapter 14: Access and Traffic**. The percentage increases in all traffic and for HGVs will be used together with the number of vehicles, proportion of HGVs and likely speed (based on the type of road) to calculate the likely change in traffic noise level due to construction traffic for the peak of the construction programme in terms of vehicle movements, using the method described in Calculation of Road Traffic Noise (CRTN).

Vibration

- 15.4.17 Vibration from traffic can be transmitted through the ground by the interaction of the vehicle tyres and the road surface. The passage of vehicles over irregularities in the road can create locally increased levels of vibration. The Design Manual for Roads and Bridges (DMRB) states that extensive research on a wide range of buildings has found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings.
- 15.4.18 With regard to human perception, DMRB states that perceptible vibration only occurs in rare cases and notes that the normal use of a building, such as closing doors and operating domestic appliances, can produce levels of vibration similar to that of passing traffic.
- 15.4.19 In relation to ground-borne vibration Paragraph A5.26 of DMRB states: "Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances". The

Applicant will engage with West Lindsey District Council and Bassetlaw District Council to ensure that the delivery route is maintained and improved as appropriate, ensuring that levels of vibration are minimised as far as practicable.

- 15.4.20 No effects from traffic-induced ground-borne vibration are anticipated and such effects have therefore not been considered further.

Construction Traffic Significance Criteria

- 15.4.21 The magnitude of effects, in terms of the predicted change in traffic noise levels on public roads, expressed as $L_{A10,18\text{hour}}$ in accordance with CRTN, and based on criteria defined in DMRB are defined as follows:

Table 15.8: Magnitude of Effect – Construction Traffic

Magnitude of Effect	Criteria	Action / Justification
Negligible	Change in noise is: 0.0 - 0.9 dB $L_{A10,18\text{h}}$	No action required. Complaints relating to road traffic noise unlikely.
Moderate	Change in noise is: 1.0 - 2.9 dB $L_{A10,18\text{h}}$	Mitigate to achieve total noise levels below relevant category threshold.
Major / Moderate	Change in noise is: 3.0 - 4.9 dB $L_{A10,18\text{h}}$	Mitigate to achieve total noise levels below relevant category threshold.
Major	Depending on context, change in noise is: >5.0 dB $L_{A10,18\text{h}}$	Mitigate to achieve total noise levels below relevant category threshold.

- 15.4.22 Moderate or Major effects are regarded as being significant in terms of the EIA Regulations.

Operational Noise Assessment Criteria

- 15.4.23 In summary, the assessment process follows the methodology set out in BS 4142:2014+A1:2019, in accordance with paragraph 5.11.6 of EN-1, which comprises:
- Identification of potential receptors;
 - Measurement of existing (baseline) background noise levels at a representative selection of potential receptors;
 - Prediction of specific sound from the Scheme at each receptor;

- Application of appropriate corrections to the specific sound to account for the level and character of the sound (i.e., the rating level); and
- Assessment of the rating level against the prevailing background sound level, taking context into account.

15.4.24 The assessment of the potential effects of noise during operation of the Scheme will be carried out for the closest, and therefore most noise sensitive properties.

Operational Noise Significance Criteria

15.4.25 Operational noise effects at the nearest noise sensitive receptors will be assessed according to BS 4142:2014 and the guidance from the NPSE and PPGN.

15.4.26 Based upon this guidance, the following BS 4142:2014 rating differences are considered to apply:

Table 15.9: Magnitude of Effect – Operational Noise

Magnitude of Effect	Criteria	Action / Justification
Negligible	BS4142 score of zero or lower.	No action required. Score of zero or lower is an indication of the sound source having a low effect.
Moderate	BS4142 score of +5 or lower.	Difference of +5 dB likely to be an indication of an adverse effect. Mitigate to achieve: BS4142 score of plus 5 or lower.
Major / Moderate	BS4142 score greater than +5.	Difference of +10 dB likely to be an indication of a significant adverse effect. Mitigate to achieve: BS4142 score of plus 5 or lower.
Major	BS4142 score of +10 or higher.	Mitigate to achieve: BS4142 score of 5 dB or lower.

15.4.27 BS 4142 advises that where rating levels and background levels are low, the assessment of operational noise should take into context the absolute noise level. Assuming that, at night, residents will be inside their property, they would benefit from noise attenuation from the building envelope. BS 8233:2014 'Guidance on sound insulation and noise reduction for buildings' suggests that a building envelope with a partially open window is generally accepted to attenuate noise by up to 15 dB.

- 15.4.28 BS 8233 and the World Health Organization (WHO) 'Guidelines for Community Noise' (1999) provide guidance levels for internal noise within dwellings and bedrooms of 35 dB $L_{Aeq,16hr}$ during the daytime and 30 dB $L_{Aeq,8hr}$ during the night-time. BS 8233 also advises that internal noise levels 5 dB greater than the guidance levels are 'reasonable'. As such, where predicted rating levels exceed the background level at a receptor but are limited to an absolute external noise level of 50 dB $L_{Ar,Tr}$ during the daytime and 45 dB $L_{Ar,Tr}$ during the night-time then this will be considered as a low adverse magnitude impact. Absolute external noise levels up to 55 and 50 dB $L_{Ar,Tr}$ during the daytime and night-time will be considered as a medium adverse magnitude impact, and any greater will be considered a high adverse magnitude impact.

Assessment of Sensitivity

- 15.4.29 The nature or sensitivity on all identified environmental receptors, as well as the magnitude of impact on those receptors will be described as high, medium, low or very low. What this looks like for this topic is set out below.

Table 15.10: Sensitivity/Importance of the Identified Environmental Receptor

Sensitivity	Definition
High	Residential properties (permanent tenants), schools and hospitals and sensitive species
Medium	Offices, internal teaching / training spaces
Low	Commercial premises

Assessment of Significance

- 15.4.30 The level of significance of each effect is determined by combining the impact with the sensitivity of the receptor. Table 15.11 shows how the interaction of magnitude and sensitivity can be combined to determine the significance of an environmental effect.

Table 15.11: Criteria for Assessing the Significance of Noise Effects

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible

- 15.4.31 For the purposes of this assessment, moderate or major effects are considered to be significant in terms of the EIA Regulations.

15.5 Baseline Conditions

Background Survey

- 15.5.1 This section discusses the baseline information relevant to this chapter.
- 15.5.2 The baseline noise environment has been established following noise surveys undertaken at each of the three land parcels as outlined in **Appendix 15.1**. The locations and summary of these measurements can be found on **Appendix 15.1** below.

Cottam 1 Noise Survey

- 15.5.3 The baseline noise environment has been established following a noise survey undertaken from Thursday 9th September 2021 to Thursday 16th September 2021. Attended 15-minute short-term measures were undertaken at nine locations during the day, evening and night-time periods with four additional locations being measured unattended over a 161-hour period. Full details of the noise monitoring survey are presented within **Appendix 15.1**, with a brief summary provided below.
- 15.5.4 The existing ambient noise climate was mainly dominated by road traffic noise and occasional farming related noise. The main sources of this noise included: Kexby Road, Willingham Road, Stow Road, the A1500 and the B1241. A summary of the baseline noise monitoring survey is shown in **Appendix 15.1**.
- 15.5.5 Statistical analysis of the long-term measured data, to derive representative background noise levels for the daytime and night-time periods are shown in Figures 15.1 – 15.8 below.

Figure 15.1: Existing Daytime Background Noise Level – Statistical Analysis LT1

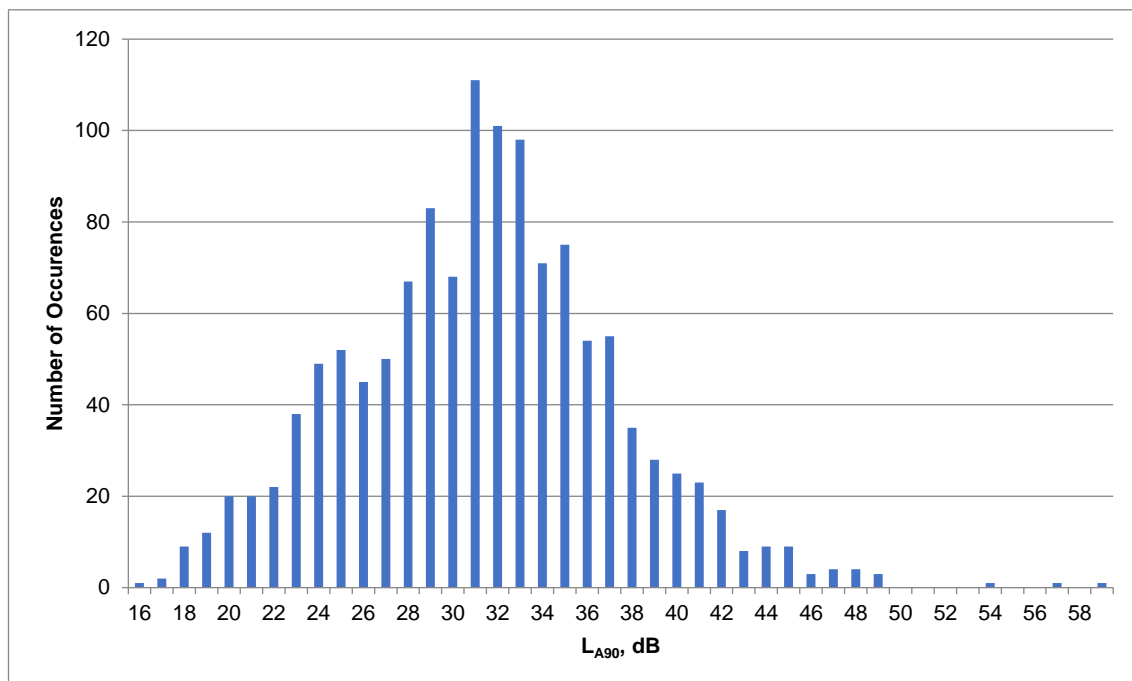


Figure 15.2: Existing Night-time Background Noise Level – Statistical Analysis LT1

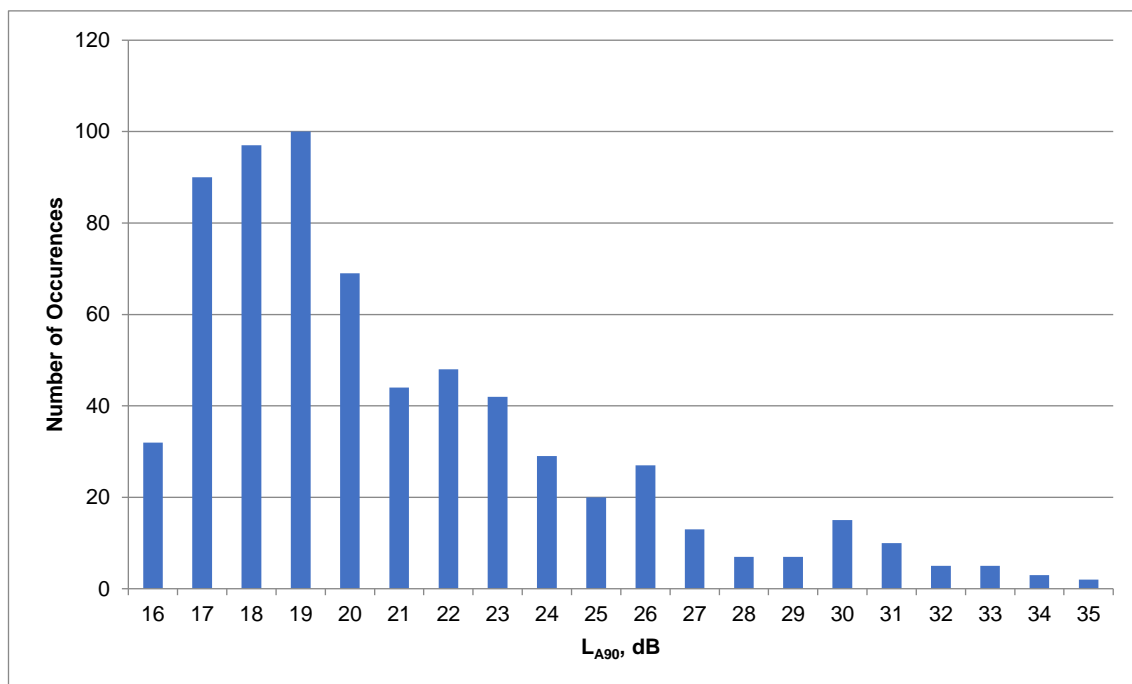


Figure 15.3: Existing Daytime Background Noise Level – Statistical Analysis LT2

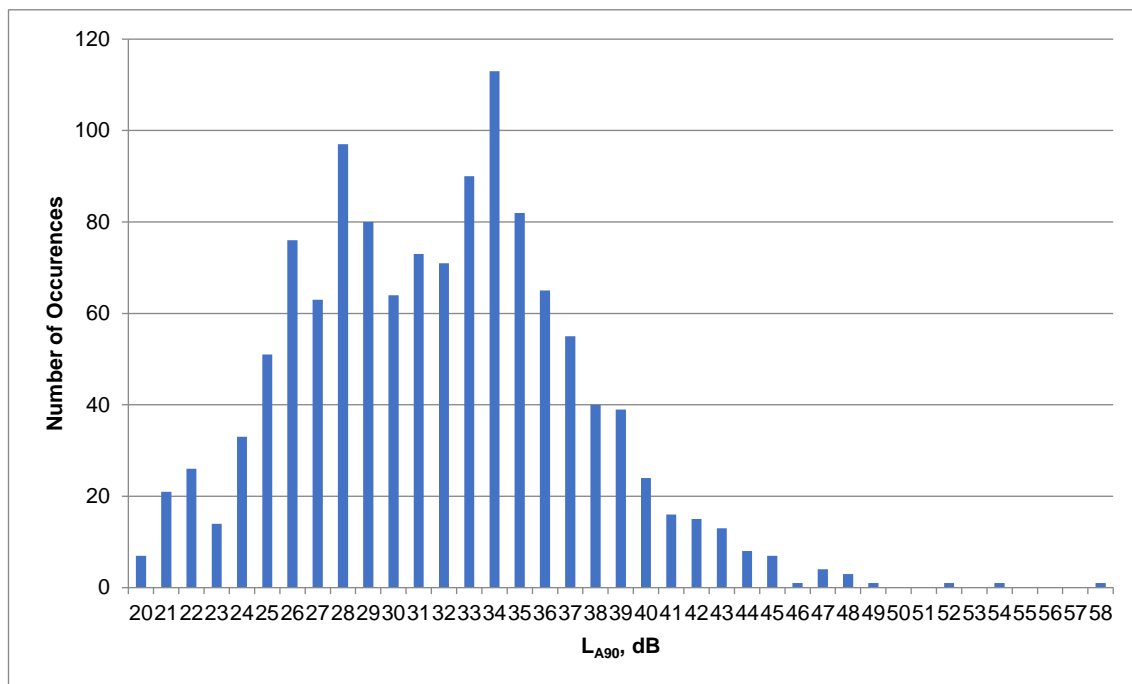


Figure 15.4: Existing Night-time Background Noise Level – Statistical Analysis LT2

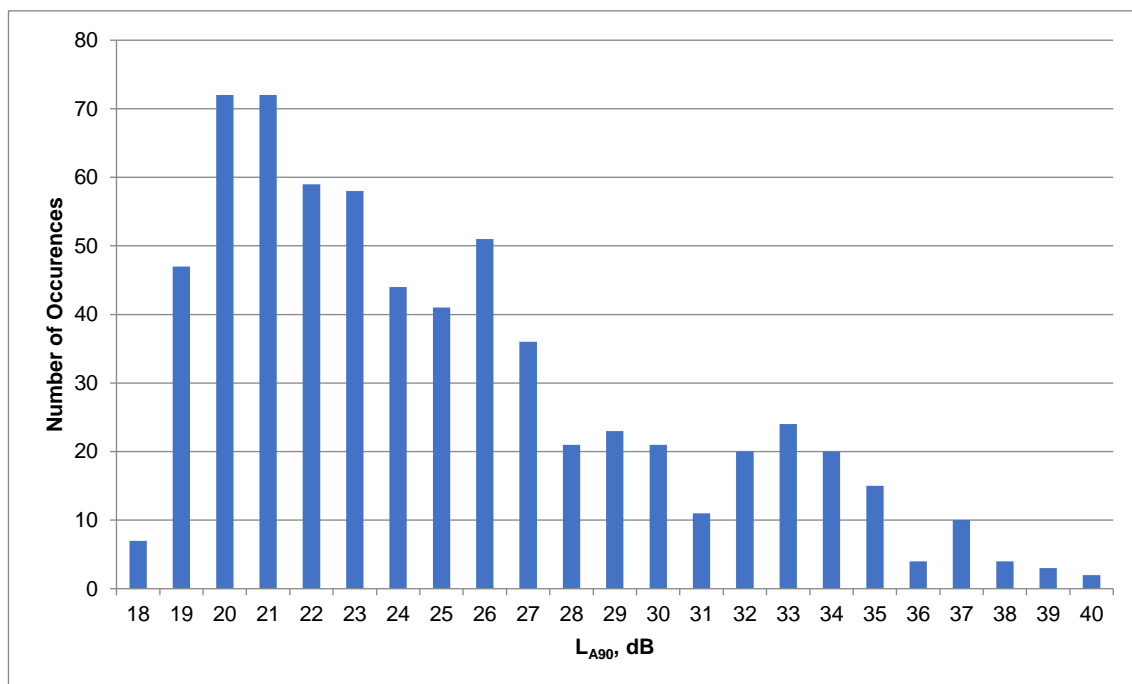


Figure 15.5: Existing Daytime Background Noise Level – Statistical Analysis LT3

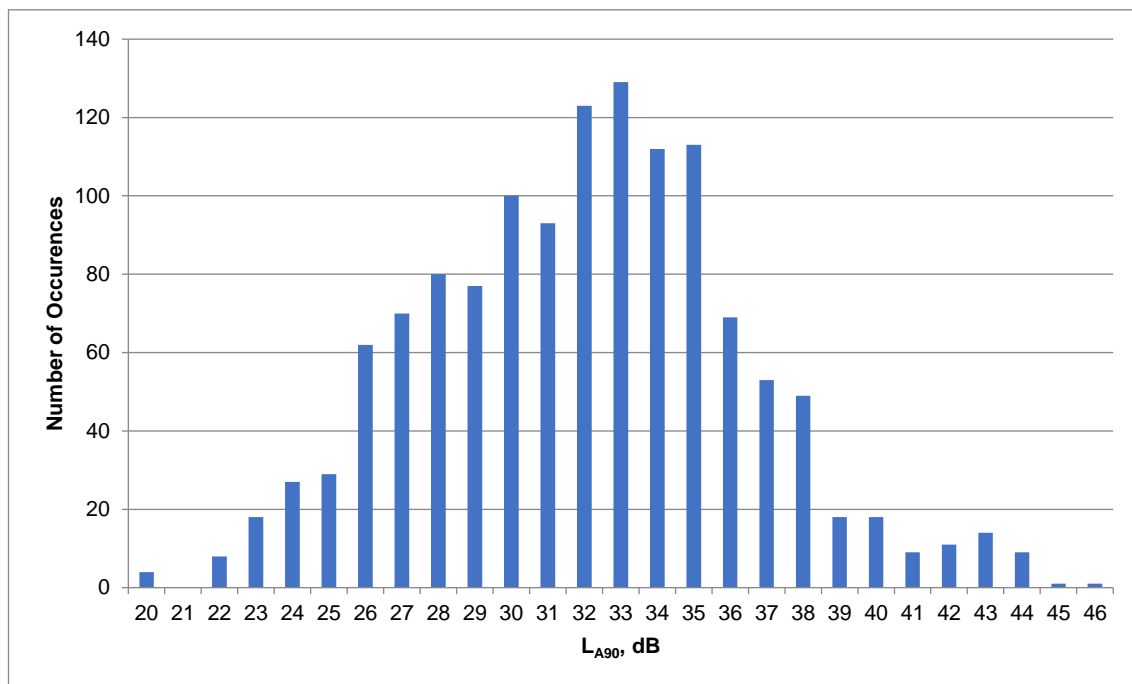


Figure 15.6: Existing Night-time Background Noise Level – Statistical Analysis LT3

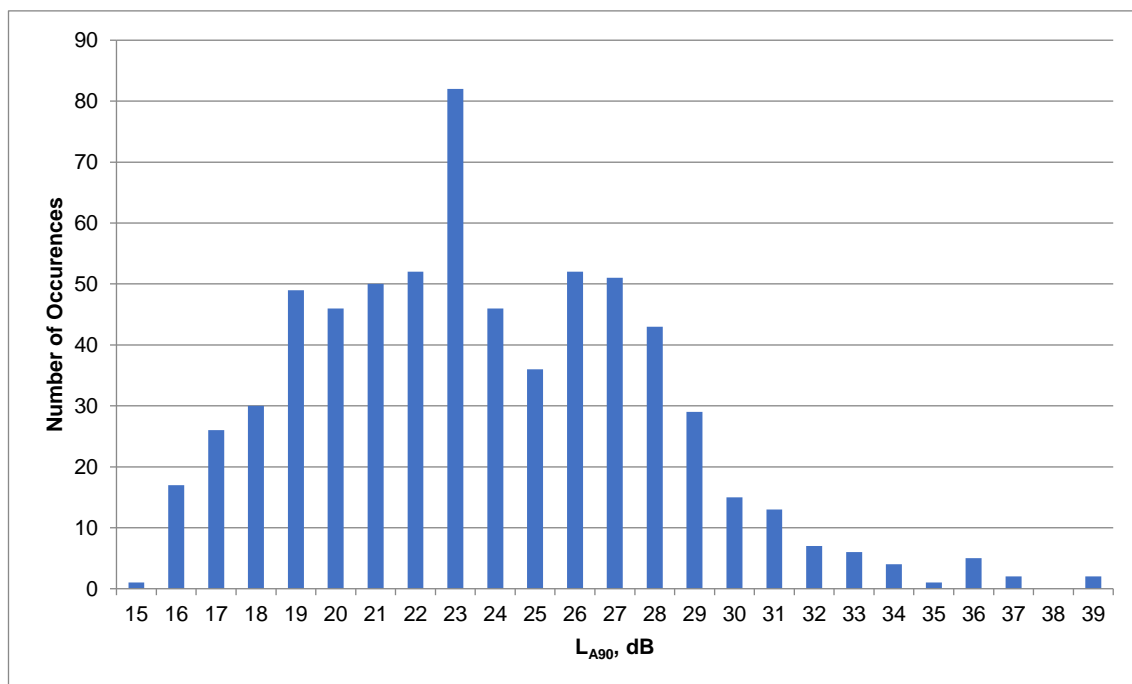


Figure 15.7: Existing Daytime Background Noise Level – Statistical Analysis LT4

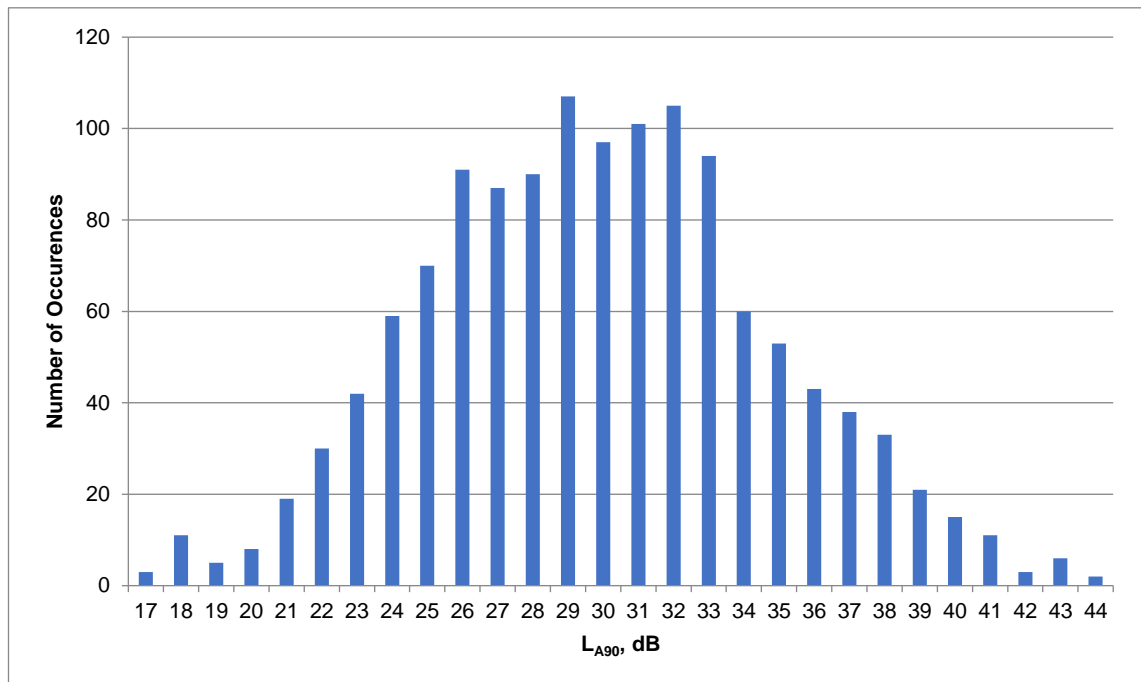
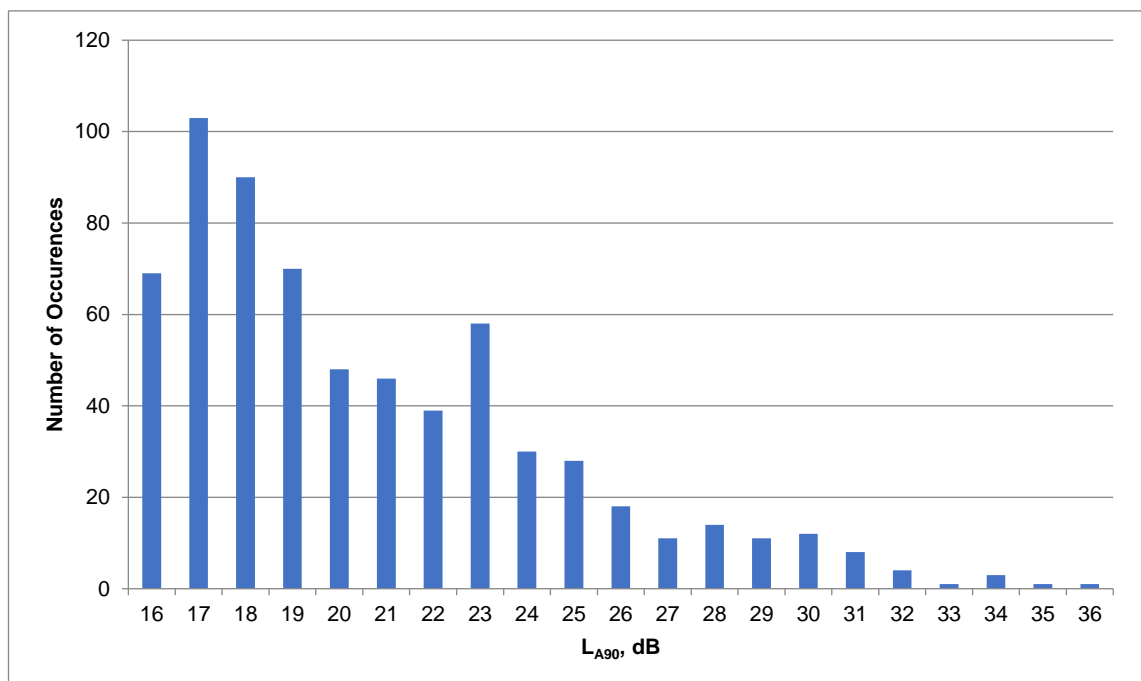


Figure 15.8: Existing Night-time Background Noise Level – Statistical Analysis LT4



Assessment Locations

- 15.5.6 Residential properties located closest to the Scheme's infrastructure were identified using the site layout contained in **Appendix 4.1** and are shown in Figure 15.9. These closest sensitive receptors are considered to be the most noise sensitive, as effects from the Scheme will be higher at these locations than at sensitive receptors located further from the Scheme.
- 15.5.7 Background sound levels measured at the properties detailed in Table 15.13 are considered to be representative of the background noise environments at other properties in similar nearby locations. Should the predicted noise levels from the Scheme comply with limits at the assessed receptors, predicted noise levels at receptors further from the Scheme will also comply.
- 15.5.8 Assessment locations are identified in Figure 15.9.

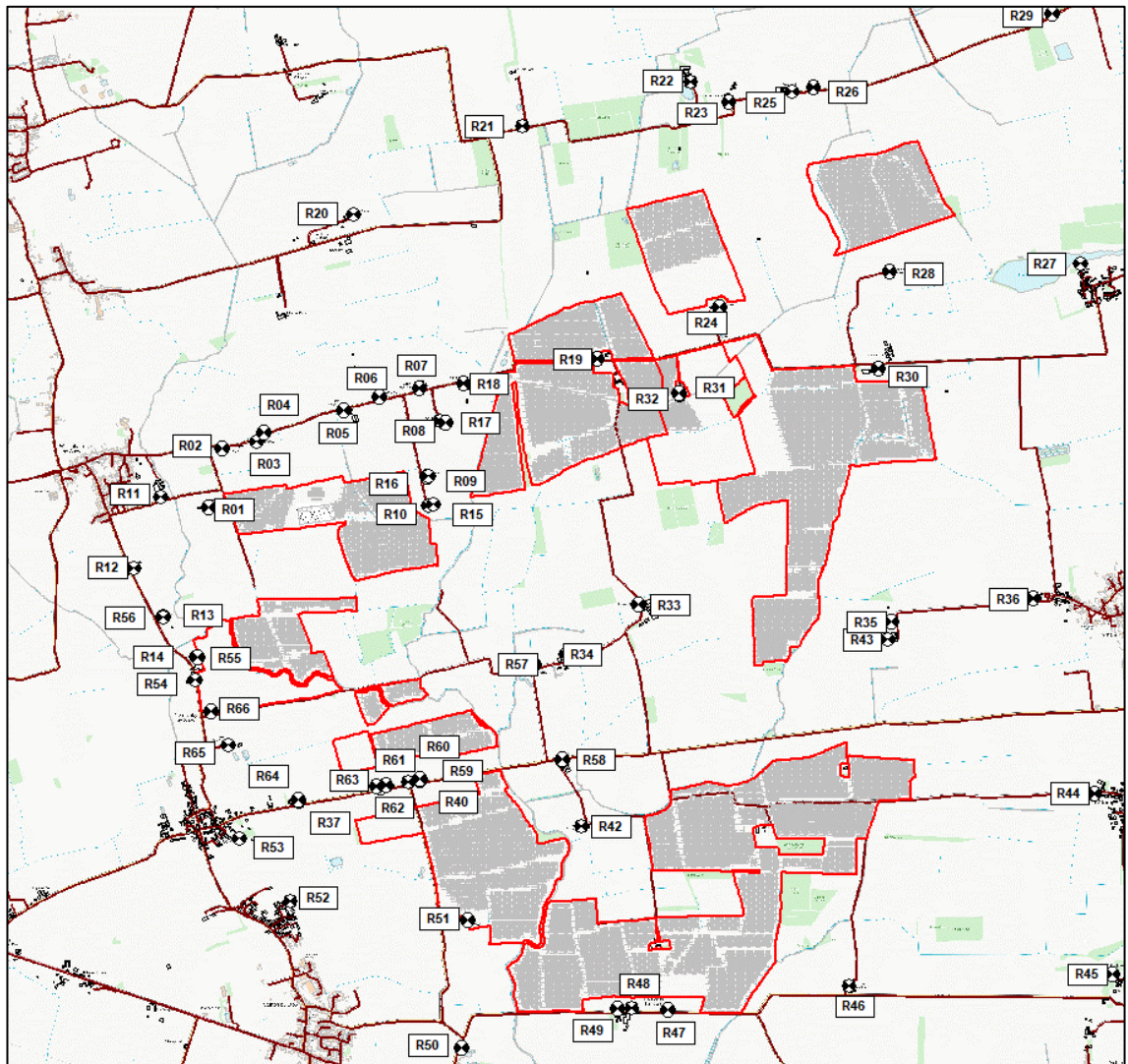
Table 15.12: Noise Assessment Locations

I.D.	Description	Land Use Classification	Approximate Distance from Red-line Boundary (m)	Height of Receptors (m)
R01	Woods Farm	Residential	140	1.5 / 4.0
R02	The Cottage	Residential	320	1.5 / 4.0
R03	Carisbrooke	Residential	320	1.5 / 4.0
R04	Uppermill Farm	Residential	380	1.5
R05	Slate House Farm	Residential	460	1.5 / 4.0
R06	South View	Residential	550	1.5 / 4.0
R07	Magin Moor Farm	Residential	550	1.5 / 4.0
R08	Chestnut Manor	Residential	340	1.5 / 4.0
R09	Lowfield Farm	Residential	140	1.5 / 4.0
R10	Moor Farm	Residential	70	1.5 / 4.0
R11	Grange Farm	Residential	460	1.5 / 4.0
R12	West View	Residential	780	1.5 / 4.0
R13	Tilby-Dale	Residential	260	1.5 / 4.0
R14	East Farm	Residential	15	1.5 / 4.0
R15	Moor Farm	Residential	100	1.5 / 4.0
R16	Lowfield Farm	Residential	150	1.5 / 4.0
R17	Chestnut Manor	Residential	290	1.5 / 4.0
R18	The Hollies	Residential	200	1.5 / 4.0
R19	Turpins Bungalows	Residential	30	1.5
R20	Glebe Farm	Residential	1,300	1.5 / 4.0

I.D.	Description	Land Use Classification	Approximate Distance from Red-line Boundary (m)	Height of Receptors (m)
R21	Low Field Farm	Residential	1,300	1.5 / 4.0
R22	Westlands Farm	Residential	780	1.5 / 4.0
R23	Orchard House	Residential	630	1.5 / 4.0
R24	North Farm	Residential	80	1.5 / 4.0
R25	Glentworth Grange	Residential	520	1.5 / 4.0
R26	Kexby Road	Residential	530	1.5 / 4.0
R27	Lakeside Cottage	Residential	960	1.5 / 4.0
R28	Fillingham Grange	Residential	230	1.5 / 4.0
R29	20 Kexby Road	Residential	1,300	1.5 / 4.0
R30	Glebe Farm	Residential	90	1.5 / 4.0
R31	Side Farm S	Residential	15	1.5 / 4.0
R32	Side Farm N	Residential	15	1.5 / 4.0
R33	Grange Farm	Residential	800	1.5 / 4.0
R34	Hall Farm	Residential	770	1.5 / 4.0
R35	Low Farm	Residential	520	1.5 / 4.0
R36	Kincraig Cottage	Residential	1,500	1.5 / 4.0
R37	17 Ingham Road	Residential	370	1.5 / 4.0
R38	25 Ingham Road	Residential	150	1.5 / 4.0
R39	31 Ingham Road	Residential	170	1.5 / 4.0
R40	The Pastures	Residential	75	1.5 / 4.0
R41	Furze Hill	Residential	450	1.5 / 4.0
R42	Lower Furze Hill	Residential	140	1.5 / 4.0
R43	Low Farm	Residential	520	1.5 / 4.0
R44	Walk House	Residential	1,300	1.5 / 4.0
R45	Brattleby Hall	Residential	2,000	1.5 / 4.0
R46	Thorpe Lane Farm	Residential	550	1.5 / 4.0
R47	The Lodge	Residential	90	1.5 / 4.0
R48	Clandon House	Residential	80	1.5 / 4.0
R49	1 Thorpe Lane	Residential	90	1.5 / 4.0
R50	The White Cottage	Residential	470	1.5 / 4.0
R51	Fleets Cottages	Residential	10	1.5 / 4.0
R52	9 Allan Close	Residential	1,000	1.5 / 4.0
R53		Residential	830	1.5 / 4.0
R54	West Farm	Residential	10	1.5 / 4.0

I.D.	Description	Land Use Classification	Approximate Distance from Red-line Boundary (m)	Height of Receptors (m)
R55	East Farm Cottage	Residential	10	1.5 / 4.0
R56	Tilby Dale	Residential	270	1.5 / 4.0
R57	The Bungalows	Residential	540	1.5 / 4.0
R58	Furze Hill	Residential	450	1.5 / 4.0
R59	The Pastures	Residential	80	1.5 / 4.0
R60	31 Ingham Road	Residential	150	1.5 / 4.0
R61	29 Ingham Road	Residential	160	1.5 / 4.0
R62	27 Ingham Road	Residential	190	1.5 / 4.0
R63	19 Ingham Road	Residential	130	1.5 / 4.0
R64	17 Ingham Road	Residential	360	1.5 / 4.0
R65	Church Farm View	Residential	240	1.5 / 4.0
R66	4 Flat Tops	Residential	10	1.5 / 4.0

Figure 15.9: Sensitive Receptor Location Plan



Not to scale

Cottam 2 Noise Survey

- 15.5.9 The baseline noise environment has been established following a noise survey undertaken from Thursday 9th September 2021 to Thursday 16th September 2021. Attended 15-minute short-term measures were undertaken at three locations during the day, evening and night-time periods with two additional locations being measured unattended over a 161-hour period. Full details of the noise monitoring survey are presented within **Appendix 15.1**, with a brief summary provided below. The locations of these measurements are presented in the Figures below.

- 15.5.10 The existing ambient noise climate was dominated by road traffic noise with the main sources being the A631 and Corringbeck Road during the daytime and evening, the road traffic noise is reduced at night-time with the dominant noise source being background animal noises.
- 15.5.11 Statistical analysis of the long-term measured data, to derive representative background noise levels for the daytime and night-time periods are shown in Figures 15.10 – 15.13 below.

Figure 15.10: Existing Daytime Background Noise Level – Statistical Analysis LT1

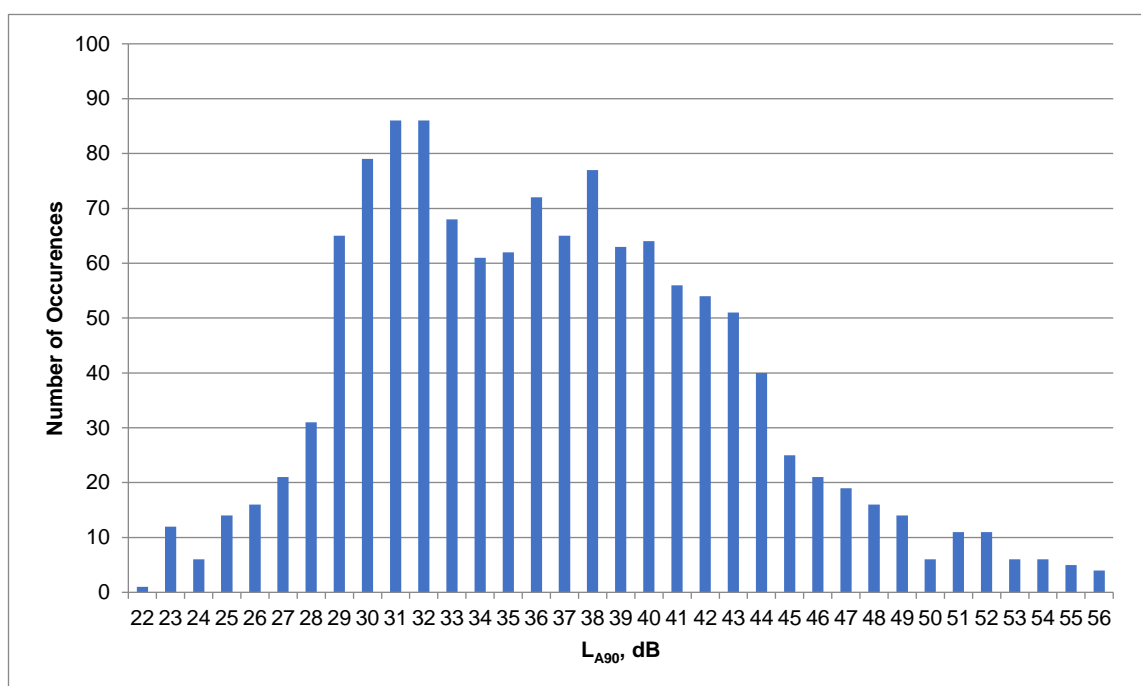


Figure 15.11: Existing Night-time Background Noise Level – Statistical Analysis LT1

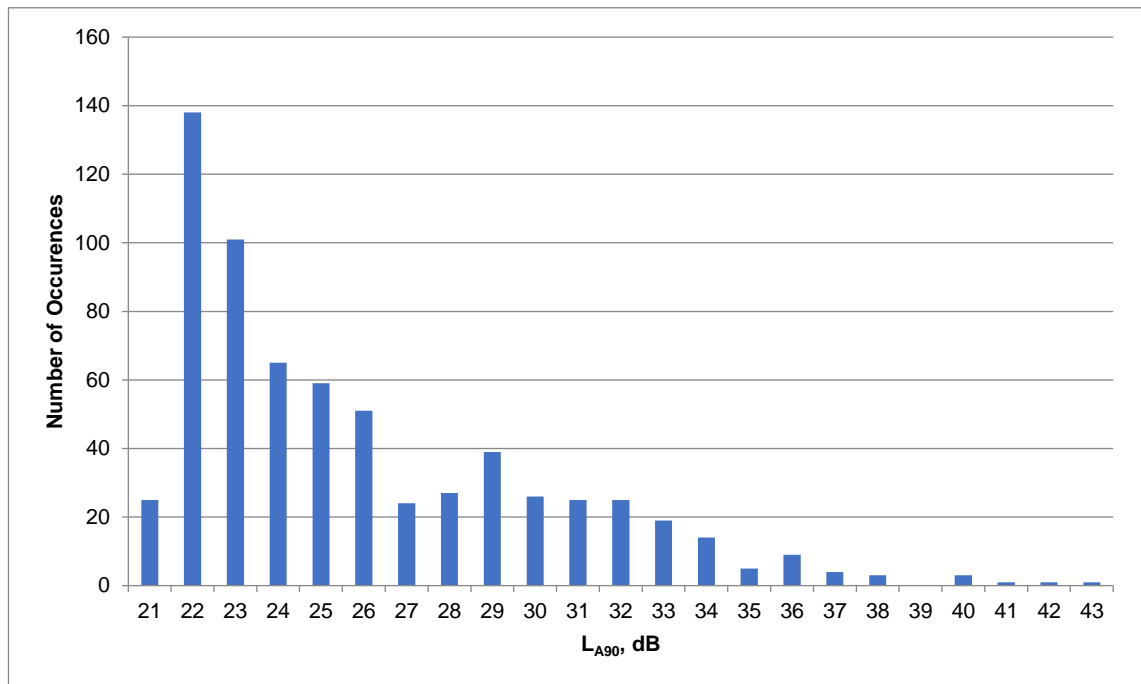


Figure 15.12: Existing Daytime Background Noise Level – Statistical Analysis LT2

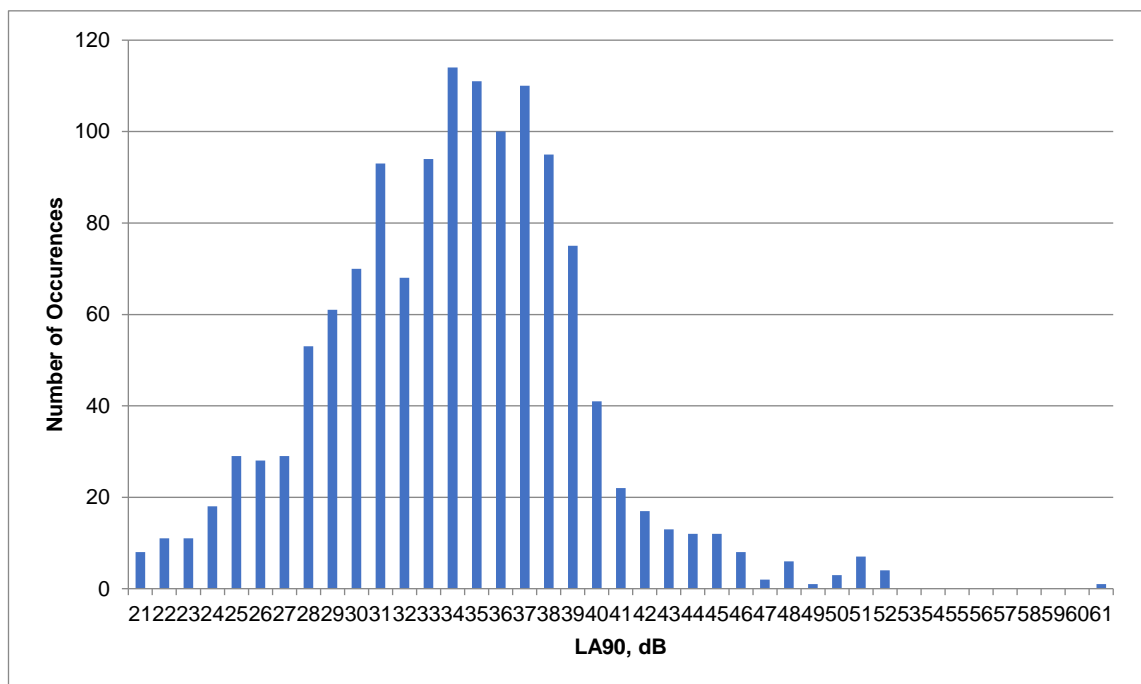
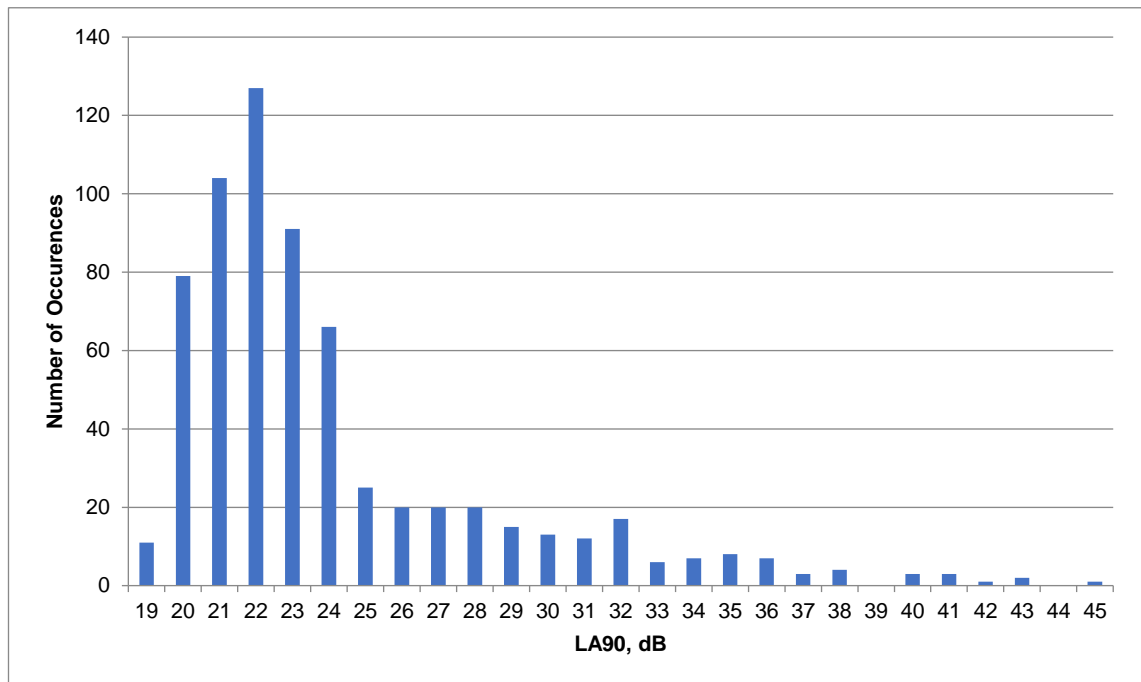


Figure 15.13: Existing Night-time Background Noise Level – Statistical Analysis LT2



Assessment Locations

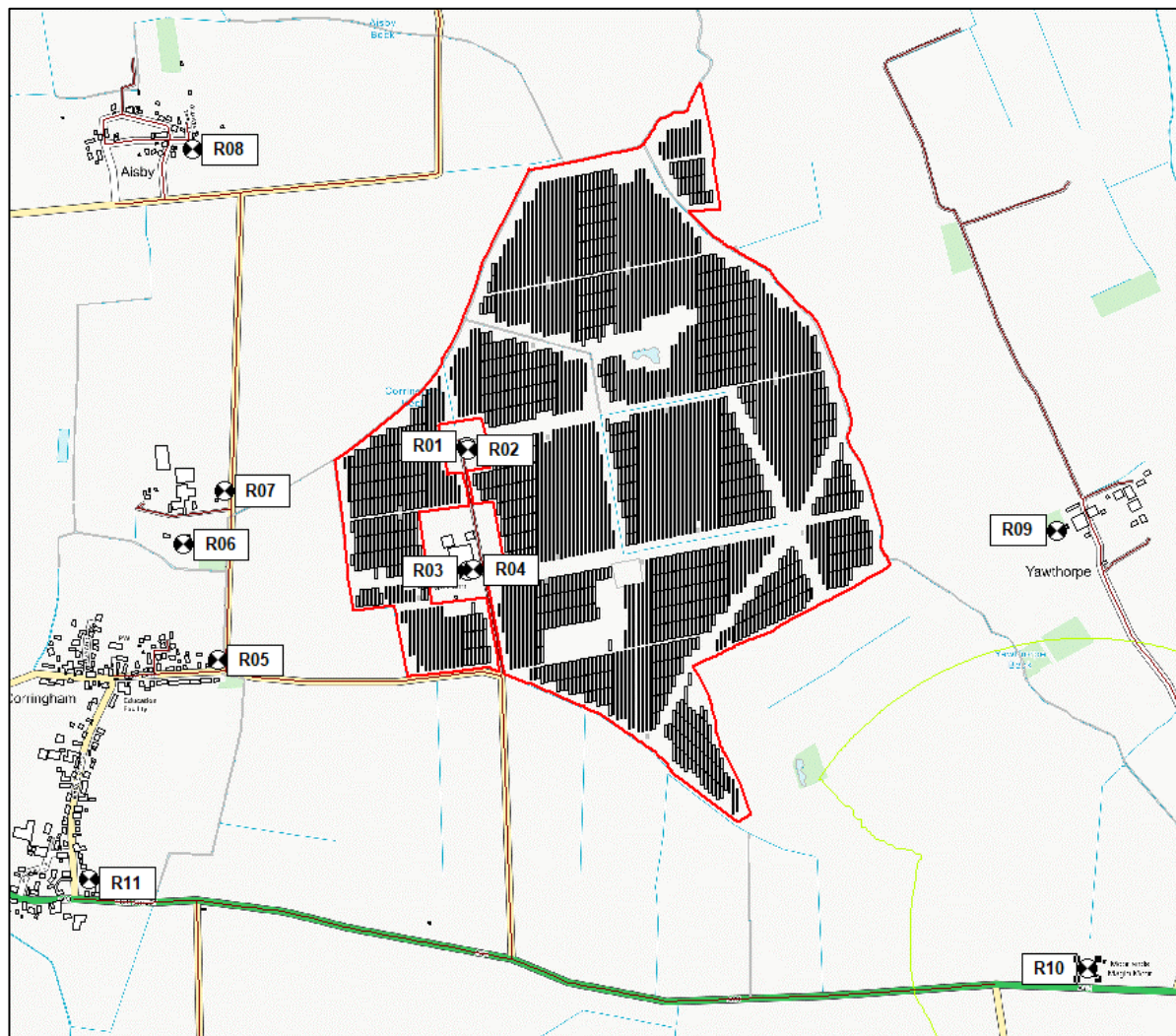
- 15.5.12 Residential properties located closest to the Scheme's infrastructure were identified using the site layout, presented in **Appendix 4.1**. These closest sensitive receptors are considered to be the most noise sensitive, as effects from the Scheme will be higher at these locations than at sensitive receptors located further from the Scheme.
- 15.5.13 Background sound levels measured at the properties detailed in Table 15.14 are considered to be representative of the background noise environments at other properties in similar nearby locations. Should the predicted noise levels from the Scheme comply with limits at the assessed receptors, predicted noise levels at receptors further from the Scheme will also comply.

15.5.14 Assessment locations are identified in Figure 15.14.

Table 15.13: Noise Assessment Locations

Ref	Description	Land Use Classification	Approximate Distance from Red-line Boundary (m)	Height of Receptors (m)
R01	The Cottage N	Residential	60	1.5 / 4.0
R02	The Cottage S	Residential	60	1.5 / 4.0
R03	Corringham Grange Farm W	Residential	70	1.5 / 4.0
R04	Corringham Grange Farm E	Residential	70	1.5 / 4.0
R05	25 East Lane	Residential	360	1.5 / 4.0
R06	The Old Hall	Residential	400	1.5 / 4.0
R07	Keepers Cottage	Residential	280	1.5 / 4.0
R08	54 Old Stack yard Lane	Residential	790	1.5 / 4.0
R09	Taskers Cottage	Residential	430	1.5 / 4.0
R10	Moorlands Magin Moor	Residential	950	1.5 / 4.0
R11	2 Middle Street	Residential	950	1.5 / 4.0

Figure 15.14: Sensitive Receptor Location Plan



Not to scale

Cottam 3a Noise Survey

- 15.5.15 The baseline noise environment has been established following a noise survey undertaken from Thursday 9th September 2021 to Thursday 16th September 2021. Attended 15-minute short-term measures were undertaken at four locations during the day, evening and night-time periods with two additional locations being measured unattended over a 169-hour period. Full details of the noise monitoring survey are presented within **Appendix 15.1**, with a brief summary provided below.
- 15.5.16 The dominant noise source found in the area is road traffic noise from Laughton Road, Kirkton Road and Church Road.

15.5.17 Statistical analysis of the long-term measured data, to derive representative background noise levels for the daytime and night-time periods are shown in Figures 15.15 – 15.20 below.

Figure 15.15: Existing Daytime Background Noise Level – Statistical Analysis LT1

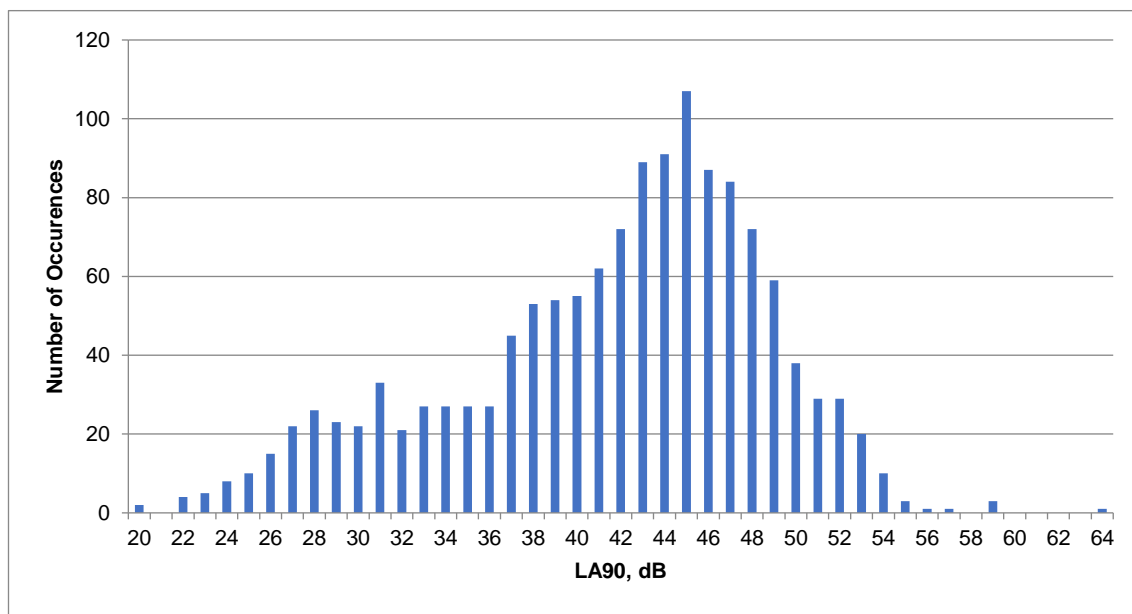


Figure 15.16: Existing Night-time Background Noise Level – Statistical Analysis LT1

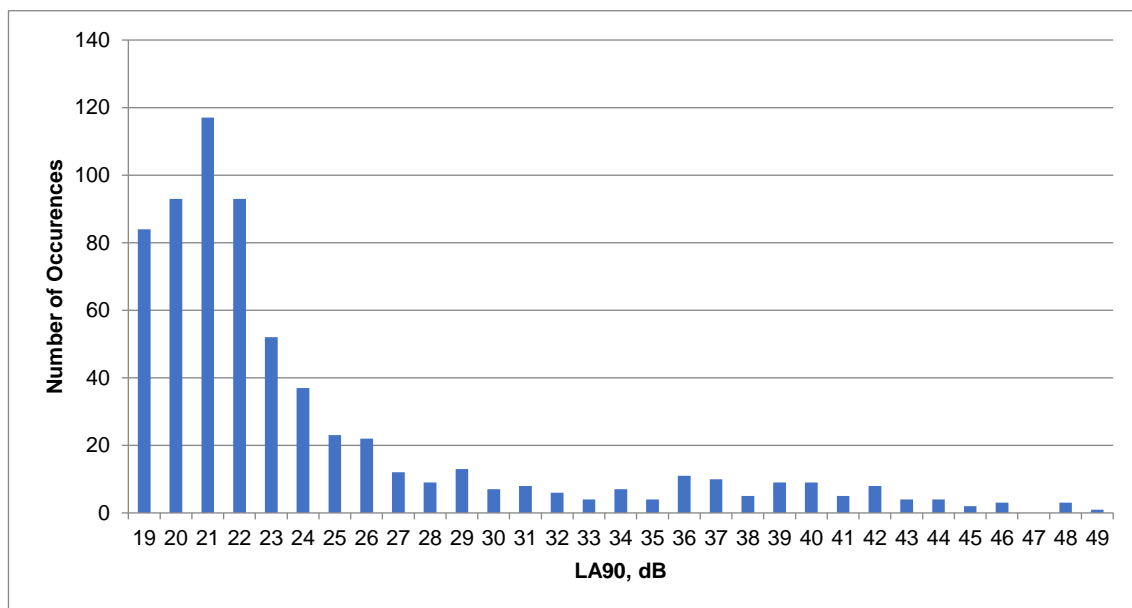


Figure 15.17: Existing Daytime Background Noise Level – Statistical Analysis LT2

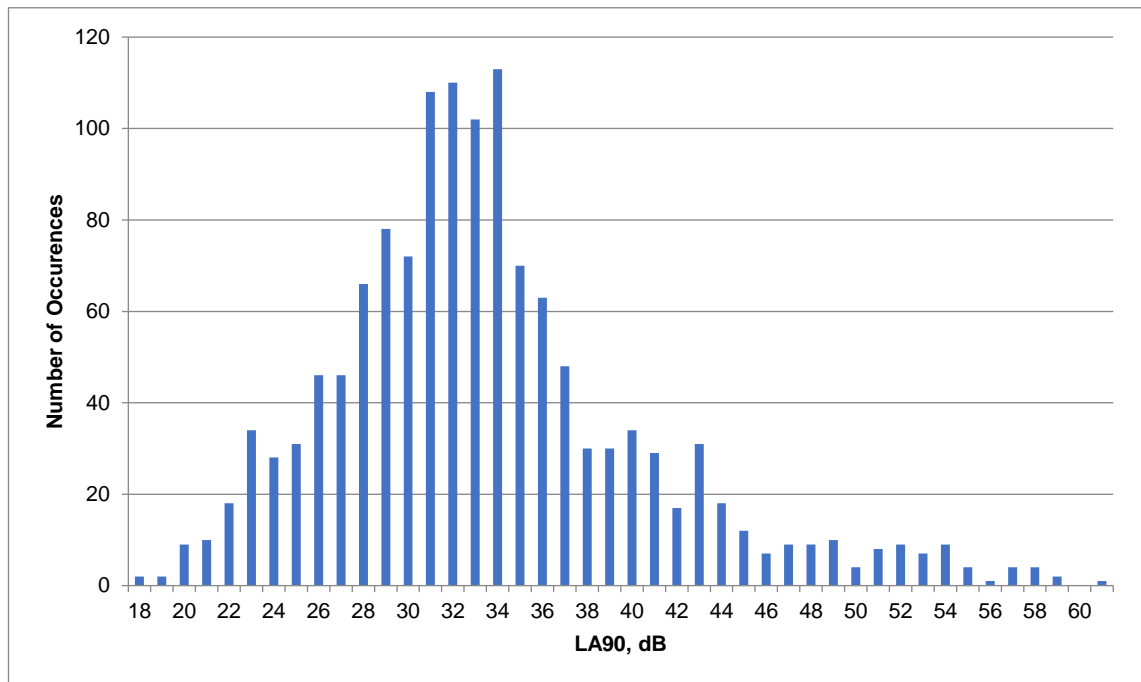


Figure 15.18: Existing Night-time Background Noise Level – Statistical Analysis LT2

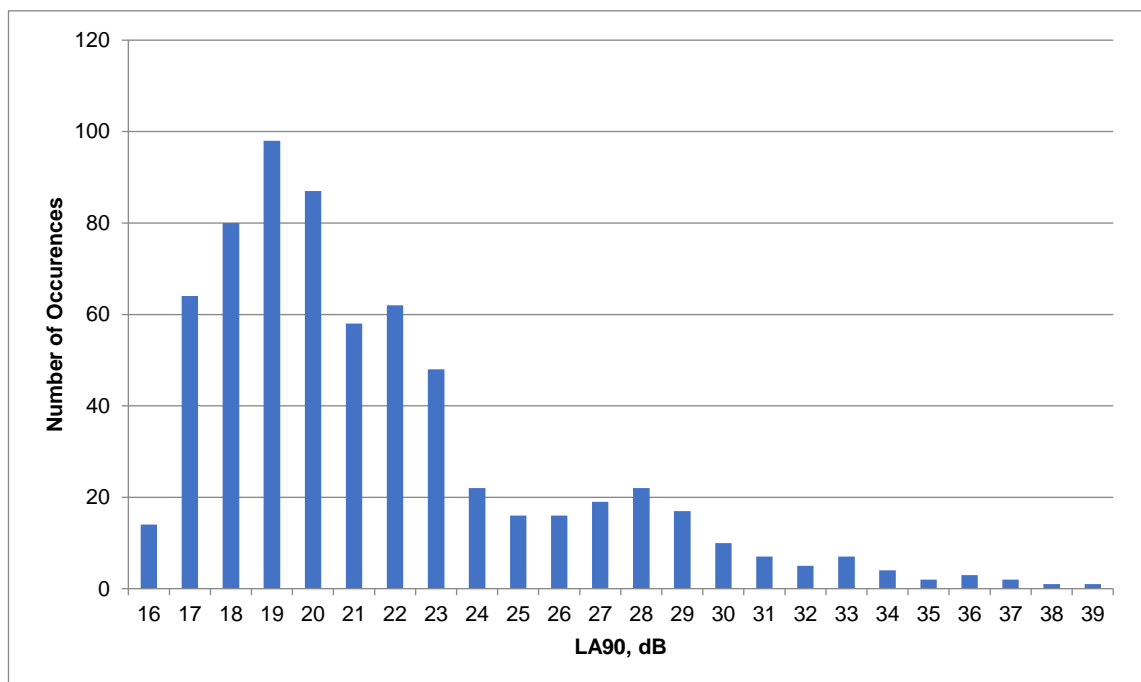


Figure 15.19: Existing Daytime Background Noise Level – Statistical Analysis LT3

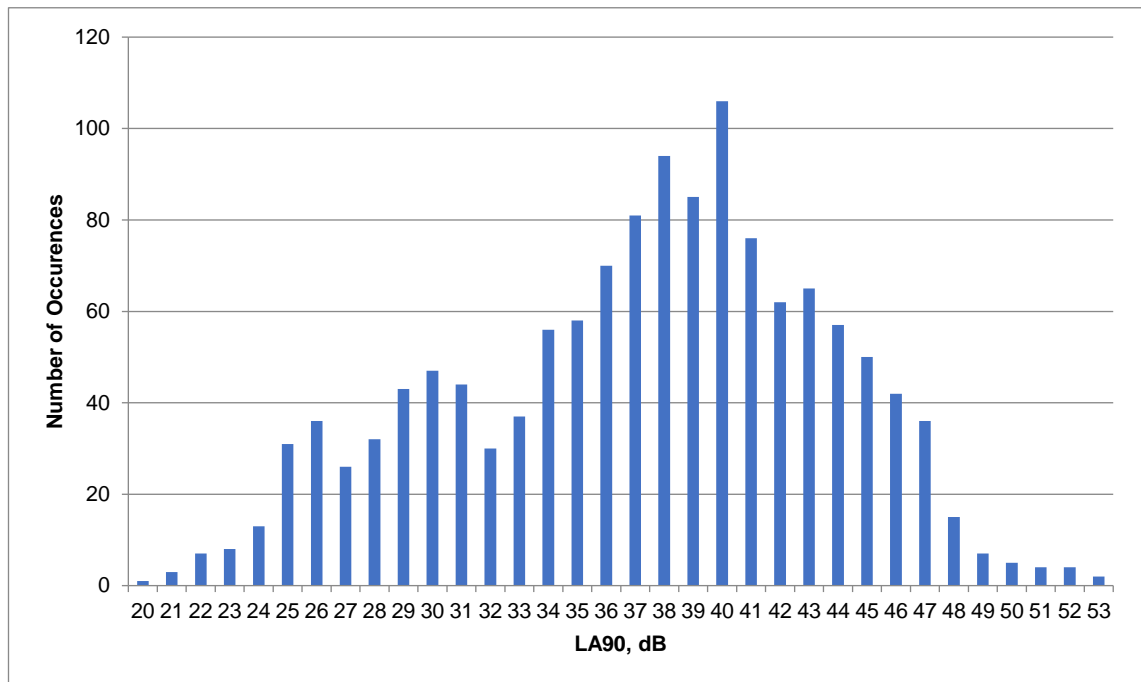
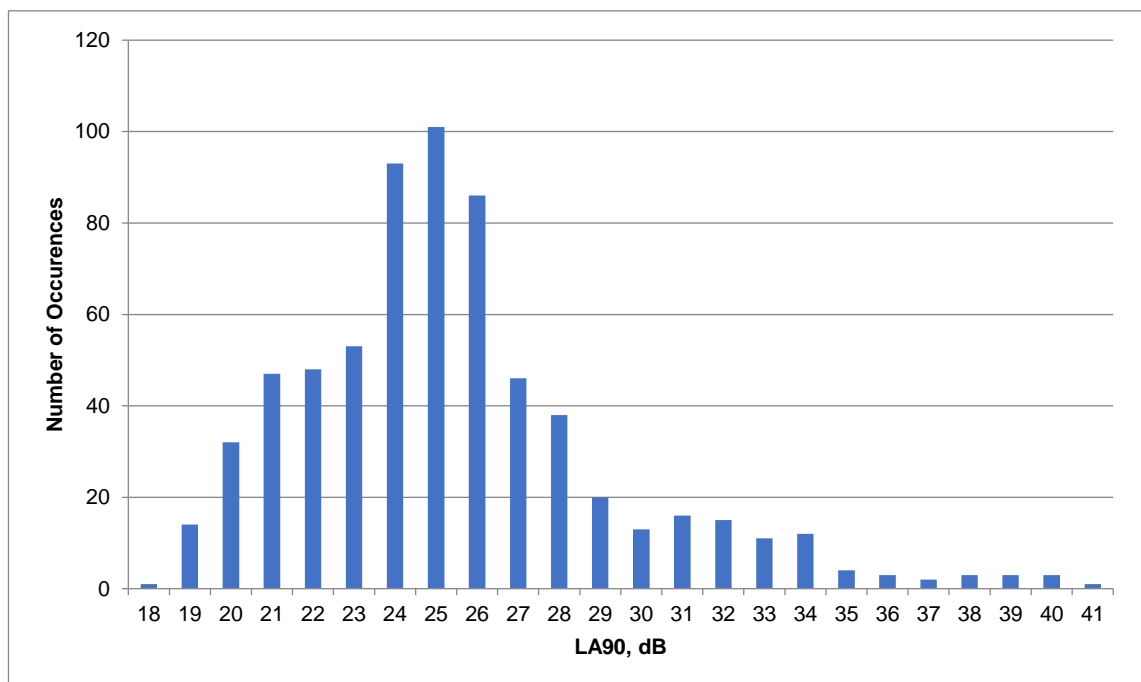


Figure 15.20: Existing Night-time Background Noise Level – Statistical Analysis LT3



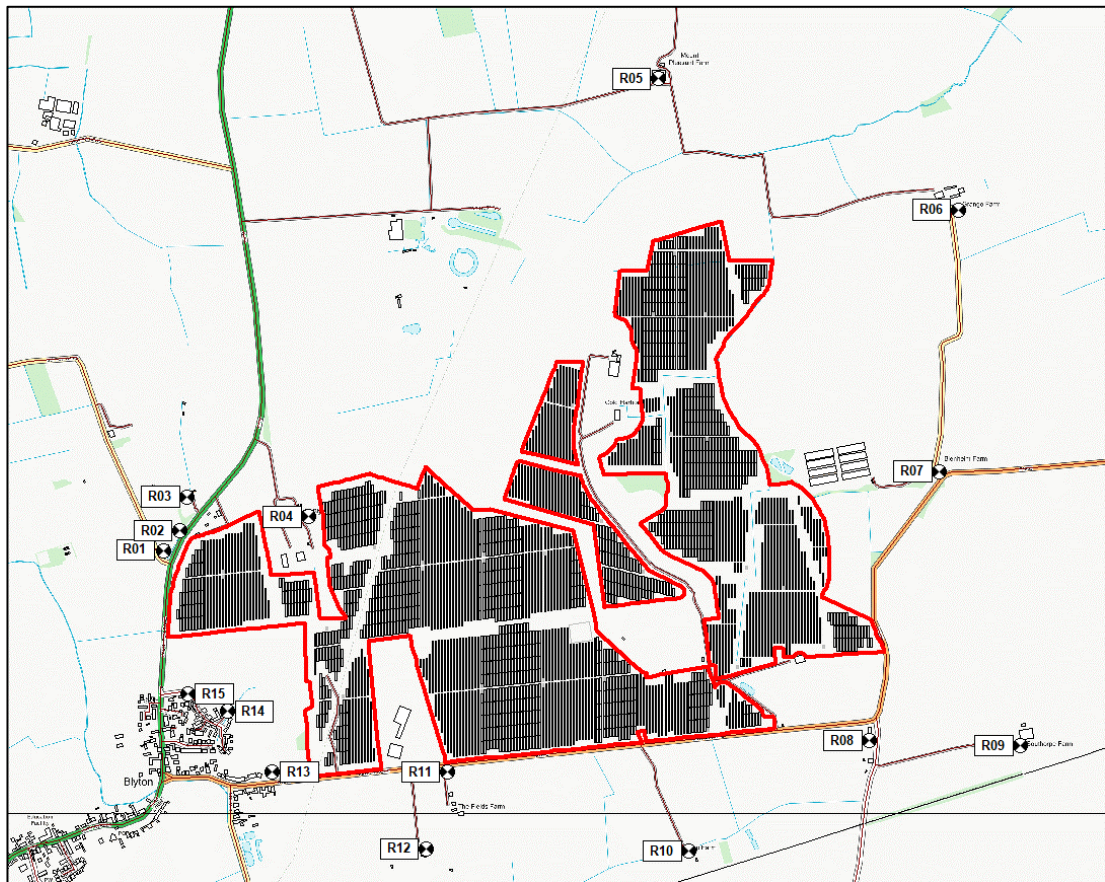
Assessment Locations

- 15.5.18 Residential properties located closest to the Scheme's infrastructure were identified using the site layout, presented in **Appendix 4.1**. These closest sensitive receptors are considered to be the most noise sensitive, as effects from the Scheme will be higher at these locations than at sensitive receptors located further from the Scheme.
- 15.5.19 Background sound levels measured at the properties detailed in Table 15.14 are considered to be representative of the background noise environments at other properties in similar nearby locations. Should the predicted noise levels from the Scheme comply with limits at the assessed receptors, predicted noise levels at receptors further from the Scheme will also comply.
- 15.5.20 Assessment locations are identified in Figure 15.21.

Table 15.14 Noise Assessment Locations

Ref	Description	Land Use Classification	Approximate Distance from Red-line Boundary (m)	Height of Receptors (m)
R01	Inglenook	Residential	65	1.5 / 4.0
R02	Grace Park Managers Residence	Residential	50	1.5 / 4.0
R03	Grace Park Caravan and Camping Site	Residential	130	1.5 / 4.0
R04	Blyton Grange	Residential	40	1.5 / 4.0
R05	Mount Pleasant Farm	Residential	510	1.5 / 4.0
R06	Grange Farm	Residential	640	1.5 / 4.0
R07	Blenheim Farm	Residential	410	1.5 / 4.0
R08	El-Bon	Residential	310	1.5 / 4.0
R09	Southorpe Farm	Residential	560	1.5 / 4.0
R10	Top Farm	Residential	380	1.5 / 4.0
R11	The Fields	Residential	950	1.5 / 4.0
R12	Grange Farm	Residential	300	1.5 / 4.0
R13	65 Kirton Road	Residential	120	1.5 / 4.0
R14	41 Irwin Road	Residential	250	1.5 / 4.0
R15	3 Irwin Road	Residential	200	1.5 / 4.0

Figure 15.21: Sensitive Receptor Location Plan



Not to scale

Cottam 3b Noise Survey

- 15.5.21 The baseline noise environment has been established following a noise survey undertaken from Thursday 9th September 2021 to Thursday 16th September 2021. Attended 15-minute short-term measures were undertaken at four locations during the day, evening and night-time periods with two additional locations being measured unattended over a 164-hour period. Full details of the noise monitoring survey are presented within **Appendix 15.1**, with a brief summary provided below.
- 15.5.22 The dominant noise source found in the area is road traffic noise from Station Road and Pilham Lane.
- 15.5.23 Statistical analysis of the long-term measured data, to derive representative background noise levels for the daytime and night-time periods are shown in Figures 15.22 – 15.25 below.

Figure 15.22: Existing Daytime Background Noise Level – Statistical Analysis LT1

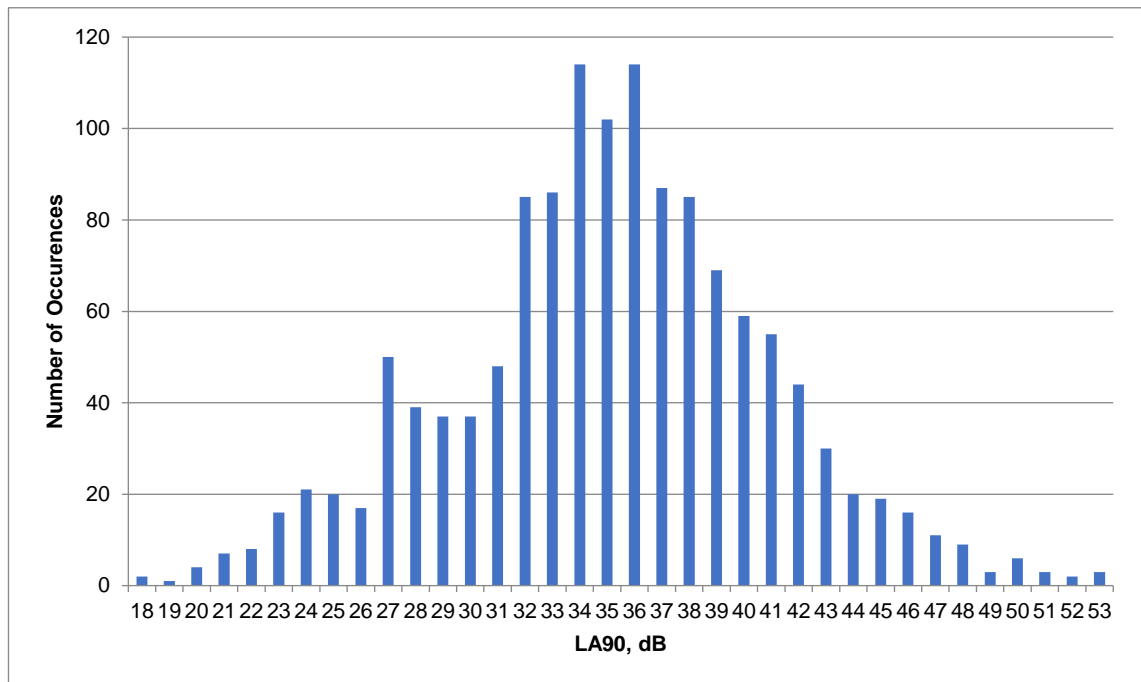


Figure 15.23: Existing Night-time Background Noise Level – Statistical Analysis LT1

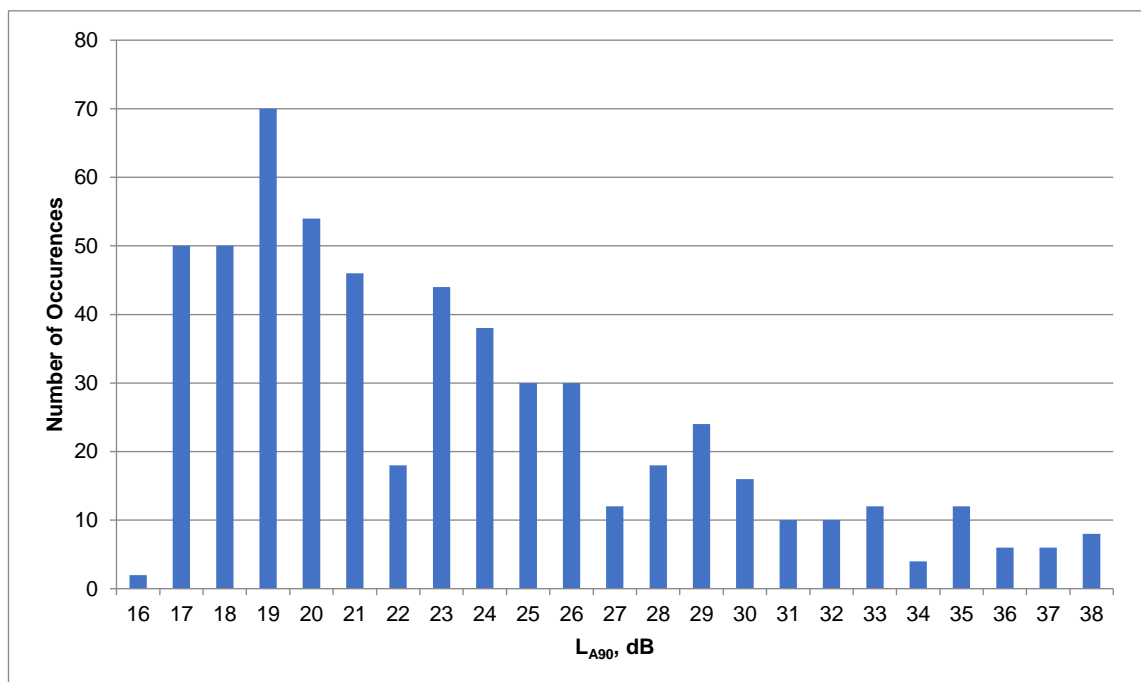


Figure 15.24: Existing Daytime Background Noise Level – Statistical Analysis LT2

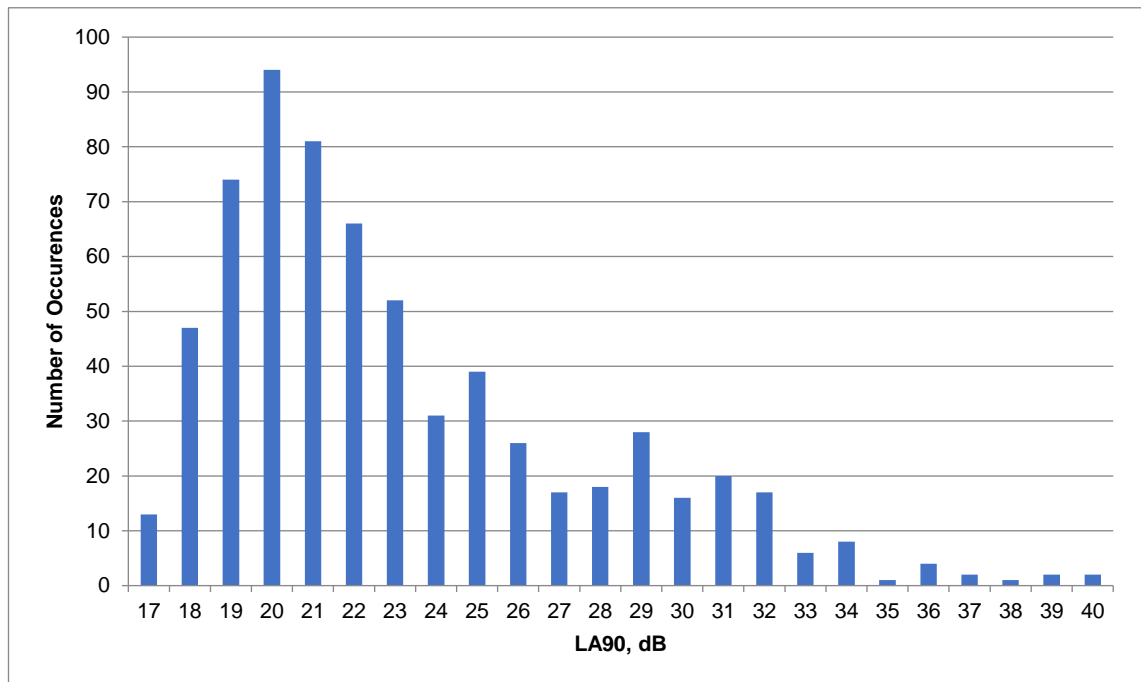
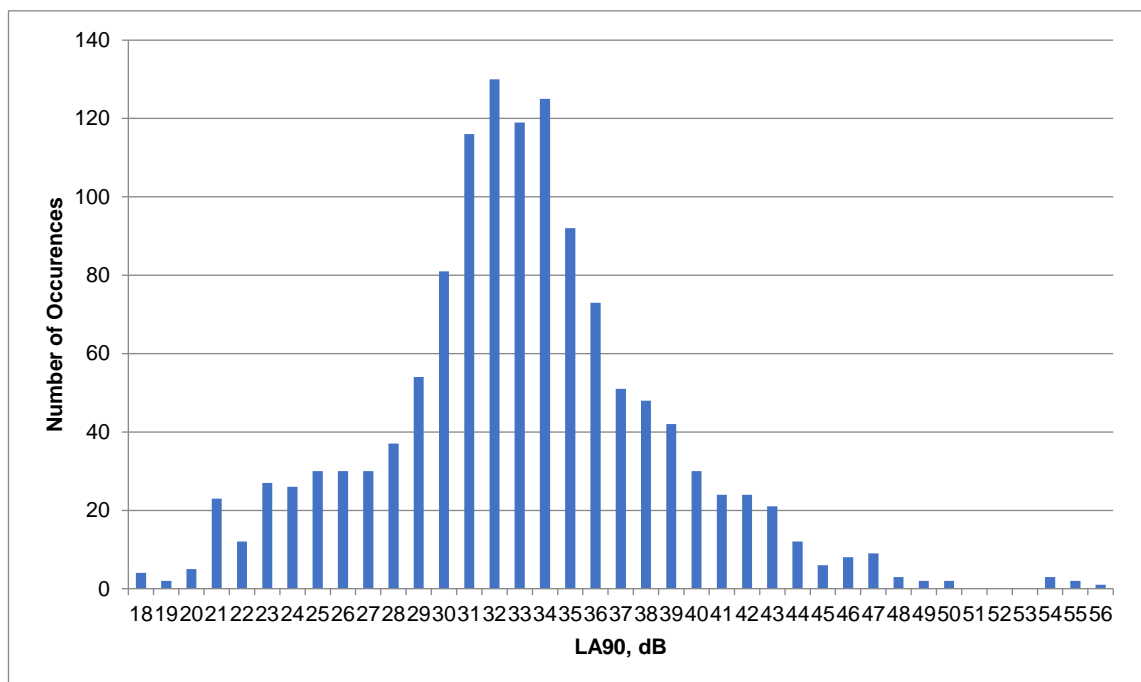


Figure 15.25: Existing Night-time Background Noise Level – Statistical Analysis LT2



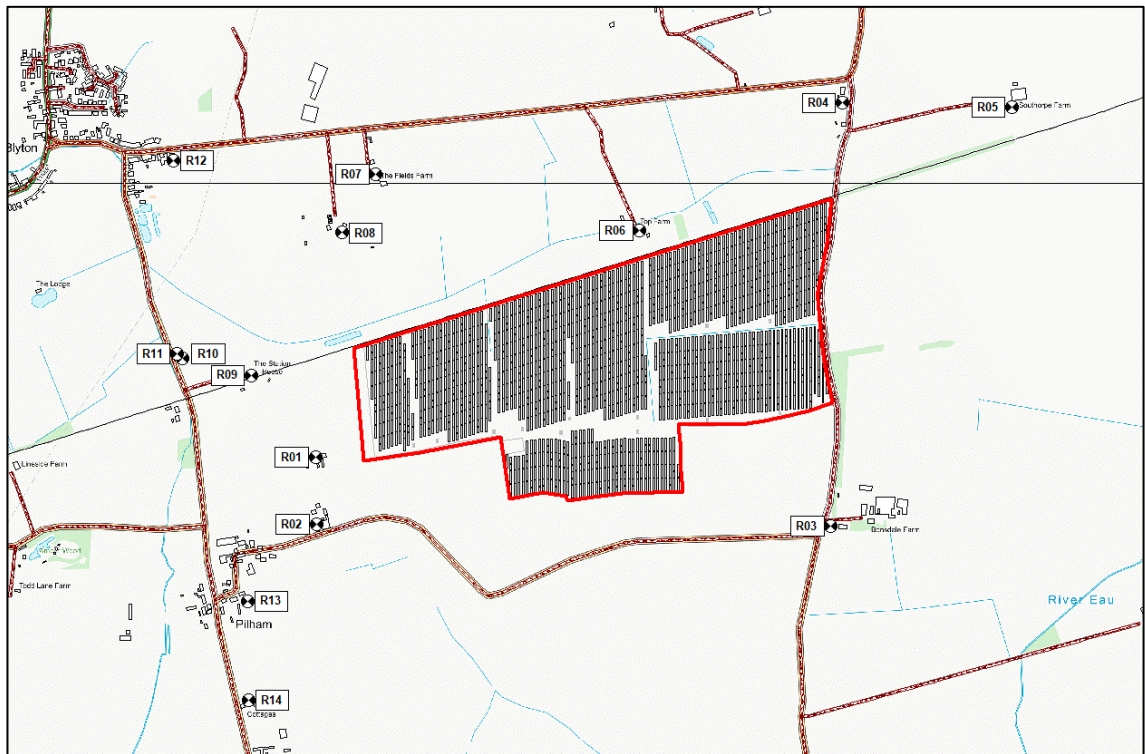
Assessment Locations

- 15.5.24 Residential properties located closest to the Scheme's infrastructure were identified using the site layout. These closest sensitive receptors are considered to be the most noise sensitive, as effects from the Scheme will be higher at these locations than at sensitive receptors located further from the Scheme.
- 15.5.25 Background sound levels measured at the properties detailed in Table 15.15 are considered to be representative of the background noise environments at other properties in similar nearby locations. Should the predicted noise levels from the Scheme comply with limits at the assessed receptors, predicted noise levels at receptors further from the Scheme will also comply.

Table 15.15: Noise Assessment Locations

Ref	Description	Land Use Classification	Approximate Distance from Red-line Boundary (m)	Height of Receptors (m)
R01	Glebe Farm	Residential	140	1.5 / 4.0
R02	Home Farm	Residential	230	1.5 / 4.0
R03	Tawny House	Residential	350	1.5 / 4.0
R04	El-Bon	Residential	280	1.5 / 4.0
R05	Southorpe Farm	Residential	600	1.5 / 4.0
R06	Top Farm	Residential	80	1.5 / 4.0
R07	The Fields Farm	Residential	460	1.5 / 4.0
R08	Grange Farm	Residential	320	1.5 / 4.0
R09	The Station House	Residential	300	1.5 / 4.0
R10	Kenroyd	Residential	490	1.5 / 4.0
R11	Fern Lea	Residential	510	1.5 / 4.0
R12	22 Kirton Road	Residential	770	1.5 / 4.0
R13	The Old Rectory	Residential	540	1.5 / 4.0
R14	Gilby Cottages	Residential	780	1.5 / 4.0

Figure 15.26: Sensitive Receptor Location Plan



Not to scale

15.6 Embedded Design Mitigation

- 15.6.1 The way that potential environmental impacts have been or will be prevented, avoided or mitigated to reduce impacts to a minimum through design and/or management of the Scheme is outlined in this section and will be taken into account as part of the assessment of the potential effects. Most of the equipment and activities utilised during construction and decommissioning will be the same and therefore noise emissions during these processes are expected to be similar. Proposed environmental enhancements are also described where relevant. The mitigation measures for both the construction/decommissioning and operational phases, are outlined below.

Construction

- 15.6.2 Measures to control noise as defined in Annex B of BS 5228-1 and measures to control vibration as defined in Section 8 of BS 5228-2 will be adopted where reasonably practicable. These measures represent BPM and are included within the Framework CEMP **Appendix 4.3**.
- 15.6.3 Examples of BPM that will be implemented during construction works are presented below:

- Unnecessary revving of engines will be avoided, and equipment will be switched off when not in use;
- Appropriate routing of construction traffic on public roads and along access tracks;
- Drop heights of materials will be minimised;
- Plant and vehicles will be sequentially started up rather than all together;
- Plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise- sensitive areas. Where possible, loading and unloading will also be carried out away from such areas; and
- Regular and effective maintenance by trained personnel will be undertaken to keep plant and equipment working to manufacturer's specifications.

15.6.4 Working hours onsite are likely to be carried out Monday to Friday 07:00 – 18:00 and between 08:00 and 13:30 on Saturdays. However, some activities may be required outside of these times (such as the delivery of abnormal loads, night-time working for cable construction works in public highways or horizontal direction drill activities).

15.6.5 A construction noise monitoring scheme shall be developed in the Outline CEMP (**Appendix 4.3**) and agreed with appropriate stakeholders following appointment of a principal contractor and prior to commencement of construction works as part of any Section 61 consent applications. Requirements for monitoring during the decommissioning stages will be outlined in the Decommissioning Environmental Management Plan which will be secured through the Requirements in the DCO.

15.6.6 Consideration will also be given to traffic routing, timing and access points to the DCO Site to minimise noise impacts at existing receptors as detailed construction working methods are developed. Management of Heavy Goods Vehicles (HGV) within the DCO Site and being let onto the highway network will be managed through a Framework Construction Traffic Management Plan (CTMP) and secured through a requirement in the DCO.

Operational Phase

15.6.7 Preliminary assessment of operational noise has been undertaken based on worst-case assessment criteria. The results of these assessments have been used to inform the design of development layouts. At this stage, due to very low existing background noise levels at many of the receptor locations, it is unclear whether guidance contained within BS4142:2014+A1:2019 or WHO guidance on internal noise levels will be the appropriate guidance for the noise assessment.

15.7 Identification and Evaluation of Key Effects

Construction Noise

- 15.7.1 The following main noise-generating activities will be assessed, although this does not cover all activities that could take place (e.g. works involving other static or moving plant items that will produce lower levels of noise):
- Site preparation, which will likely include the use of excavators and dozers;
 - Installation of solar PV panels, which will likely include the use of push press piling rigs and excavators; and
 - Trenching and installation of the cable route, which will likely include the use of excavators and dozers.
- 15.7.2 Typical noise levels from these types of activities with multiple plant carrying out heavy ground works can be up to 85 dB $L_{Aeq,T}$ at a distance of 10m, without the use of any noise reduction measures e.g. equipment in continuous use and no site hoarding or acoustic barriers in place.
- 15.7.3 Construction noise levels at surrounding receptors will vary depending on the locations and types of works taking place. Due to the variation in construction works activities and locations across the DCO Site, it is considered that any periods of regular high construction noise levels experienced at a receptor would be of a limited short-term duration (i.e. less than one month). Occupants of nearby receptors are likely to be more tolerable of these events if they are provided with timings and duration of high noise generating events.
- 15.7.4 In practice, for the majority of the construction activities, high-noise works will take place at farther distances from a receptor such that construction noise levels would only likely exceed the LOAEL. As exceedances of the LOAEL are likely to occur throughout the construction programme, all reasonable steps will be taken to mitigate and minimise the effects through adoption of BPM.
- 15.7.5 Exceedances of the SOAEL are unlikely to take place due to the fact that BPM will be adopted and secured through the CEMP. For example, the use of temporary acoustic barriers can provide approximately 10 dB of noise attenuation which can reduce noise levels to below the SOAEL.
- 15.7.6 Typical construction noise levels across the overall duration of the construction programme will likely be limited to a low magnitude impact; for receptors of high sensitivity this equates to a moderate adverse effect which is not significant.

Construction Vibration

- 15.7.7 BS 5228-2 makes reference to the Transport Research Laboratory (TRL) report 429 'Groundborne Vibration Caused by Mechanised Construction Works' (2000). Figure 50 of the TRL report indicates that ground vibration from miscellaneous vehicle operations on construction sites (including scrapers, rollers, dumpers, breakers, dozers and HGVs) are in the region of 1 mm/s PPV at approximately 10m, decreasing to the region of 0.1 mm/s PPV at approximately 50m.
- 15.7.8 Actual vibration levels from works are dependent on a number of factors including ground conditions, plant or vehicle size, the nature of the works (in particular piling methods), the speed of HGV movements and the quality of surface of haul or other temporary roads. Based on the assumed HGV speeds on access routes and regular maintenance of access route road surfaces, vibration from vehicles on the access roads will be minimised.
- 15.7.9 BS 5228-2 indicates that impact or vibratory piling activities generally only generate vibration impacts when they are located less than 20m from sensitive locations. The impact depends on the type of piling, ground conditions, and receptor distance. Vibration from smaller scale push piling techniques, which are proposed be used for the installation of solar module mounting structures, are generally limited to 1 mm/s for distances up to 10m.
- 15.7.10 Based on the distances between the DCO boundary and surrounding receptors to locations where heavy ground works (excavation, push piling) may take place, it is considered that vibration from construction works experienced at sensitive receptors will be below the LOAEL and therefore limited to very low adverse magnitude impacts as per the criteria. For receptors of high sensitivity this would be equivalent to a moderate effect, which is not significant.
- 15.7.11 Vibration levels from activities (including on-site works and construction HGV traffic) are anticipated to be below the level at which there is any potential for cosmetic damage to structures as per the criteria in Table 15.6 and as such is a negligible effect which is not significant.
- 15.7.12 It is considered that any periods of construction vibration experienced at a receptor would unlikely exceed one month, with no permanent residual effect once works are completed. As such, any construction vibration effects are considered to be short-term in duration

Construction Traffic Noise

- 15.7.13 At this stage details of HGV movements associated with the construction phase of the scheme are not yet confirmed. Therefore, the assessment of construction traffic noise will be included in the ES. However, Table 14.9 in Chapter 14 (Transport and access) of the PEIR provides a forecast of construction vehicle trips for each of the three Sites considered. Based on the worst-case value of 23 trips per day at Cottam 1, the impact of noise from construction related HGV movements is likely to be insignificant.

Operational Noise

- 15.7.14 At this stage, we are currently in discussions with the LPAs regarding assessment criteria, with regard to the rural settings of the scheme and the relatively low existing background noise levels. Therefore, the operational noise assessment will be included in the ES. However, through the use of careful design and mitigation including barriers and enclosures, the impact of operational noise on sensitive receptors is expected to be insignificant.

15.8 In-Combination Effects

- 15.8.1 In-combination effects will be assessed in the ES.

15.9 Cumulative Effects

- 15.9.1 A 'long list' of potential cumulative development sites is provided in **Appendix 2.2** of the PEIR and the more substantial developments are shown on the plan at **Appendix 2.3**. Of particular relevance to any cumulative assessment is the West Burton Solar Project and Gate Burton Solar Project (both NSIP schemes).
- 15.9.2 We have examined the following projects (or potential projects) for the cumulative assessment, which are considered to have the potential to have a transport impact effect on the Study Area:
- West Burton Solar Project
 - Gate Burton Energy Park
 - EDF West Burton C
 - Decommissioning of West Burton A
 - Saxilby Heights
 - Development at Land off Sturton Road

- Blyton Driving Centre
- Wood Lane Solar Farm

15.9.3 Cumulative noise effects during construction and operation phases may occur when developments are within 500m of a common receptor. At greater distances, any noise emissions would be attenuated such that there would normally be no combined effect.

15.9.4 At this stage of the EIA, developments that may give rise to cumulative noise effects with the Scheme have not yet been fully assessed and will be addressed in the ES. Whilst it is not possible to definitely state the significance of cumulative impacts, based on an initial review of the list and their nature and distance from the developments, it is not expected that cumulative schemes would elevate any of the residual effects identified in this assessment. At worst, the cumulative effect is expected to be moderate adverse, for example if any construction phases associated with any cumulative schemes overlap with the Scheme or if they include noisy operational emissions within 500m of the Scheme Site.

15.10 Additional Mitigation Measures

15.10.1 At this stage, no additional mitigation measures for the construction/decommissioning phases are considered to be required given that no significant adverse effects are expected. However, this will be investigated further within the ES.

15.11 Residual Effects

15.11.1 Whilst at this stage of the project, residual effects have not been fully assessed, it is anticipated that through the use of further mitigation measures (e.g. selection of quieter plant, positioning of noise-emitting equipment away from sensitive receptors, and the use of enclosures, louvres and/or acoustic barriers around inverters and energy storage system cooling fans), operational noise from associated solar farm plant will result in no significant residual adverse effects.

16 Glint and Glare

16.1 Introduction

16.1.1 This chapter sets out the preliminary assessment carried out to determine the potential effects generated by the Scheme during construction and operation in relation to glint and glare. This chapter relates to the potential level of effects associated with the following receptors for which specific study areas have been defined:

- Road users – specifically drivers of motor vehicles;
- River users;
- Occupants of surrounding dwellings;
- Railway operations and infrastructure; and
- Aviation activity surrounding RAF Scampton, Sturgate Airfield.

16.2 Assessment Methodology

16.2.1 There is no formal guidance with regard to the maximum distance at which glint and glare should be assessed. From a technical perspective, there is no maximum distance for potential reflections. However, the significance of a solar reflection decreases with distance. This is because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. In most instances, terrain and shielding by vegetation are also more likely to obstruct an observer's view at greater distances.

16.2.2 The considerations presented above and extensive experience over a significant number of glint and glare assessments undertaken shows that a 1km study area is considered appropriate for glint and glare effects on local dwellings and road users, 500m for railway operations and infrastructure and 15km for aviation activity. In most cases the assessed distance is much less than this due to the likelihood of visibility to a solar development typically reducing with distance as a result of the relatively low lying nature of the solar panels (ground level receptors only).

16.2.3 The initial judgement for selecting receptors is made based on high-level consideration of aerial photography and mapping i.e. receptors are excluded if it is clear from the outset that no visibility would be possible. A more detailed assessment is made if the modelling reveals a reflection would be geometrically possible.

Assessment Process

16.2.4 The glint and glare assessment methodology set out in this Chapter has been derived from the information provided to the Applicant and its consultants through consultation with stakeholders, assessment experience and by reviewing the available guidance and studies. The methodology for ground level glint and glare assessments is as follows:

- Identify the key receptors in the area surrounding the Scheme;
- Consider direct solar reflections from the Scheme towards the identified receptors by undertaking geometric calculations based on the proposed panel options as set out in Chapter 4;
- Consider the visibility of the panels from the receptor's location. If the panels are not visible from the receptor, then no reflection can occur;
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur;
- For aviation receptors consider the solar reflection intensity;
- Consider the intensity of the solar reflection from the Scheme in relation to aviation activity;
- Consider both the solar reflection from the Scheme and the location of the direct sunlight with respect to the receptor's position;
- Consider the solar reflection with respect to the published studies and guidance - including intensity calculations where appropriate; and
- Determine whether a significant detrimental impact is expected in line with Pager Power's standard process and recommended methodology.

16.2.5 Regard has been had to the EIA Scoping Opinion issued by PINS in March 2022. The responses from this are set out in the table below. Consultation with other bodies is described throughout the Chapter.

Table 16.1: Consultation responses

Consultee and Date	Response
The Planning Inspectorate, Scoping Opinion, March 2022	No matters have been proposed to be scoped out of the assessment

Consultee and Date	Response
The Planning Inspectorate, Scoping Opinion, March 2022	Sensitive receptors for glint and glare impacts are listed in Scoping Report paragraph 16.1.1. This does not include river users. The Cottam one site is located adjacent/near navigable waterways and therefore there remains potential for glint and glare to impact on users of the navigation. The ES should assess glint and glare impacts to river users where significant effects are likely to occur.

16.3 Study Area

- 16.3.1 A 1km distance surrounding the development is considered appropriate for road users and dwellings. The following receptors have been identified:
- Residential dwellings; and
 - National and Regional roads.
- 16.3.2 A 500m distance surrounding the development is considered appropriate for rail operations and infrastructure; the 500m area surrounding the Scheme contains the following rail infrastructure:
- Sections of railway line; and
 - Identified railway signals.
- 16.3.3 A 15km distance surrounding the development is considered appropriate for aviation considering the type of aerodromes scoped. The 15km assessment area surrounding the Scheme contains the following licensed or military aerodromes:
- Sturgate Airfield – 4km north-west of Cottam 1.
 - RAF Scampton – 4.1km north-east of Cottam 1.
- 16.3.4 The main source of irradiance in the area will be the sun, which is a more intense source of light than solar reflections from solar photovoltaic panels. Road users, pilots and train drivers are already aware of safety implications when navigating in bright sunlight.

16.4 Sensitivity of Receptors

Environmental Receptor – Road User

- 16.4.1 Sensitivity and tolerance to change: For road user receptors, it is relevant to consider that road types can generally be categorized as:
- Major National – Typically a road with a minimum of two carriageways with a maximum speed limit of up to 70mph. These roads typically have fast moving vehicles with busy traffic.
 - National – Typically a road with a one or more carriageways with a maximum speed limit of up to 60mph or 70mph. These roads typically have fast moving vehicles with moderate to busy traffic density.
 - Regional – Typically single carriageways with a maximum speed limit of up to 60mph. The speed of vehicles will vary with a typical traffic density of low to moderate.
 - Local – Typically roads and lanes with the lowest traffic densities. Speed limits vary.
- 16.4.2 Local roads would be considered as ‘Low’ sensitivity and Regional, National, and Major National roads would be considered of ‘Medium’ sensitivity.
- 16.4.3 Magnitude of impact: The magnitude of effect upon road user receptors is predominantly dependent on the following factors:
- The distance between the receptor and the panel area – a study area of one kilometre is applied;
 - The type of road – in the context of traffic speeds and likely densities;
 - Whether a solar reflection is predicted to be experienced in practice; and
 - The location of the reflecting panels relative to a road user’s direction of travel – a solar reflection directly in front of a driver is more hazardous than a reflection from a location off to one side.
- 16.4.4 A ‘Negligible’ magnitude would occur if solar reflections are not geometrically possible or are not predicted to be experienced by a road user.
- 16.4.5 A ‘Low’ magnitude would occur if solar reflections would all originate from outside a road user’s main field of view. Reflections originating within a road user’s main field of view can be of ‘Low’ magnitude based on consideration of the following mitigating circumstances:
- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers along dual carriageways and motorways compared to other types of road;

- The separation distance to the panel area – larger separation distances reduce the proportion of an observer’s field of view that is affected by glare; and
- The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not.

16.4.6 A ‘Medium’ magnitude would occur if solar reflections were experienced from within a driver’s main field of view and there are insufficient mitigating factors.

16.4.7 A ‘High’ magnitude would occur if solar reflections were experienced from directly in front of a road user’s direction of travel with no mitigating factors.

Environmental Receptor – Dwelling Occupants

16.4.8 Sensitivity and tolerance to change: ‘Low’ because they are of local importance.

16.4.9 Magnitude of impact: The magnitude of effect upon dwelling receptors is predominantly dependent on the following factors:

- The distance between the receptor and the panel area – a study of one kilometre is applied;
- Whether a solar reflection is predicted to be experienced in practice; and
- The duration of the predicted effects, relative to the thresholds of three months per year and sixty minutes per day.

16.4.10 A ‘Negligible’ magnitude would occur if solar reflections are not geometrically possible or are not predicted to be experienced by an observer within a dwelling.

16.4.11 A ‘Low’ magnitude would occur when a solar reflection would be experienced for less than three months per year and for less than sixty minutes per day, or outside of these limits based on consideration of the following mitigating circumstances:

- The separation distance to the panel area – larger separation distances reduce the proportion of an observer’s field of view that is affected by glare;
- The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not;
- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity; and

16.4.12 Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact.

16.4.13 A 'Medium' magnitude would occur if solar reflections were experienced for more than three months per year and for more than sixty minutes per day.

16.4.14 A 'High' magnitude would occur if solar reflections were experienced for more than three months per year and for more than sixty minutes per day.

Environmental Receptor – Rail Operations and Infrastructure

16.4.15 Sensitivity and importance: Railway operations are typically considered to be of 'Medium' sensitivity because they are of regional to national importance with a low to moderate capacity to absorb change.

16.4.16 Magnitude of impact: The magnitude of effect upon train drivers' receptors is predominantly dependent on the following factors:

- Whether a solar reflection is predicted to be experienced in practice;
- The location of the reflecting panels relative to a train drivers' direction of travel – a solar reflection directly in front of a driver is more hazardous than a reflection from a location off to one side; and
- The estimated workload of the driver at the location glare is predicted i.e. is there a station or signal present.

16.4.17 A 'Negligible' magnitude would occur if solar reflections are not geometrically possible or are not predicted to be experienced by a train driver.

16.4.18 A 'Low' magnitude would occur if solar reflections would all originate from outside a train drivers' main field of view (30 degrees either side of the direction of travel). Reflections originating within a train drivers' main field of view can be of 'Low' magnitude based on consideration of the following mitigating circumstances:

- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare; and
- The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not.

16.4.19 A 'Medium' magnitude would occur if solar reflections were experienced from within a train drivers' main field of view and there are insufficient mitigating factors.

16.4.20 A 'High' magnitude would occur if solar reflections were experienced from directly in front of a train drivers' direction of travel with no mitigating factors.

Environmental Receptor – Aviation

16.4.21 Sensitivity and importance: Aviation receptors are typically considered to be of 'Medium' sensitivity because they are of regional to national importance with a low to moderate capacity to absorb change. The interim CAA guidance does not say anything specific about glint and glare.

16.4.22 Magnitude of impact: See below for aviation receptor types.

Air Traffic Control (ATC) Tower

16.4.23 The magnitude of effect upon the ATC Tower receptors is dependent on the following main factors:

- Whether a solar reflection is predicted to be experienced in practice;
- The glare intensity and duration - a reflection of greater intensities and prolonged time periods have a higher impact upon ATC Tower personnel;
- Proportion of an observer's field of vision that is taken up by the reflecting area; and
- Glare location relative to key operational areas – a solar reflection originating near sensitive areas such as the runway threshold will have a higher impact upon the ATC Tower personnel.

16.4.24 A 'Negligible' magnitude would occur if solar reflections are not geometrically possible, or are not predicted to be experienced by ATC personnel.

16.4.25 A 'Low' magnitude would occur if solar reflections were experienced by ATC personnel but there are sufficient mitigating main factors, or the aerodrome confirmed the level of glare is acceptable.

16.4.26 A 'Medium' magnitude would occur if solar reflections were experienced by ATC personnel and effects occasionally and marginally affected the safeguarding operations.

16.4.27 A 'High' magnitude would occur if solar reflections were experienced by ATC personnel and the safeguarding operations were regularly and substantially affected.

Approach Paths

16.4.28 The magnitude of effect upon aircraft approaching a runway (also referred as approach paths) is dependent on the following main factors:

- Whether a reflection is predicted to be experienced in practice;

- The location of glare relative to the approach bearing – a solar reflection directly in front of a driver is more hazardous than a reflection from a location off to one side;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not; and
- Existing reflecting surfaces – a solar reflection is less noticeable by pilots when there are existing reflective surfaces in the surrounding environment.

16.4.29 A 'Negligible' magnitude would occur if solar reflections are not geometrically possible.

16.4.30 A 'Low' magnitude would occur under the following scenarios:

- Solar reflections originate from outside a pilot's main field of view;
- The glare has a 'low potential for temporary after-image';
- The glare has a 'potential for temporary after-image' with sufficient mitigating factors; and
- The aerodrome has confirmed the level of glare is acceptable.

16.4.31 A 'Medium' magnitude would occur if the glare has 'potential for temporary after-image' without sufficient mitigating main factors.

16.4.32 A 'High' magnitude would occur off solar reflections if the glare has 'potential for permanent eye damage'.

Environmental Receptor – Public Rights of Way (PROW)

16.4.33 In Pager Power's experience, significant impacts to pedestrians/observers along PROWs are not likely due to glint and glare effects from the Scheme. The reasoning is due to the sensitivity of the receptors (in terms of amenity and safety) being concluded to be of low significance. This is because:

- The typical density of pedestrians on a PROW is low in a rural environment;
- Any resultant effect is much less serious and has far lesser consequences than, for example, solar reflections experienced towards a road network whereby the resultant impacts of a solar reflection can be much more serious;
- Glint and glare effects towards receptors on a PROW are transient, and time and location sensitive whereby a pedestrian could move beyond the solar reflection zone with ease with little impact upon safety or amenity;

- Any observable solar reflection to users of the PROW would be of similar intensity to those experienced whilst navigating the natural and built environment on a regular basis.

16.4.34 The PROWs surrounding the Scheme have therefore not been assessed in detail within the technical glint and glare assessment because any resultant impact would be deemed low, requiring no mitigation.

Environmental Receptor – River Users

16.4.35 In Pager Power's experience, significant impacts to river users are not likely due to glint and glare effects from the Scheme. This view is supported by initial consultation with the Canals and Rivers Trust who have stated *"The canal and river are more than 1km from the solar fields proposed. From our point of view, if the report addresses that receptors more than this distance away will not suffer ill effects (with information to back that up), I believe we would be satisfied with the information provided."*

16.4.36 The river users surrounding the Scheme have therefore not been assessed in detail within the technical glint and glare assessment. Consideration will be given in the ES if required.

16.5 Potential and Likely Environmental Effects

16.5.1 The following potential effects were identified at the scoping stage for consideration in this assessment:

- Direct effects during construction and operation from glint and glare on:
 - Ground-based receptors (roads and dwellings);
 - Aviation activity surrounding RAF Scampton and Sturgate Airfield;
 - Railway operations and infrastructure (train drivers).
- There are no indirect effects during construction or operation from glint and glare.

Road Users

16.5.2 The magnitude of impact upon a maximum of an approximately 2500m of Kirton Road at Cottam 3a is classified as 'medium' due to effects occurring within a driver's main field of view. The resulting significance of effect would be moderate due to the 'medium' sensitivity of the type of receptor.

- 16.5.3 The worst-case magnitude of impact upon the remaining sections of road is 'low' due to mitigating factors that will sufficiently reduce the level of impact. The resulting significance of effect is minor and not significant.

Dwellings

- 16.5.4 Initial analysis has shown that there will be dwellings that experience an impact which is classified as 'medium' in the worst-case. This is due to effects being predicted to be experienced for more than three months per year but less than 60 minutes per day, and a lack of sufficient mitigating factors such as intervening planting/screening. The resulting significance of effect would be moderate and significant.
- 16.5.5 The worst-case magnitude of impact upon the remaining dwellings is low or negligible due to effects occurring for more than three months per year but less than 60 minutes per day with mitigating factors; effects occurring for less than three months per year and less than 60 minutes per day or no geometric reflections possible towards the dwelling. The resulting significance of effect would be minor and not significant.

Aviation

- 16.5.6 The worst-case magnitude of impact upon RAF Scampton would be medium due to glare with 'potential for temporary-after image' predicted for aircrafts approaching runway 22 ('medium' sensitivity), originating from Cottam 1. The resulting significance of effect for runway 22 approach path would be moderate and significant.
- 16.5.7 The worst-case magnitude of impact upon Sturgate Airfield would be medium due to glare with 'potential for temporary-after image' predicted for aircrafts approaching runway 09 ('medium' sensitivity), originating from Cottam 1 and Cottam 2 and for aircrafts approaching runway 14 ('medium' sensitivity), originating from Cottam 1. The resulting significance of effect for both runways, 09 and 14 approach path, would be moderate and significant.
- 16.5.8 Consultation with the safeguarding team (MoD) for RAF Scampton has been initiated and it is currently underway. The consultation with the safeguarding team at Sturgate Airfield has been completed and the conclusion is that the impact is acceptable, and they will not object to the proposal.

Railway

- 16.5.9 At this stage detailed modelling has not been undertaken for railway receptors. The worst-case significance of effect would be moderate and significant.

16.6 Mitigation

- 16.6.1 Any predicted impacts towards the ground-based infrastructure can likely be solved with relatively simple mitigation strategies – the most common being the provision of screening at the site perimeter to obstruct views of potentially reflecting panels. Where views of reflecting panels are obstructed, no effects can be experienced. Other solutions such as layout modification can be considered but are rarely required in practice.
- 16.6.2 Any moderate impact upon aviation operations will have to be mitigated. Whilst formal guidance within the UK for quantifying impacts is sparse, the industry standard is to evaluate effects on aviation receptors based on their intensity (specifically the potential for a temporary after-image following publication of a methodology by Sandia Laboratories in the USA) as well as their duration and operational sensitivity. For tracking panels, the viability of less invasive mitigation solution can be explored. However, these options may affect the operation of the tracking system. This will be explored further at the ES stage.

Residual Effects

- 16.6.3 If the mitigation measures identified above are implemented where significant reflection effects are predicted to be experienced, effects would be reduced to low and non-significant at worst.

16.7 Cumulative Effects

- 16.7.1 A 'long list' of potential cumulative development sites is provided in **Appendix 2.2** of the PEIR and the more substantial developments are shown on the plan at **Appendix 2.3**. Of particular relevance to any cumulative assessment is the West Burton Solar Project and Gate Burton Solar Project (both NSIP schemes).
- 16.7.2 Identification of other developments that may give rise to cumulative effects will be agreed with the relevant statutory bodies; and any cumulative effects arising will be considered and described. Where there are no cumulative effects, this will also be stated. The cumulative assessment will consider all projects that are built, have been consented or are under construction.

Predicted Cumulative Effects during Construction

- 16.7.3 Glint and glare effects can occur from any solar panels that are installed within the developable area. However, as not all panels will be installed simultaneously, the length and intensity of any solar reflections during the construction phase will be less than or equal to the operational phase.

- 16.7.4 Therefore, the effects during construction will be less than or equal to effects during operation and therefore cumulative effects are not considered during construction and this has been agreed in the Scoping Opinion.

Predicted Cumulative Effects during Operation

- 16.7.5 Cumulative effects are theoretically possible in combination with other solar developments that are consented, under construction or operational and will, therefore, be considered cumulatively within the technical impact assessment. This includes consideration of potential cumulative effects with the West Burton Solar Project and Gate Burton Energy Park. Cumulative effects, where possible, can be mitigated. Mitigating solutions are outlined in paragraph 16.6.1 for ground-based receptors and in paragraph 16.6.2 for aviation receptors.

In-combination Effects

- 16.7.6 Identification of any effects on glint and glare receptors in-combination with other effects and/or from combined phases of work on the Scheme will be considered and described. Based on previous project experience, in-combination effects for glint and glare are not predicted. Where there are no in-combination effects, this will also be stated.

16.8 Conclusion and Next Steps

- 16.8.1 The Scheme is predicted to have a 'moderate' significance of effect in terms of glint and glare at worst, without mitigation. The prediction of significant effects at this time is based on receptors having medium sensitivity (for all but local dwellings, where it is low sensitivity) and a worst-case medium magnitude of impact for surrounding road users, dwellings, aviation, and railway receptors. The mitigation measures suggested in this chapter would need to be implemented to remove or reduce any significant residual effects. The requirement for mitigation will be identified, reviewed, and reported in the ES.

17 Air Quality

17.1 Introduction

17.1.1 This chapter of the PEIR evaluates the effects of the Scheme as described in **Chapter 4 Development Proposal**, on air quality at nearby sensitive receptors during the construction, operation and decommissioning phases. The aim of this preliminary assessment is to predict the levels of air quality pollutants and assess them to determine whether there are any likely significant effects, taking account of relevant policy, guidelines and best practice.

17.1.2 This chapter is supported by the following Appendix:

- **Appendix 17.1 – 17.4:** Qualitative Dust Assessment and Construction Dust Management Plans (CDMPs)

17.1.3 This chapter includes the following elements:

- Policy Content
- Assessment Methodology and Significance Criteria
- Baseline Conditions
- Identification and Evaluation of Key Effects
- Cumulative/In-combination Effects
- Mitigation Measures
- Residual Effects
- References

17.2 Policy Context

17.2.1 This section provides an overview of the legislative and planning policy framework against which the Scheme will be considered for air quality. These policies identify the need for a site-specific air quality assessment to consider the impacts of construction, operational and decommissioning phase air quality pollution on local sensitive receptors.

Legislation

European Legislation

- 17.2.2 European air quality legislation is consolidated under Directive 2008/50/EC, which came into force on 11th June 2008. This Directive consolidated and replaced previous legislation which was designed to deal with specific pollutants in a consistent manner and provides new air quality objectives for fine particulates. The consolidated Directives include:
- Directive 1999/30/EC – the First Air Quality "Daughter" Directive – sets ambient air limit values for nitrogen dioxide (NO₂) and oxides of nitrogen (NO_x), sulphur dioxide (SO₂), lead (Pb) and particulate matter (PM);
 - Directive 2000/69/EC – the Second Air Quality "Daughter" Directive – sets ambient air limit values for benzene (C₆H₆) and carbon monoxide (CO); and,
 - Directive 2002/3/EC – the Third Air Quality "Daughter" Directive – seeks to establish long-term objectives, target values, an alert threshold and an information threshold for concentrations of ozone (O₃) in ambient air.
 - The 2008 Ambient Air Quality Directive (2008/50/EC) - The Directive sets limits for key pollutants in the air we breathe outdoors. These legally binding limit values are for concentrations of major air pollutants that impact public health, such as particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂). The directive also sets limit values for a range of other pollutants, such as ozone, sulphur dioxide and carbon monoxide.
 - The 4th air quality daughter directive (2004/107/EC) – the Directive sets targets for levels in outdoor air of certain toxic heavy metals and polycyclic aromatic hydrocarbons. Both directives are introduced into the UK through the Air Quality Standards Regulations 2010.
- 17.2.3 The European Commission (EC) Directive Limits, outlined above, have been transposed in the UK through the Air Quality Standards Regulations. In the UK responsibility for meeting ambient air quality limit values is devolved to the national administrations in Scotland, Wales and Northern Ireland.

National Legislation

Air Quality Standards Regulations 2010 (as amended)

- 17.2.4 The consolidated EU directive referred to above is implemented into domestic law by the Air Quality Standards Regulations 2016ⁱ. The limit values (re ambient air quality) defined within those Regulations are legally-binding and apply across England, with the exception of the carriageway and central reservation of roads

where the public does not normally have access, on factory premises or at industrial locations (where health and safety provisions apply) and any locations where the public does not have access and there is no fixed habitation.

- 17.2.5 The Air Quality Standards Regulations 2010ⁱⁱ (as amended) set legally binding limits for concentrations of certain air pollutants (i.e. “limit values”). This is with the intention of avoiding, preventing or reducing harmful effects on human health and the environment as a whole. To the extent that any concentrations exceed limit values, the Secretary of State is required to prepare an “air quality plan” with measures so as to achieve the limit value.

The UK Air Quality Strategy

- 17.2.6 The UK Air Quality Strategyⁱⁱⁱ is the method for implementation of the air quality limit values in England, Scotland, Wales and Northern Ireland and provides a framework for improving air quality and protecting human health from the effects of pollution.
- 17.2.7 For each nominated pollutant, the Air Quality Strategy sets clear, measurable, outdoor air quality standards and target dates which should be aimed for; the combined standard and target date is referred to as the Air Quality Objective (AQO) for that pollutant. Adopted national standards are based on the recommendations of the Expert Panel on Air Quality Standards (EPAQS) and have been translated into a set of Statutory Objectives within the Air Quality (England) Regulations 2000.

Environmental Protection Act 1990

- 17.2.8 The Environmental Protection Act 1990^{iv} prescribes a statutory nuisance as air quality pollutants emitted from premises (including land), through smoke, fumes or gases, dust, steam or smell that is prejudicial to health or a nuisance.
- 17.2.9 Local Authorities are required to investigate any public complaints regarding air quality, and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve an abatement notice. A notice is served on the person responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be carried out, or it prohibits or restricts the activity.

National Planning Policy

- 17.2.10 The following planning policy, legislation, guidance and standards are of particular relevance to air quality.
- Overarching National Policy Statement for Energy (EN-1) including draft revised NPS EN-1;

- National Policy Statement on Renewable Energy Infrastructure (EN-3) including draft revised NPS EN-3;
- National Planning Policy Statement for Electrical Networks (EN-5) including draft revised NPS EN-5;
- The National Planning Policy Framework (NPPF)^v;
- The National Planning Practice Guidance (PPG) (2019)^{vi}; and,
- The Clean Air Strategy (2019)^{vii}.

17.2.11 The overarching NPS for Energy (EN-1) was adopted in July 2011 and sets out the overall national energy policy for delivering major energy infrastructure. Broadly similar provisions are contained in draft revised NPS EN-1.

17.2.12 Section 5.2.6 of EN-1 deals with effects from Air Quality and Emissions, and states;

"Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the Environmental Statement (ES). The ES should describe:

- *any significant air emissions, their mitigation and any residual effects distinguishing between the project stages and taking account of any significant emissions from any road traffic generated by the project;*
- *the predicted absolute emission levels of the proposed project, after mitigation methods have been applied;*
- *existing air quality levels and the relative change in air quality from existing levels;*
- *and any potential eutrophication impacts."*

17.2.13 With regards to the decision-making process, EN-1 states that the project should not lead to a deterioration in air quality in an area or lead to a new area where air quality breaches any national air quality limits (see paragraph 5.2.9).

17.2.14 Where substantial changes in air quality levels are expected, even if this does not lead to any breaches of national air quality limits, any relevant statutory air quality limits should be taken into account. Additionally, where a project is likely to lead to a breach of such limits, appropriate mitigation measures should be secured (paragraphs 5.2.9 and 5.2.10).

17.2.15 Draft Overarching National Policy Statement for Energy (EN-1) September 2021 states in respect of Air Quality:

'Infrastructure development can have adverse effects on air quality. The construction, operation and decommissioning phases can involve emissions to air which could lead to adverse impacts on health, on protected species and habitats, or on the wider countryside and species. Levels for pollutants in ambient air are set out in the Air Quality Standards Regulations 2010 and reiterated in the Air Quality Strategy. The Secretary of State for Environment, Food and Rural Affairs is required to make available up to date information on air quality to any relevant interested party.....Where the project is likely to have adverse effects on air quality the applicant should undertake an assessment of the impacts of the proposed project as part of the ES.'

- 17.2.16 The National Policy Statement on Electricity Networks Infrastructure 5 (EN-5) was adopted in July 2011. Whilst EN-5 principally covers above-ground electricity lines of 132 kV and above, paragraph 1.8.2 confirms that EN-5 will also be relevant if the electricity network constitutes an associated development for which consent is sought, such as a generating station. EN-5 is therefore relevant to the Development, as a grid connection is proposed, however, EN-5 does not reference any specific requirements regarding air quality.

The National Planning Policy Framework (NPPF)

- 17.2.17 The NPPF, revised July 2021, sets out the Government's planning policies for England, providing a framework within which local policies can be developed. The key principle of the NPPF is a presumption in favour of sustainable development. The NPPF principally brings together and summarises the suite of Planning Policy Statements (PPS) and Planning Policy Guidance (PPG) which previously guided planning policy making. With regards to air quality, the NPPF states:

- 17.2.18 Paragraph 174:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

- 17.2.19 Paragraph 186:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management,

and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."

17.2.20 Paragraph 188:

"The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities."

Planning Practice Guidance

17.2.21 The National Planning Policy Framework was published on 27 March 2012 and revised in 2018, 2019 and most recently 20 July 2021. It sets out the government's planning policies for England and how these are expected to be applied.

17.2.22 The relevant Guidance Category of Air Quality in the Planning Practice Guidance (PPG) web-based resource was updated by the Ministry for Housing, Communities and Local Government (MHCLG) on 1st November 2019 to support the National Planning Policy Framework and make it more accessible. A review of PPG: Air Quality identified the following guidance (Paragraph: 001 Reference ID: 32-001-20191101):

"The 2008 Ambient Air Quality Directive sets legally binding limits for concentrations in outdoor air of major air pollutants that affect public health such as particulate matter (PM₁₀ and PM_{2.5}) and nitrogen dioxide (NO₂).

The UK also has national emission reduction commitments for overall UK emissions of 5 damaging air pollutants:

- *fine particulate matter (PM_{2.5});*
- *ammonia (NH₃);*
- *nitrogen oxides (NO_x);*
- *sulphur dioxide (SO₂); and*
- *non-methane volatile organic compounds (NMVOCs).*

As well as having direct effects on public health, habitats and biodiversity, these pollutants can combine in the atmosphere to form ozone, a harmful air pollutant (and potent greenhouse gas) which can be transported great distances by weather systems. Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

17.3 Consultation

17.3.1 A summary of consultation is provided in Table 17.1.

Table 17.1: Summary of Consultation Responses

Date	Consultee and Response	Action
March 2022	PINS Scoping Opinion, Case Reference: EN010132 (Scoping Report Section 19) 3.14 Major Accidents and Disasters	
	Scoping Report paragraph 19.2.1 sets out a list of potential impacts from major accidents and disasters to/from the Proposed Development and where these will be assessed in other Chapters in the ES. Impacts include: <ul style="list-style-type: none"> Fire and explosion The above impacts are proposed to be assessed in other chapters such as Human Health (Scoping Report paragraph 19.3.1), however, Human Health is also proposed to be assessed in other chapters, rather than a stand-alone chapter. The ES should not be a 'paperchase' and should clearly signpost where these impacts are assessed in other relevant chapters and where any relevant mitigation measures are secured.	Fire incident impact assessment will be undertaken using detailed air quality dispersion modelling to assess potential smoke effects on the residential receptors a major solar panel fire accident.
	PINS Scoping Opinion, Case Reference: EN010132 (Scoping Report Section 20) 3.15 Air Quality	
	The Scoping Report seeks to scope out detailed air quality modelling and assessment of effects from construction, although a qualitative dust assessment and a CEMP taking account of Institute of Air Quality Management (IAQM) guidance are proposed. Subject to confirmation that the proposed construction vehicle numbers alone or cumulatively with other proposals on relevant links (e.g. for Cottam Solar Project) will not exceed the relevant IAQMEPUK thresholds e.g.	An Outline CEMP has been produced for each of the Sites of: Cottam 1, 2 & 3; and West Burton 1, 2, 3, & 4. Assessment of construction vehicles scoped out of the ES.

	100 HGV Annual Average Daily Traffic (AADT), the Inspectorate considers that the need for detailed construction air quality modelling and assessment can be scoped out.	
	Based on the nature of the development and subject to confirmation of the type and number of maintenance vehicles, the Inspectorate considers that operational traffic movements will be limited and that operational traffic air quality modelling may be scoped out.	Assessment of operational vehicles scoped out of the ES.

17.4 Assessment Methodology and Significance Criteria

Construction Assessment Methodology

Construction Phase Dust Assessment

- 17.4.1 The effects during the construction phase have the potential to result in dust nuisance complaints and surface soiling from deposition, as opposed to the risk of exceeding a custom and practice threshold for dust mass deposition of 200 mg m⁻² day⁻¹ averaged over the period of a month (Good practice guide: control and measurement of nuisance dust and PM₁₀ from the extractive industries, Mineral Industry Research Organisation (MIRO)/AEA Technology plc, 25 February 2011). The effects will be direct as they occur as a result of activities associated with the Scheme, temporary as they will only potentially occur during construction activities, short-term because they will only arise at particular times when certain activities and meteorological conditions for creating the level of magnitude predicted combine and will be reversible.
- 17.4.2 Additional vehicle movements (particularly HGV movements) associated with the construction phase have the potential to generate exhaust emissions, such as NO₂, PM₁₀ and PM_{2.5} on the local road network.
- 17.4.3 The effects identified for the construction phase and considered for the purpose of this assessment from (1) on-site construction activities and (2) the associated construction traffic outside of the Site boundary are as follows:

On-site construction Activities:

- Temporary generation of dust arising from construction works within the Site boundary leading to potential impacts on dust soiling and concentrations of particulate matter (as PM₁₀) and the study areas are set up as:

For human receptors:

- 350m of the boundary of the Site; or
- 50m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrances (s).

The study area for ecological receptors:

- 50m of the boundary of the Site; or
- 50m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrances (s).

Associated Construction Traffic outside of the Site Boundary

- At this stage of the proposed Scheme detailed traffic data as a result of any temporary vehicles operating on the local road network are not available. However, it is anticipated that the heavy-duty vehicle (HDV) movements on the local road network will not be greater than 100 annual average daily traffic (AADT) and the light duty vehicle (LDV) will not be greater than 500 AADT. As the Sites are not located within or adjacent to an AQMA, the traffic air quality impact can be scoped out, according to the “Indicative criteria for requiring an air quality assessment” in IAQM Guidance of Land-use planning & development control: Planning for air quality, June 2016^{viii}.

17.4.4 Appropriate site-specific mitigation for the on-site construction activities will be recommended in accordance with the IAQM document (Guidance on the assessment of dust from demolition and construction, January 2017^{Error! Bookmark not defined.}) for inclusion in the Outline Construction Environmental Management Plan.

17.4.5 Appropriate site-specific mitigation will be recommended in accordance with the IAQM document and included within the Construction Environmental Management Plan (CEMP) for the proposed Scheme, which will mitigate any potential adverse effects associated with the construction phase of the development. Following the implementation of the mitigation, it is expected there will be a ‘negligible’ impact as a result of the Scheme.

Construction Significance Criteria

Construction Dust Significance Criteria

17.4.6 The IAQM Guidance does not assign a significance criterion prior to the implementation of mitigation measures, instead it assigns a ‘risk factor’ to determine the level of site-specific mitigation measures which should be implemented as part of the Scheme.

- 17.4.7 Appropriate site-specific mitigation will be recommended in accordance with the IAQM document (Land-use planning & development control: Planning for air quality, January 2017) and included within the Construction Environmental Management Plan (CEMP) for the Scheme, which will mitigate any potential adverse effects associated with the construction phase of the development. Following the implementation of the mitigation, it is expected there will be a 'negligible' impact as a result of the development.

Operational Phase Assessment Methodology

- 17.4.8 The operational traffic associated with the scheme is expected to be very low, therefore, it is anticipated that the number of vehicle and heavy-duty vehicle (HDV) movements on the local road network will not be greater than the light duty vehicle (LDV) will not be greater than 500 AADT. As the Sites are not located within or adjacent to an AQMA, the traffic air quality impact can be scoped out, according to the "Indicative criteria for requiring an air quality assessment" in IAQM Guidance of Land-use planning & development control: Planning for air quality, January 2017^{ix}.
- 17.4.9 The scheme does not include any fixed plant which may give rise to emissions, such as Combined Heat and Power (CHP) or boilers, therefore there are not emissions associated with the proposed scheme and the direct impacts on air quality are determined to be 'imperceptible'.

Fire Incident Impact Assessment

- 17.4.10 In general, major accidents or disasters, as they relate to the Scheme, fall into three categories:
- Events that could not realistically occur, due to the nature of the Scheme or its location;
 - Events that could realistically occur, but for which the Scheme, and associated receptors, are no more vulnerable than any other development; and
 - Events that could occur, and to which the Scheme is particularly vulnerable, or which the Scheme has a particular capacity to exacerbate.
- 17.4.11 'Accidents' are considered to be an occurrence resulting from uncontrolled developments in the course of construction and operation of a development (e.g. major emission or fire). As such, the potential impacts on local residents from a fire accident, such as solar panel, battery storage and sub-stations fire, will be considered and assessed. Particulate matter exposure is the key principle public health threat from short-term smoke exposure, therefore, detailed air dispersion modelling of particulate matter impact from smoke will be undertaken at the ES

stage to predict the short-term concentrations of PM₁₀ and PM_{2.5} at residential receptors at downwind locations likely to be affected by incidents including fire.

- 17.4.12 Detailed air quality dispersion modelling will be undertaken to generate background concentrations which are required to inform the assessment of Air Quality Impact from a Major Fire Accident.
- 17.4.13 An approved atmospheric dispersion modelling package (ADMS-Road) will be used in the Air Quality Impact Assessment of a Major Fire Accident, where, smoke levels and their associated air quality category (good to hazardous level) will be estimated using the modelled predicted particulate matter levels, and the potential smoke effects on residential and other sensitive receptors are assessed and mitigation measures are discussed where appropriate. (Major Accidents and Disasters are also dealt with in Chapter 20 of the PEIR).

Health effects of fire smoke exposures are assessed for the protection of human health. A guide of "Smoke Exposure from Wildland fires, interim Guidelines for Protecting community Health and wellbeing" Manitoba Health (January 26, 2021)^x, is used to estimate the smoke levels and air quality category (good to hazardous level) using the predicted particulate matter levels displayed in Table 17.3 which provides an approximated conversion between visibility through smoke as a visibility index provides a quick, alternative way to estimate smoke levels. Using landmarks at known distances, an experienced observer can provide a reasonable estimate of particle concentration.

- 17.4.14 Air quality is a measure of how clean or polluted the air is. For this assessment air quality has been divided into 5 categories from good (healthy) to hazardous using the particulate matter levels in air. Visibility affected by particulate matter is also discussed in Table 17.2 below.

Table 17.2: Estimating Smoke Levels from Particulate Matter Concentrations

Air Quality Category	Equivalent approx. PM _{2.5} 1-3-hour average in µg/m ³	Visibility in km
Good	0-40	15 kms and up
Moderate/Unhealthy for Sensitive Groups	41-175	5-14 kms
Unhealthy	176-300	2.5-4 kms
Very Unhealthy	301-500	1.5-2 kms
Hazardous	over 500	Less than 1 km

Operational Phase Assessment Significance Criteria

- 17.4.15 The significance of the effects during the operational phase of the Proposed Development is based on the latest guidance produced by Environmental Protection UK (EPUK) and IAQM in January 2017. The guidance lays a basis for a consistent approach that could be used by all parties associated with the planning process to professionally judge the overall significance of the air quality effects based on severity of air quality impacts.
- 17.4.16 Table 17.3 provides the criteria used for the classification of the magnitude of the air quality impacts during the Site construction, operational and decommissioning phases.

Table 17.3: Methodology for Assessing Magnitude of Effect

Magnitude	Description	Examples
Large	Impact resulting in a considerable change in baseline environmental conditions with severe undesirable/desirable consequences on the receiving environment.	<ul style="list-style-type: none"> Air quality varies between the do minimum and do something by more than 10% of the air quality criterion (Emissions). Substantial risk that emissions will generate statutory nuisance complaints, resulting in formal action (Construction).
Medium	Impact resulting in a discernible change in baseline environmental conditions with undesirable/desirable conditions	<ul style="list-style-type: none"> Air quality varies between the do minimum and do something by 5 - 10% of the air quality criterion (Emissions). Moderate risk that emissions will generate statutory nuisance complaints, resulting in formal action (Construction).
Small	Impact resulting in a discernible change in baseline environmental conditions with undesirable/desirable conditions that can be tolerated.	<ul style="list-style-type: none"> Air quality varies between the do minimum and do something by 1 - 5% of the air quality criterion (Emissions). Slight risk that emissions will generate statutory nuisance complaints, resulting in formal action (Construction).
Imperceptible	Very low discernible change in baseline environmental conditions.	<ul style="list-style-type: none"> Air quality varies between the do minimum and do something by less than 1-2%

		<p>of the air quality criterion (Emissions).</p> <ul style="list-style-type: none"> • Little or no cause for nuisance complaints to be made (Construction).
Neutral	No change in baseline conditions	<ul style="list-style-type: none"> • Air quality varies between the do minimum and do something by less than 0.5% of the air quality criterion (Emissions).

- 17.4.17 It is recognised that likely significant air quality impacts can operate over a range of geographical areas and therefore a geographical scale may be taken into account in determining the scale/magnitude of the likely significant impact.

Assessment of Sensitivity

- 17.4.18 Receptors can demonstrate different sensitivities to changes in their environment. For the purpose of this assessment, sensitivity will be determined as Very High, High, Medium, Low or Negligible, as detailed in Table 17.4 for both the construction and operational phase of the development.

Table 17.4: Methodology for Assessing Sensitivity of Receptor

Sensitivity	Definition
Very High	<p>'Do Minimum' pollutant concentration are 110% and greater than 110% of the relevant Air Quality Objectives (AQO) (Emissions).</p> <p>Receptors of very high sensitivity to dust and odour, such as: hospitals and clinics, retirement homes, painting and furnishing, hi-tech industries and food processing (Construction).</p> <p>Densely populated areas – more than 100 dwellings within 20m of the development site (Construction).</p>
High	<p>'Do Minimum' pollutant concentration between 103 - 109% of the relevant AQO (Emissions).</p> <p>Receptors of high sensitivity to dust and odour, such as: schools, residential areas, food retailers, glasshouses and nurseries, horticultural land and offices (Construction).</p> <p>Densely populated areas – 10-100 dwellings within 20m of the development site (Construction).</p>
Medium	<p>'Do Minimum' pollutant concentration between 95 - 102% of the relevant AQO (Emissions).</p> <p>Receptors of medium sensitivity to dust and odour, such as: farms, outdoor storage, light and heavy industry (Construction).</p> <p>Suburban or edge of town areas (Construction).</p>
Low	<p>'Do Minimum' pollutant concentration between 75-90% of the relevant AQO (Emissions)</p> <p>All other dust/odour sensitive receptors not identified above (Construction).</p>

	Rural/Industrial areas (Construction).
Negligible	Concentration less than 75% of the relevant AQO (Emissions) Receptor more than 350m away (construction)

Assessment of Significance

- 17.4.19 The level of significance is determined by combining the likely magnitude of impact with the sensitivity of the receptor during the construction and operational phases. Table 17.5 shows how the interaction of magnitude and sensitivity, results in the significance of an environmental impact. If the scale of the impact magnitude is negative, then the resulting impact is adverse. If the scale of the impact magnitude is positive, then the resulting impact is beneficial. If the impact is Moderate to Substantial then the change is considered to have a significant effect on the local air quality, whether positive or negative.
- 17.4.20 The table has been developed by the Applicant's consultants Tetra Tech, but the matrix combinations and terms used correlate with the significance matrix recommended by Land-Use Planning & Development Control: Planning for Air Quality (2017)^{ix}.

Table 17.5: Criteria for Assessing the Significance of Air Quality Effects

Sensitivity of Receptor	Magnitude of Impact				
	Large	Medium	Small	Imperceptible	Neutral
Very High	Substantial	Substantial	Substantial	Moderate	Negligible
High	Substantial	Substantial	Moderate	Moderate	Negligible
Medium	Substantial	Moderate	Moderate	Slight	Negligible
Low	Moderate	Moderate	Slight	Negligible	Negligible
Negligible	Moderate	Slight	Negligible	Negligible	Negligible

- 17.4.21 For the purposes of this assessment, moderate or substantial effects are considered to be significant in terms of the EIA Regulations.

17.5 Baseline Conditions

- 17.5.1 This section provides a review of the existing air quality in the vicinity of the Site and the study areas discussed in Section 17.4.3 in order to provide a benchmark against which to assess potential air quality impacts of the Scheme. Baseline air quality in the vicinity of the application site has been defined from several sources, as described in the following sections.

Local Air Quality Management (LAQM)

- 17.5.2 The Scheme Sites are located in West Lindsey district. As required under Section 82 of the Environment Act 1995, West Lindsey District Council (WLDC) reviews and assesses air quality within its area of jurisdiction. The assessments have indicated that concentrations of air quality pollutants are not above the relevant AQOs at any locations of relevant public exposure within the district. Therefore, WLDC has not designated any Air Quality Management Areas (AQMAs).
- 17.5.3 In respect of any cumulative assessment, notably, some of the proposed Sites for the West Burton Solar Project, namely West Burton 4, West Burton Substation and parts of the cable route and grid connection at Cottam Power Station, are located within Bassetlaw District Council (BDC), who also review and assess air quality within its area of jurisdiction. The assessments have indicated that concentrations of air quality pollutants are not above the relevant AQOs at any locations of relevant public exposure within the district. Therefore, BDC has not designated any Air Quality Management Areas (AQMAs).

Air Quality Monitoring

- 17.5.4 Monitoring of air quality within WLDC has been undertaken through both automatic and non-automatic monitoring methods in 2019. Automatic methods consist of Automatic analysers continuously draw in ambient (outdoor) air and measure the concentration of the pollutant in the sampled air. Non-automatic Networks measure less frequently compared to automatic networks - either daily, weekly or monthly - and samples are collected by some physical means (such as diffusion tube or filter). These samples are then subjected to chemical analysis, and final pollutant concentrations calculated from these results. These have been reviewed in order to provide an indication of existing air quality in the area surrounding the application site. WLDC publishes the monitoring data annually and at the time of this assessment the most recent available, representative monitoring data within WLDC was undertaken during 2019.

Automatic Monitoring

- 17.5.5 WLDC undertook automatic pollution monitoring during 2019 at 4 different locations. The closest monitoring location to the Scheme Site is named as GC, which is located at Gainsborough Cemetery. The most recent available, representative data is from 2019 which is presented in Table 17.6, and Figure 17.1.

Table 17.6: Monitored Annual Mean NO₂ Concentrations at Automatic Monitoring Locations

Site ID	Location	Site Type	Distance from Kerb of Nearest Road (m)	Inlet Height (m)	2019 NO ₂ Annual Mean Concentration (µg/m ³)
GC	Gainsborough Cemetery	Industrial	N/A	3.0	7.5

- 17.5.6 As outlined in Table 17.7, GC monitoring location monitored annual average concentrations below the AQO for NO₂ (40 µg/m³ annual mean) during 2019. Neither WLDC or BDC undertake any monitoring of PM₁₀ or PM_{2.5}.

Non - Automatic Monitoring

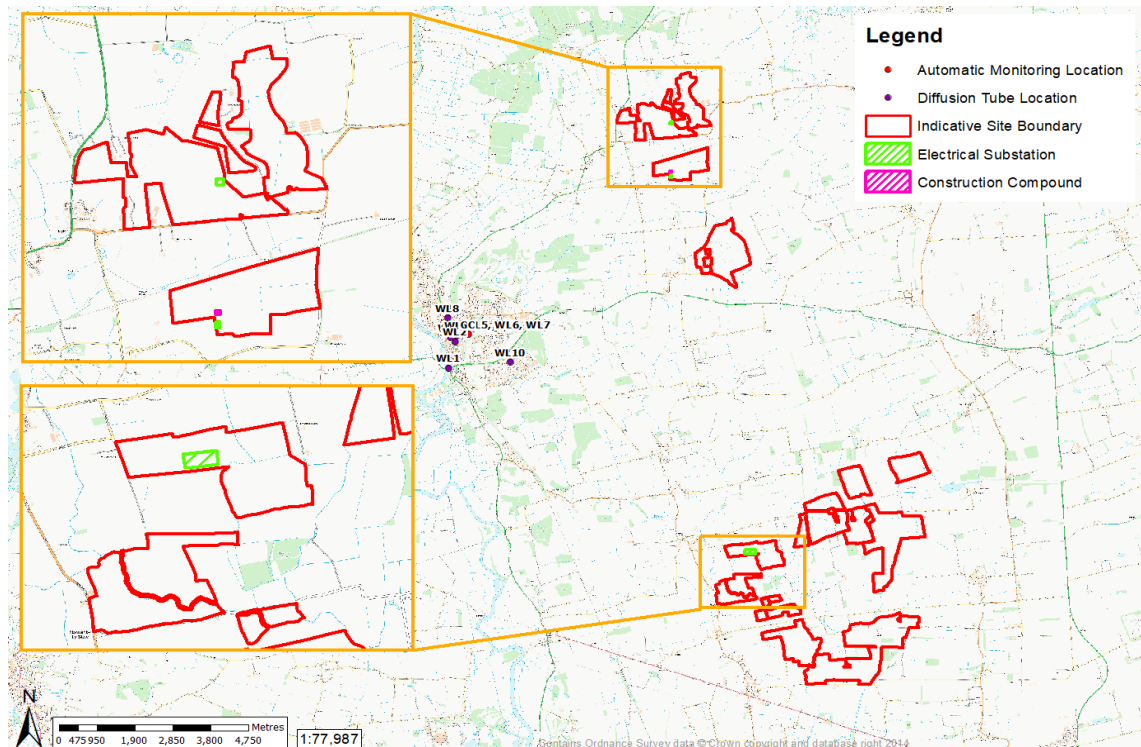
- 17.5.7 WLDC operated a network of 86 passive diffusion tubes during 2019. The most recently available, representative diffusion tube data is from 2019 which is presented in Table 17.7 and Figure 17.1.

Table 17.7: Monitored Annual Mean NO₂ Concentrations at Diffusion Tubes

Site ID	Location	Site Type	Distance from Kerb of Nearest Road (m)	Inlet Height (m)	2019 NO ₂ Annual Mean Concentration (µg/m ³)
WL1	3 Lea Road, Gainsborough	Roadside	8.6	2.8	22.8
WL2	58 Etherington Street, Gainsborough	Roadside	1.6	2.8	19.0
WL3	19 Spring Gardens, Gainsborough	Roadside	2.9	2.8	17.3
WL4	Heaton Street	Roadside	2.2	2.8	20.7
WL5, WL6, WL7	Gainsborough Cemetery, Gainsborough	Industrial	13.8	3.0	11.3
WL8	Cherry Tree, Gainsborough	Kerbside	0.2	2.8	14.7
WL10	Marshall Way, Gainsborough	Roadside	15.9	2.8	15.0

- 17.5.8 As indicated in Table 17.7, all diffusion tubes located within the Air Quality Assessment area monitored annual average NO₂ concentrations below the AQO for NO₂ (40 µg/m³ annual mean) during 2019.

Figure 17.1: West Lindsey Monitoring Locations



Background Pollutant Mapping

- 17.5.9 The use of background concentrations within the modelling process ensures that pollutant sources other than traffic are represented appropriately. Background sources of pollutants include industrial, domestic and rail emissions within the vicinity of the study site. Several sources have been used to obtain representative background levels as discussed below.
- 17.5.10 The background concentrations used within the assessment have been determined with reference to the IAQM Guidance and Technical Guidance (TG) (16).
- 17.5.11 The IAQM Guidance states:
- “A matter of judgement should take into account the background and future background air quality and whether it is likely to approach or exceed the value of the AQO.”*
- 17.5.12 Additionally, TG (16) states:

“Typically, only the process contributions from local sources are represented within an output by the dispersion model. In these circumstances, it is necessary to add an appropriate background concentration(s) to the modelled source contributions to derive the total pollutant concentrations.”

- 17.5.13 All the Defra background concentrations detailed in Table 17.9 for 2019, show that the background levels are predicted to be below the relevant AQO within the study area.
- 17.5.14 The relevant background concentrations for this assessment are shown in Table 17.8 were obtained from the UK National Air Quality Information Archive database based on the National Grid Co-ordinates of 1 x 1 km grid squares nearest to the application Site. Those background data was published by Defra in a data group named as “Background Maps 2018” for nitrogen oxide (NO_x), NO₂, PM₁₀ and PM_{2.5} in August 2020.

Table 17.8: Published Background Air Quality Levels (µg/m³)

Council	Area	UK NGR (m)		2021 Predicted Background Concentration (µg/m ₃)			
		X	Y	NO _x	NO ₂	PM ₁₀	PM _{2.5}
West Lindsey District	Cottam 1	491500	383500	9.02	7.03	15.50	8.41
West Lindsey District	Cottam 2 & 3	487500	393500	9.00	7.02	15.58	8.44

- 17.5.15 All the Defra background concentrations detailed in Table 17.8 for 2021, show that the background levels were predicted to be below the relevant AQO within the study area. It should be noted that using 2021 background data would produce a worst-case assessment as background data after 2021 would be less than 2021 data as Defra data includes the year-on-year decrease in the data base.

Assessment Locations

Discrete (Individual) Receptors

Receptors for Qualitative Dust Assessment and Construction Dust Management Plan (CDMP)

For human receptors:

- 350m of the boundary of the Site; or
- 50m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrances (s).

- The study area for ecological receptors:
- 50m of the boundary of the Site; or
- 50m of the route(s) used by construction vehicles on the public highway, up to 500 m from the Site entrances (s).

Receptors for Fire Impact Assessment

- 17.5.16 Considering the nature of a fire incident, a fire could be taking place anywhere within the Site and it would a short period before being extinguished, therefore, a set of generic receptor locations has been defined to assess the potential fire impacts on the fire downwind locations. Four sets of receptor locations have been selected to assess the smokes to spread 4 directions: south, north, east and west.
- Receptor Set 1: Receptor locations affected by west wind (coming from the west and blowing toward the east), A series of 20 receptors, which were spaced at 10 m intervals, are defined eastward away from the fire.
 - Receptor Set 2: Receptor locations affected by east wind (coming from the east and blowing toward the west), A series of 20 receptors, which were spaced at 10 m intervals, are defined westward away from the fire.
 - Receptor Set 3: Receptor locations affected by south wind (coming from the south and blowing toward the north), A series of 20 receptors, which were spaced at 10 m intervals, are defined northward away from the fire.
 - Receptor Set 4: Receptor locations affected by north wind (coming from the north and blowing toward the south), A series of 20 receptors, which were spaced at 10 m intervals, are defined southward away from the fire.
- 17.5.17 Considering fire could occur at any location within the development, a set of generic receptor locations at Cottam 1 site has been selected to represent potential receptors at Cottam 1, 2 and 3.
- 17.5.18 The selected generic receptor locations are presented in Table 17.9 and Figure 17.2

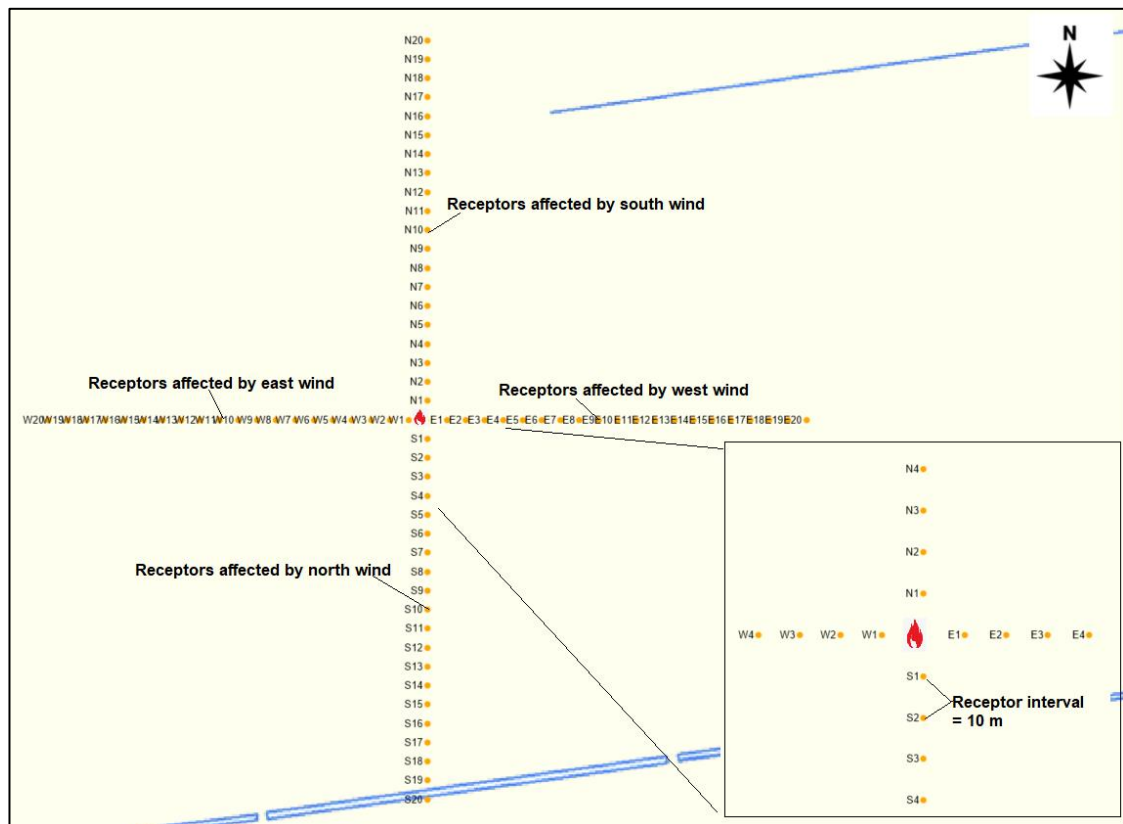
Table 17.9: Selected Sensitive Receptor Locations

Discrete Sensitive Receptor		UK NGR (m)	
		X	Y
E1	Affected by a West Wind	488310	382900
E2		488320	382900
E3		488330	382900
E4		488340	382900
E5		488350	382900
E6		488360	382900

E7		488370	382900
E8		488380	382900
E9		488390	382900
E10		488400	382900
E11		488410	382900
E12		488420	382900
E13		488430	382900
E14		488440	382900
E15		488450	382900
E16		488460	382900
E17		488470	382900
E18		488480	382900
E19		488490	382900
E20		488500	382900
W1	Affected by an East Wind	488290	382900
W2		488280	382900
W3		488270	382900
W4		488260	382900
W5		488250	382900
W6		488240	382900
W7		488230	382900
W8		488220	382900
W9		488210	382900
W10		488200	382900
W11		488190	382900
W12		488180	382900
W13		488170	382900
W14		488160	382900
W15		488150	382900
W16		488140	382900
W17		488130	382900
W18		488120	382900
W19		488110	382900
W20		488100	382900
N1	Affected by a South Wind	488300	382910
N2		488300	382920
N3		488300	382930
N4		488300	382940
N5		488300	382950
N6		488300	382960
N7		488300	382970
N8		488300	382980
N9		488300	382990
N10		488300	383000
N11		488300	383010
N12		488300	383020

N13		488300	383030
N14		488300	383040
N15		488300	383050
N16		488300	383060
N17		488300	383070
N18		488300	383080
N19		488300	383090
N20		488300	383100
S1	Affected by a North Wind	488300	382890
S2		488300	382880
S3		488300	382870
S4		488300	382860
S5		488300	382850
S6		488300	382840
S7		488300	382830
S8		488300	382820
S9		488300	382810
S10		488300	382800
S11		488300	382790
S12		488300	382780
S13		488300	382770
S14		488300	382760
S15		488300	382750
S16		488300	382740
S17		488300	382730
S18		488300	382720
S19		488300	382710
S20		488300	382700

Figure 17.2 Selected Sensitive Receptor Locations



17.6 Embedded Design Mitigation

- 17.6.1 The way that potential environmental impacts have been or will be avoided, prevented, reduced, or off-set through design and/or management of the Scheme are outlined below and will be taken into account as part of the assessment of the potential effects. Proposed environmental enhancements are also described where relevant. The mitigation measures for both the construction/decommissioning and operational phases, are outlined below.

Construction and Decommissioning

- 17.6.2 Measures to control construction and decommissioning dust as defined in IAQM's guidance will be adopted, where reasonably practicable. The appropriate site-specific mitigation measures will be determined through the construction phase dust assessment and included within the Framework CEMP via a construction dust management plan. This will be secured through a DCO Requirement.
- 17.6.3 Health and Safety on-site would be managed by the contractor during construction and decommissioning to mitigate the risk of fire.

Operational Phase

- 17.6.4 There is a potential fire risk associated with certain types of batteries such as lithium ion. The Scheme design includes cooling systems which are designed to regulate temperatures to within safe conditions to minimise the risk of fire. The battery technologies on which the design is based details the following with regards to fire protection:
- 17.6.5 The manufacturer undertakes extensive testing and analysis to assess fire risk:
- Do not install batteries where temperatures routinely approach or exceed 80°C – this is not the case with the Scheme;
 - Do not install batteries near heating equipment or heat sources – this is not the case with the Scheme;
 - Protect the installation area and equipment from flooding, which may cause electrical fires. The risk of flooding has been assessed as part of the draft Flood Risk Assessment in PEIR (**Chapter 10**) and mitigation measures to protect it from flooding have been recommended which will be developed as part of the detailed design; and
 - Ensure that installation areas comply with appropriate local fire, electrical and building code requirements, including access to fire trucks in case of emergency. This would be the case with the Scheme.
- 17.6.6 Fire detection and suppression features will be installed to detect (e.g., multispectral infrared flame detectors) and suppress fire (e.g. water-based suppression systems) to minimise the effect of any fire. Batteries will be installed in single locked steel containers which would contain a fire and reduce the likelihood of fire spreading. The Scheme design will include adequate separation between battery banks to ensure that an isolated fire would not become widespread and lead to a major incident.
- 17.6.7 With the above embedded mitigation, any potential risk of fire and the resulting effects would be reduced as far as possible. However, an 'Outline Battery Fire Safety Management Plan' will be produced for the Scheme and submitted with the DCO application. This will be secured through a DCO Requirement.

17.7 Assessment of Effects

Construction Phase Dust

- 17.7.1 The potential effects during the construction phase include fugitive dust emissions from site activities, such as demolitions, earthworks, construction and trackout, have been assessed in accordance with guidance in the Institute of Air Quality Management's (IAQM) 'Guidance on the Assessment of Dust from Demolition and Construction, 2014'^{xii}.
- 17.7.2 Construction activities could give rise to short term elevated dust and/or PM₁₀ concentrations within the vicinity of the Site. This may arise from construction activities, vehicle movements, soiling of the public highway, or windblown stockpiles. Assessment of the potential effects of construction has been undertaken within 50m of the Site boundary, and 50m of roads within 500m radius of the Site.
- 17.7.3 The main emissions during construction works are likely to be dust and particulate matter generated during excavation, earth moving (particularly during dry months), or from construction materials.
- 17.7.4 The main potential effects of particulates/dust are:
- Visual – dust plume, reduced visibility, coating and soiling of surfaces leading to annoyance, loss of amenity, the need to clean surfaces;
 - Physical and/or chemical contamination and corrosion of artefacts;
 - Coating of vegetation and soil contamination; and,
 - Health impacts due to inhalation, e.g. asthma or irritation of the eyes.
- 17.7.5 Factors, such as the amount of precipitation and other meteorological conditions, distance from the source, and the type of activity taking place, will also influence the amount of particulate matter generated.
- 17.7.6 The UK Air Quality Standards seek to control the health implications of respirable particulate matter PM₁₀ (less than 10 micrometres (µm) in diameter). However, the majority of particles released from construction works will be greater than this in size. Particles greater than 10µm are likely to settle out relatively quickly and may cause annoyance due to their soiling capability. There are no formal standards or criteria for nuisance caused by deposited particles, however, a deposition rate of 200mg/m²/day is often presented as a threshold for serious nuisance though this is usually only applied to long term exposure as people are generally more tolerant of dust for a short or defined period. Significant nuisance is likely when the dust coverage of surfaces is visible in contrast with adjacent clean areas, especially when

it happens regularly. Severe dust nuisance occurs when the dust is perceptible without a clean reference surface.

- 17.7.7 Effects of construction dust impact on the human receptors and ecological receptors for Cottam Sites 1, 2 & 3 are presented in Table 17.10, Table 17.11, and Table 17.12 respectively.

Table 17.10 Impact Description of Construction Activities without Mitigation – Cottam 1

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM ₁₀	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Medium	Low	Medium
Construction	Medium	Low	Medium
Trackout	Medium	Low	Medium

Table 17.11 Impact Description of Construction Activities without Mitigation – Cottam 2

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM ₁₀	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Low	Low	N/A
Construction	Low	Low	N/A
Trackout	Low	Low	N/A

Table 17.12 Impact Description of Construction Activities without Mitigation – Cottam 3

Source	Summary Risk of Impacts Prior to Mitigation		
	Dust Soiling	Health Effects of PM ₁₀	Ecological
Demolition	N/A	N/A	N/A
Earthworks	Medium	Low	Low
Construction	Medium	Low	Low
Trackout	Medium	Low	Low

- 17.7.8 The effects during the construction works are predicted with regard to the potential for dust nuisance complaints and surface soiling events due to deposition, as opposed to the risk of exceeding any Air Quality Objective (AQO). All dust effects are considered to be direct, temporary, short-term and reversible in nature. The effects are determined to be direct as they occur as a result of activities associated with the Development, temporary as they will only potentially occur during the construction works, short-term because these will only arise at particular times when certain activities and meteorological conditions for creating the level of magnitude predicted combine, and reversible upon cessation of construction works.
- 17.7.9 The assessment of dust and/or PM₁₀, which is undertaken qualitatively using professional judgement, utilises the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction (January 2014) and Part 1 LA105 Air Quality of the Volume 11 Section 3 of the Design Manual for Roads and Bridges^{xi}.
- 17.7.10 The Applicant's consultants Tetra Tech have adapted guidance from the IAQM 'Guidance on the Assessment of Dust from Demolition and Construction' published in 2014 ^{xii}. In total, four stages are considered, namely demolition, earthworks, construction and trackout. For each of these phases, the significance of the potential dust is derived following the determination of a dust emission magnitude and the distance of activities to the nearest sensitive receptor, therefore the worst-case is assessed.
- 17.7.11 Following the implementation of the appropriate site-specific mitigation measures, the significance of the effects from dust and PM₁₀ emissions associated with the construction works is considered to be negligible on all receptors. This is based on the IAQM Guidance. All effects are considered to be temporary, direct, adverse and short term.

Operational Phase

- 17.7.12 The operational fire incident impact assessment will be included in the ES.

Decommissioning Phase

- 17.7.13 Decommissioning phase impacts are likely to be similar to those considered during construction.

17.8 Cumulative/In-Combination Effects

- 17.8.1 The scheme does not include any fixed plant which may give rise to industrial emissions, such as Combined Heat and Power (CHP) or boilers, therefore cumulative effects from industrial emission impacts will be not assessed.

With regard to traffic air quality impact from the scheme, the Scoping Opinion concluded that "Subject to confirmation that the proposed construction vehicle numbers alone or cumulatively with other proposals on relevant links (e.g. for Cottam Solar Project) will not exceed the relevant IAQMEPUK thresholds e.g. 100 HGV Annual Average Daily Traffic (AADT), the Inspectorate considers that the need for detailed construction air quality modelling and assessment can be scoped out. Based on the nature of the development and subject to confirmation of the type and number of maintenance vehicles, the Inspectorate considers that operational traffic movements will be limited and that operational traffic air quality modelling may be scoped out."

- 17.8.2 However, the cumulative traffic air quality effects will be re-assessed by considering other NSIP projects in this locality for similar developments along with planning applications for the same in the ES. It is noted that there are a number of other NSIPs in this locality that are at a similar stage to this application; these have not yet attained permission but will be considered within the cumulative impact assessment in the ES. Details of the closest cumulative developments are provided in **Appendix 2.2** and **2.3** of the PEIR.
- 17.8.3 At this stage, it is anticipated that the cumulative vehicle numbers would not exceed the "Indicative criteria for requiring an air quality assessment" in IAQM Guidance of Land-use planning & development control: Planning for air quality, January 2017 and air quality modelling for cumulative traffic assessment will be not required.

17.9 Mitigation Measures

- 17.9.1 The site-specific construction dust mitigation has been detailed in the CDMP's in **Appendices 17.1 – 17.4**.
- 17.9.2 With regard to the mitigation measures for the decommissioning phase, it is anticipated that the dust and particulate matter emission impacts during the decommissioning will be less than the impacts during the constructions. Therefore, following the implementation of the appropriate site-specific mitigation measures identified for the construction phase, the significance of the effects from dust and PM₁₀ emissions associated with the decommissioning works is considered to be negligible on all receptors.
- 17.9.3 A fire impact assessment report will detail the mitigation measures and actions to be taken in case of a fire occurring and presented in the ES at the DCO stage.

17.10 Residual Effects

- 17.10.1 Following the implementation of the appropriate site-specific mitigation measures identified during the construction, operation and decommissioning phases and during an occurrence of fire incident, the residual effects on both human receptors and ecological receptors are determined to be negligible.

17.11 References

- ⁱ The Air Quality Standards Regulation (2016) <https://www.legislation.gov.uk/uksi/2016/1184/contents/made>
- ⁱⁱ The Air Quality Standards Regulation (2010) <http://www.legislation.gov.uk/uksi/2010/1001/contents/made>
- ⁱⁱⁱ Defra (2019) The Air Quality Strategy.
- ^{iv} UK Legislation (1990). Environment Protection Act.
- ^v CLG (2019) National Planning Policy Framework.
- ^{vi} CLG (2019) Planning Practice Guide
- ^{vii} Defra (2019). Clean Air Strategy.
- ^{viii} Institute of Air Quality Management (2016). Guidance on the assessment of dust from demolition and construction.
- ^{ix} Institute of Air Quality Management, (2017). Land-Use Planning & Development Control: Planning for Air Quality v1.2.
- ^x Manitoba Health (2012). Smoke Exposure from Wildland Fires, Interim Guidelines for Protecting Community Health and Wellbeing.
- ^{xi} Highways Agency et al. (2019) Design Manual for Roads and Bridges LA 105 Air Quality.
- ^{xii} Institute of Air Quality Management (2014). Guidance on the assessment of dust from demolition and construction.

18 Socio-Economics, Agriculture, Tourism and Recreation

18.1 Introduction

18.1.1 The chapter of the PEIR will describe and identify environmental effects arising as a result of the Scheme, in relation to:

- Population demography;
- Population health;
- Population skill level and qualification attainment;
- Indices of deprivation;
- Economic activity and performance;
- Business profiles, sector shares and classification;
- Agricultural circumstances;
- Agricultural Land Classification;
- Tourism as an economic sector;
- Accessibility to tourism and recreational facilities

18.1.2 The EIA Regulations 2017 require the direct and indirect significant effects of the proposed development on population and human health factors to be identified, described, and assessed.

18.1.3 As this forms part of a PEIR, baseline data, survey results, cumulative assessments, and impact assessments will be reviewed and updated as necessary subject to new data being available and statutory consultee comments between the publication of this PEIR and parallel statutory consultation, and the final Environmental Statement for DCO application submission.

Assessment Scope

18.1.4 Following receipt of the EIA Scoping Opinion in March 2022, the Planning Inspectorate (PINS) has confirmed the extent of the assessments to be undertaken in the ES.

- Socio-economic impacts during construction. There is potential for the Scheme to give rise to socio-economic effects on the local and regional impact areas. The likely effects are considered to be increased access to employment opportunities, increased workplace population, and increased direct and indirect economic activity, many of which are anticipated to be positive.
- Socio-economic impacts during operation. This will be limited to impacts on the agricultural industry through taking the land out of production for the lifetime of the Scheme.
- Impacts on agricultural circumstances during construction, operation, and decommissioning. Effects on agricultural circumstances are likely to be limited to those immediately impacted by the development, which are soil disturbance and damage, agricultural land classification and productivity, agricultural land use, and the agricultural economy.

- Impacts on tourism and recreation during construction and operation. Effects on tourism and recreation are likely to be limited to those facilities immediately impacted by the development, which are Public Rights of Way and heritage assets within close proximity to the development areas. Impacts on the local tourism economy and on other recreational points of interest will be investigated.

Consultation

- 18.1.5 In addition to the agreement of the scope of assessment in the ES, the Scoping Opinion was accompanied by a period of consultation with statutory bodies. The comments made by these bodies in relation to socio-economics, agriculture, tourism and recreation, are summarised in **Table 18.1** below.

Table 18.1: EIA Scoping Responses re. Socio-Economics, Agriculture, Tourism and Recreation

Consultee	Comment	Response Addressed in PEIR/ES
Planning Inspectorate	<p>Human Health is scoped out of this Chapter as the assessment of impacts to human health are proposed to be incorporated into aspect Chapters in the ES: 9: Hydrology, Flood Risk and Drainage; 10: Ground Conditions and Contamination; 14: Transport and Access; 15: Noise and Vibration; 16: Glint and Glare; 17: Electromagnetic Fields; 18: Light Pollution; 19: Major Accidents and Disasters; 20: Air Quality; 22: Agricultural Circumstances; 23: Waste; 24: Telecommunications, Utilities and Television Receptors.</p> <p>It is noted that some of the Chapters referenced above are scoped out or proposed to be assessed in other relevant Chapters. The Inspectorate is content with this approach on the basis that the ES clearly signposts in which other Chapters impacts to human health are assessed.</p> <p>New census data is set to be published in spring 2022. This should be used to inform baseline data and the ES assessment</p> <p>The Scoping Report explains that significance is assessed based on comparison of receptor sensitivity and impact magnitude criteria in Table 21.5 but</p>	<p>Human Health matters with regard to socio-economics have been assessed in this Chapter, with signposting provided to the Human Health summary provided at the dedicated section 20.2 in the "Other Environmental Matters" chapter.</p> <p>The publication of Census 2021 data has been deferred to July 2022, and as such is not available at PEIR stage. The data will therefore be used in the ES.</p> <p>Section 18.3: Assessment Methodology and Significance Criteria has been updated since the scoping stage to contain</p>

	<p>does not explain what constitutes a significant effect. The ES should confirm the threshold for determination of a significant effect in relation to impacts on Human Health, Socio-economics and Tourism.</p> <p>Scoping Report paragraph 22.4.1 proposes to assess impacts to agricultural land resources, soil resources and farming circumstances in the socio-economics, tourism and recreation and human health Chapter of the ES.</p> <p>The Inspectorate is content with this approach although the ES should signpost where effects to these receptors have been incorporated into the relevant Chapter assessments. Where impacts to soils and agricultural land is assessed in other relevant Chapters, this should include determining the degree and extent to which soils have been disturbed or damaged and any relevant mitigation measures employed to avoid/reduce impacts to soils; these should be secured via the DCO.</p>	<p>the determination of what is considered a significant effect.</p> <p>Agricultural Land Classification surveys have been provided at Appendix 3.2 of this PEIR document. Preliminary assessment of soil resources and farming circumstances have been provided in this chapter. These will be assessed in full in the ES. Preliminary construction impacts on soil from construction traffic have been identified in this chapter and cross-referenced with Chapter 10: Ground Conditions and Contamination, and Chapter 14: Transport. Mitigation measures have been identified in these chapters and summarised in the Draft Outline Construction Environmental Management Plan (OCEMP)</p>
Bassetlaw District Council	<p>The inclusion of a joint district area assessment in the form of a Local Impact Area for socio-economic, tourism and recreation, and human health impacts is welcomed.</p> <p>It is considered that [agricultural circumstances] is an important issue for the District, especially cumulatively with other similar proposals. It therefore should be scoped into the ES.</p>	<p>Noted.</p> <p>Agricultural circumstances have been scoped in as included within this chapter.</p>
Nottinghamshire County Council	<p>It is recommended that [the] checklist is completed to enable the potential positive and negative impacts of the planning application on health and wellbeing to be considered in a consistent, systematic and objective way, identifying opportunities for maximising potential health gains and minimizing harm and addressing inequalities taking account of the wider determinants of health.</p>	<p>Key impacts on population health and wellbeing have been assessed in the socio-economic section of this chapter, whilst impacts on access to recreation spaces has been assessed in the tourism and recreation section of this chapter.</p>
Fillingham Parish Meeting	<p>Agricultural circumstances appear to be currently out of scope of the ES, citing the matters relating to farming practice as being out of scope. It is therefore not clear that how or whether the environmental</p>	<p>Loss of agricultural land and impacts on farming circumstances have been included within this chapter. An indicative assessment has been</p>

	<p>impact of displacing such a large area of agricultural land will be considered.</p> <p>It is not clear within the framework of the consultation where efficiency of land use is to be considered, but this appears to be omitted.</p>	<p>made at PEIR stage and will be expanded for the ES.</p> <p>Efficiency of land use has not been directly assessed. With regard to BMV, Agricultural Land Classification surveys were undertaken in 2021-2022 across the three Sites that make up the Scheme. These are located at Appendix 3.2. An indicative description of the site selection process is provided at Chapter 5: Alternatives and Design Evolution.</p>
Lincolnshire County Council	The range of the scoping document [with regard to socio-economics] appears reasonable, and able to comment in further detail at the next stage.	Noted.
Natural England	<p>The following issues should be considered and included as part of the Environmental Statement (ES):</p> <ul style="list-style-type: none"> • The degree to which soils would be disturbed or damaged as part of the development • The extent to which agricultural land would be disturbed or lost as part of this development, including whether any best and most versatile (BMV) agricultural land would be impacted. • The ES should set out details of how any adverse impacts on BMV agricultural land can be minimised through site design/masterplan. • The ES should also set out details of how any adverse impacts on soils can be avoided or minimised and demonstrate how soils will be sustainably used and managed, including consideration in site design and master planning, and areas for green infrastructure or biodiversity net gain. The aim will be to minimise soil handling and maximise the sustainable use and management of the available soil to achieve successful after-uses and minimise offsite impacts. <p>In order to fully assess the impacts to Best and Most Versatile land, a detailed Agricultural Land Classification (ALC) survey may be necessary</p>	<p>Agricultural Land Classification surveys were undertaken in 2021-2022 across the three Sites that make up the Scheme. These are located at Appendix 3.2.</p> <p>A breakdown of the assessed agricultural land quality by individual site is provided at Tables 18.9 and 18.10.</p> <p>Long-term impacts on soil quality have been preliminarily explored in this chapter and will be assessed in detail in the ES.</p> <p>A further set of soil surveys is to be undertaken during summer 2022. This will provide updated data for a detailed ALC assessment to be used for the ES.</p>

North Kesteven District Council	Request that the cumulative effects of the 5 proposed NSIPs in Lincolnshire on loss of Best and Most Versatile agricultural land are assessed,	The cumulative effects have preliminarily been identified in this chapter. A full assessment of the cumulative effects will be undertaken in the ES.
North Lincolnshire Council	<p>Having considered Chapter 21 of the EIASR, it is noted that the impacts range from beneficial negative in respect of loss of agricultural land and risks of fire. NLC do not have any objections to the approach set out in the EIASR at this stage.</p> <p>Having considered Chapter 22 of the EIASR, NLC do not have any objections to the approach set out in the EIASR at this stage. However, it should be noted that NLC does not have expertise in the methods used in this specific study.</p>	<p>Noted.</p> <p>Noted.</p>
UK Health Security Agency	<p>The details for the consultancies responsible for the human health assessments should be identified.</p> <p>[The current approach to population and human health is proportionate at this stage and] should be kept under review as more information becomes available ... a separate population and human health chapter may be justified as the assessments develop.</p> <p>The scoping report does not identify any baseline health data to support any population or human health assessment or consider local health priorities which have been identified within local Joint Strategic Needs Assessments (JSNA) or Health and Wellbeing Strategies.</p> <p>Baseline health data should be provided, which is adequate to identify any local sensitivity or specific vulnerable populations. The identification of vulnerable populations should be based on the list provided by the Welsh Health Impact Assessment Support Unit and the International Association of Impact Assessment (IAIA).</p> <p>The ES should provide a defined area, with justification, of the geographic scope of this assessment and any variation between</p>	<p>Human health impacts are to be assessed by a number of consultancies with regard to individual topic in the ES. These will be collated and assessed by Lanpro Services.</p> <p>Separate population and human health chapter not considered necessary at PEIR. Responses to the statutory consultation will be used to review this position.</p> <p>Preliminary baseline population health data has been included in section 18.4. This will be expanded upon in the ES with a full assessment of impacts and likely significant effects from the Scheme.</p> <p>Preliminary baseline population health data has been included in section 18.4. This will be expanded upon in the ES with a full assessment of impacts and likely significant effects from the Scheme.</p> <p>The geographic scope of assessment is described in Section 18.3: Assessment</p>

	<p>geographic scope between socio-economics and population and human health.</p> <p>The peak numbers of construction workers and non-home-based workers should be established and a proportionate assessment (including cumulative impacts) undertaken on the impacts for housing availability and affordability and impacts on any local services.</p>	<p>Methodology and Significance Criteria.</p> <p>Preliminary identification of housing and accommodation availability has been provided at PEIR, with potential likely significant effects identified where anticipated. A full assessment is to be undertaken for the ES.</p>
West Lindsey District Council	<p>Detailed soil surveys undertaken by competent soil specialists should be undertaken in accordance with Natural England guidelines.</p> <p>The Scoping report is unclear as to what surveys have already taken place, and how has the ALC and BMV figures have been derived.</p> <p>It is considered that the effect on agricultural land resource and farming is likely to be significant and must be in scope. However, we do not object to this being covered by the "Socio Economics..." chapter</p>	<p>Agricultural Land Classification surveys were undertaken in 2021-2022 across the five Sites that make up the Scheme. These are located at Appendix 3.2.</p> <p>A breakdown of the assessed agricultural land quality by individual site is provided at Tables 18.9 and 18.10.</p> <p>A further set of soil surveys is to be undertaken during summer 2022. This will provide updated data for a detailed ALC assessment to be used for the ES.</p> <p>Noted.</p>

18.2 Policy Context

Legislative Context

- 18.2.1 The Planning Act 2008⁴⁶ sets out the process for the consenting of major infrastructure projects as is the principal legislation governing an application for a Nationally Significant Infrastructure Project (NSIP).

⁴⁶ Planning Act 2008, 2008 c.29.

- 18.2.2 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017⁴⁷ sets out the regulatory framework for Environmental Impact Assessments in connection with development consent order applications, to include screening, scoping and the requirements in respect of their content.

National Policy Context

- 18.2.3 National Policy Statements (NPS) set out the policy basis for NSIPs. At present, there is no NPS which specifically deals with ground mounted solar developments. However, there are aspects of three Energy NPSs which are relevant to decision making and are important material considerations, in addition to other relevant and important national and local planning policies. These have been identified in **Chapter 6: Energy Need, Legislative Context and Energy Policy**.

National Policy Statement for Energy (EN-1)⁴⁸

- 18.2.4 Part 4 of EN-1 sets out the assessment principles for energy applications. Paragraphs 4.1.3 states that the Secretary of State should take into account the potential benefits of development proposals including their *"contribution to meeting the need for energy infrastructure, job creation and any long-term or wider benefits"*. Paragraph 4.1.4 states that the Secretary of State should take into account *"environmental, social and economic benefits and adverse impacts, at national, regional and local levels"*.
- 18.2.5 NPS EN-1 requires applicants to describe the existing socio-economic conditions in the areas surrounding the proposed development (paragraph 5.12.3), and assess all relevant socio-economic which may include:
- The creation of jobs and training opportunities;
 - The provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;
 - Effects on tourism;
 - The impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure; and
 - Cumulative effects.

Draft National Policy Statement for Energy (EN-1)⁴⁹

- 18.2.6 The Department for Business, Energy and Industrial Strategy is currently undertaking a review of the six NPSs for energy infrastructure, with consultation being undertaken from September to November 2021. The transitional provisions

⁴⁷ The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, 2017 No.572.

⁴⁸ Department of Energy and Climate Change (2011). Overarching National Policy Statement for Energy (EN-1). London: The Stationery Office.

⁴⁹ Department of Business, Energy & Industrial Strategy (2021). Draft Overarching National Policy Statement for Energy (EN-1). London: The Stationery Office.

in draft NPS EN-1 state that the 2011 NPSs will be the applicable national policy statements for any DCO application that is accepted for examination before the designation of the updated NPSs. However, the policies set out in the emerging draft NPSs (or those designated but not having effect) are potentially capable of being important and relevant considerations in the decision-making process.

- 18.2.7 Part 4 of Draft EN-1 also sets out the assessment principles for energy applications. The requirements set out in Paragraphs 4.1.3-4.1.4 for the Secretary of State are retained. Of additional note, paragraph 4.3.4 states: *"New energy infrastructure may also affect the composition and size of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport or the use of open space for recreation and physical activity."*
- 18.2.8 The Draft NPS EN-1 requires applicants to consider the generic impacts of development on the surrounding environment with regard to land use in Section 5.11, and socio-economics in Section 5.13.
- 18.2.9 Paragraph 5.11.8 requires applicants to *"seek to minimise impacts on the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) and preferably use land in areas of poorer quality (grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations. Applicants should also identify any effects and seek to minimise impacts on soil quality taking into account any mitigation measures proposed."*
- 18.2.10 Paragraph 5.13.2 outlines that *"where the project is likely to have socio-economic impacts at local or regional levels, the applicant should undertake and include in their application an assessment of these impacts as part of the ES."*
- 18.2.11 As in the adopted EN-1, the draft policy requires the applicant to describe the existing socio-economic conditions in the areas surrounding the proposed development (paragraph 5.13.4), and assess all relevant socio-economic impacts as set out in paragraph 5.13.3:
- The creation of jobs and training opportunities;
 - The contribution to the development of low-carbon industries;
 - The provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;
 - Indirect beneficial impacts for the region hosting the infrastructure;
 - Effects on tourism;
 - The impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure; and
 - Cumulative effects.
- 18.2.12 The Draft NPS EN-1 also states at paragraph 5.13.6 that *"applicants should also consider developing accommodation strategies where appropriate, especially during construction and decommissioning phases, that would include for the need to provide temporary accommodation for construction workers if required."*

- 18.2.13 Furthermore, Draft EN-1 requires the Secretary of State to *“consider any relevant positive provisions the applicant has made or is proposing to make to mitigate impacts (for example through planning obligations) and any legacy benefits that may arise as well as any options for phasing development in relation to the socio-economic impacts.”*

Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)⁵⁰

- 18.2.14 Draft NPS EN-3 has been updated with a section dedicated to solar photovoltaic generation, and as such, the policies therein are directly relevant to this Scheme. Paragraphs 2.48.13-2.48.15 specifically relate to the locating of solar PV projects with respect to agricultural land classification and land type.
- 18.2.15 The Draft EN-3 states *“Where possible, ground mounted Solar PV projects should utilise previously developed land, brownfield land, contaminated land, industrial land, or agricultural land preferably of classification 3b, 4, and 5 (avoiding the use of “Best and Most Versatile” cropland where possible). However, land type should not be a predominating factor in determining the suitability of the site location”* (paragraph 2.48.13).
- 18.2.16 Paragraph 2.48.14 goes on to state that *“The Agricultural Land Classification (ALC) is the only approved system for grading agricultural quality in England and Wales and should be used to establish the ALC and identify the soil types to inform soil management at the construction, operation and decommissioning phases. This should be extended to the underground cabling and access routes. The soil survey may also inform the suitable beneficial use of the land during the operational phase. Criteria for grading the quality of agricultural land using the Agricultural Land Classification (ALC) of England and Wales is decided by Natural England and considerations relating to land classification are expected to be made with reference to this guidance, or any successor to it.”*

National Planning Policy Framework(2021)⁵¹

- 18.2.17 Paragraph 5 of the National Planning Policy Framework (NPPF), amended July 2021, acknowledges that while it *“does not contain specific policies for nationally significant infrastructure projects”*, it may be given weight in decision-making for NSIPs where the policies in the NPPF are *“other matters that are relevant”*.
- 18.2.18 Key to the overarching principles of the NPPF is that the *“purpose of the planning system is to contribute to the achievement of sustainable development”* (paragraph 7) and this should be achieved by pursuing interdependent and mutually supportive economic, social, and environmental objectives (paragraph 8). Therefore: *“plans and*

⁵⁰ Department of Business, Energy & Industrial Strategy (2021). Draft National Policy Statement for Renewable Energy Infrastructure (EN-3). London: The Stationery Office.

⁵¹ Ministry of Housing, Communities & Local Government (2021). National Planning Policy Framework. London: The Stationery Office.

decisions should apply a presumption in favour of sustainable development.”
(paragraph 11)

- 18.2.19 To meet the economic objectives, the NPPF emphasises the importance of building a strong, competitive economy by supporting *“economic growth and productivity, taking into account both local business needs and wider opportunities for development”* (paragraph 81) and helping to support a prosperous rural economy. Social sustainability is given policy context through emphasis on promoting healthy and safe communities (section 8) through enabling and supporting social healthy lifestyles, social interaction, providing social, recreational and cultural facilities (paragraphs 92-93), and retaining access to open space, recreational spaces (paragraphs 98-99), and public rights of way (paragraph 100). Finally, the NPPF gives significant importance to protecting and enhancing the natural, built and historic environments (sections 15-16). All three of these objective areas are relevant to assessment of socio-economic, agriculture, tourism and recreation effects anticipated from the development of the Scheme.
- 18.2.20 Paragraph 152 demonstrates the national ambitions for the planning system to *“support the transition to a low carbon future in a changing climate”* and to *“support renewable and low carbon energy and associated infrastructure”*. The NPPF (at paragraph 155) goes on to explain how local planning authorities should seek to increase the use and supply of renewable energy through providing a positive strategy for energy whilst ensuring adverse impacts are addressed and considering identifying suitable areas for renewable energy sources.

Local Policy Context

Lincolnshire Minerals and Waste

- 18.2.21 The Lincolnshire Minerals and Waste Local Plan consists of two documents: the Core Strategy & Development Management Policies⁵², adopted June 2016; and the Site Locations document⁵³, adopted 2017. Together these define the countywide planning strategy and policy framework for determining applications and allocation of land for mineral extraction and waste development, including safeguarding land from other developments. Detailed matters regarding minerals and waste are discussed in **Chapters 12** and **19** of this PEIR respectively.
- 18.2.22 The policies of relevance to socio-economics are primarily concerned with minerals safeguarding and ensuring the Scheme does not impact on the viability of land for minerals extraction. These have been previously explored in **Chapter 12** of this PEIR.

⁵² Lincolnshire County Council (2016). Lincolnshire Minerals and Waste Local Plan: Core Strategy & Development Management Policies. Lincoln.

⁵³ Lincolnshire County Council (2017). Lincolnshire Minerals and Waste Local Plan: Site Locations. Lincoln.

Nottinghamshire Minerals and Waste

- 18.2.23 The Nottinghamshire Minerals Local Plan⁵⁴ was adopted in March 2021 and provides the policy context for minerals extraction in the Nottinghamshire county area. The Nottinghamshire Waste Plan is a separate document that does not contain policy pertinent to the socio-economic, agricultural, or tourism and recreation impacts of the development.
- 18.2.24 The policies in the Nottinghamshire Minerals Local Plan of relevance to socio-economics are primarily concerned with minerals safeguarding and ensuring the proposed development does not impact on the viability of land for minerals extraction.
- 18.2.25 Policy SP1 outlines the strategy for the supply of minerals in Nottinghamshire, whilst policy SP7 gives context to the strategic nature of “*minerals safeguarding, consultation areas and associated minerals infrastructure*”. These have been previously explored in **Chapter 12** of this PEIR.

Central Lincolnshire Local Plan

- 18.2.26 The Central Lincolnshire Local Plan provides local planning and development management policy for the districts of North Kesteven, Lincoln City, and West Lindsey. The existing Local Plan document⁵⁵ and associated Proposals Maps⁵⁶ were adopted in April 2017. These are currently undergoing review, with an emerging Local Plan⁵⁷ having been consulted on between March and May 2022.
- 18.2.27 The adopted policies deemed to be of most relevance from the Central Lincolnshire Local Plan to socio-economic, agriculture, and tourism and recreation factors, are:
- Policy LP1: A Presumption in Favour of Sustainable Development;
 - Policy LP5: Delivering Prosperity and Jobs
 - Policy LP7: A Sustainable Visitor Economy
 - Policy LP9: Health and Wellbeing
 - Policy LP19: Renewable Energy Proposals
 - Policy LP55: Development in the Countryside
- 18.2.28 Those emerging policies deemed to be of most relevance from the Central Lincolnshire Local Plan Review to socio-economic, agriculture, and tourism and recreation factors, are:

⁵⁴ Nottinghamshire County Council (2021). Nottinghamshire Minerals Local Plan. Nottingham.

⁵⁵ North Kesteven District Council, Lincoln City Council, West Lindsey District Council (2017). Central Lincolnshire Local Plan. Sleaford: North Kesteven District Council.

⁵⁶ North Kesteven District Council, Lincoln City Council, West Lindsey District Council (2017). Policies maps for Adopted Central Lincolnshire Local Plan. Sleaford: North Kesteven District Council.

⁵⁷ North Kesteven District Council, Lincoln City Council, West Lindsey District Council (2022). Central Lincolnshire Local Plan Review: Proposed Submission. Sleaford: North Kesteven District Council.

- Policy S5: Development in the Countryside
- Policy S10: Supporting a Circular Economy
- Policy S14: Renewable Energy
- Policy S15: Protecting Renewable Energy Infrastructure
- Policy S16: Wider Energy Infrastructure
- Policy S28: Spatial Strategy for Employment
- Policy S34: Non-designated Employment Proposals in the Countryside
- Policy S43: Sustainable Rural Tourism
- Policy S45: Strategic Infrastructure Requirements
- Policy S46: Safeguarded Land for Future Key Infrastructure
- Policy S48: Walking and Cycling Infrastructure
- Policy S54: Health and Wellbeing
- Policy S67: Best and Most Versatile Agricultural Land

West Lindsey Sustainability, Climate Change and Environment Strategy

- 18.2.29 In response to the Intergovernmental Panel on Climate Change's Special Report, 'Global Warming of 1.5°C', published in October 2018, West Lindsey District Council have published and adopted their Sustainability, Climate Change and Environment Strategy⁵⁸. This will help to guide the Council towards achieving their internal goal of achieving net zero by 2050. Key to this strategy is the Council's "possible priority themes" which include reducing and shifting energy demands and moving energy sourcing to low carbon and renewable energy generation and storage technology.

Bassetlaw Plan

- 18.2.30 Local policy in Bassetlaw District is directed by the Bassetlaw Core Strategy & Development Management Policies Development Plan Document⁵⁹, adopted in December 2011. Bassetlaw District Council are in the midst of drafting a new Local Plan⁶⁰, with a consultation being held between May and June 2022. Given the advanced stage of the Plan, the emerging policies of relevance to the socio-economic, agriculture, and tourism and recreation factors of the Scheme are:
- POLICY ST6: Cottam Priority Regeneration Area
 - POLICY ST11: Rural Economic Growth and Economic Growth Outside Employment Areas
 - POLICY ST12: Visitor Economy
 - POLICY ST44: Promoting Healthy, Active Lifestyles
 - POLICY ST47: Promoting Sport and Recreation

⁵⁸ West Lindsey District Council (2021). Sustainability, Climate Change and Environment Strategy. Gainsborough: West Lindsey District Council.

⁵⁹ Bassetlaw District Council (2011). Core Strategy & Development Management Policies DPD. Workop: Bassetlaw District Council.

⁶⁰ Bassetlaw District Council (2022). Bassetlaw Local Plan 2020-2038 Publication Version Second Addendum. Workop: Bassetlaw District Council.

- POLICY ST50: Reducing Carbon Emissions, Climate Change Mitigation and Adaptation
- POLICY ST51: Renewable Energy Generation

18.3 Assessment Methodology and Significance Criteria

- 18.3.1 The baseline assessment undertaken for this PEIR has been provided to give an initial understanding of the socio-economic conditions within the anticipated zones of influence of the Scheme. The Local Impact Area has been defined as the combined areas of Bassetlaw District and West Lindsey District, due to the geographic expanse and scale of the Scheme. The Regional Impact Area is defined as the statistical East Midlands ITL region.
- 18.3.2 This assessment will be expanded in the ES to produce a more detailed evaluation and basis for full impact assessment. This will include where applicable and practicable, providing additional fine-grain data at individual District level, or at District Ward level.
- 18.3.3 As part of the baseline assessments, data from the relevant local authorities will be used to assess how the development will affect the socio-economic environment, agricultural circumstances, and tourism and recreation receptors. The information sources to be used for the assessments are as follows:
- ONS Census 2011
 - ONS Annual Population Survey
 - ONS Local Authority and National Population Projections;
 - DCLG: Indices of Multiple Deprivation Map App;
 - ONS: Annual Survey of Hours and Earnings;
 - ONS Business Register and Employment Survey;
 - Bassetlaw Local Plan Publication Version and supporting documentation;
 - Central Lincolnshire Local Plan and supporting documentation;
 - National Planning Policy Framework;
 - Natural England;
 - Agricultural Land Classification Reports;
 - Visit Nottinghamshire;
 - Visit Lincoln;
 - OpenStreetMap;
 - OS Explorer Map;
 - Google Maps and Google Earth;
 - Long Distance Walkers Association;
 - Lincolnshire Ramblers Association; and
 - The National Byway.

Assessment of Sensitivity and Magnitude

- 18.3.4 The nature of sensitivity on all identified environmental receptors will be described as high, medium, low, or negligible, whilst the magnitude of impact on those receptors will be described as high, medium, low, negligible, or neutral.
- 18.3.5 The sensitivity of the receptors identified in this chapter will be assessed by understanding measurable indicators of the receptor's present characteristics and considering this alongside the weighted importance of the receptor in local, regional, and national policy or strategic requirements together with professional judgment. For example, the sensitivity of number of jobs is likely to be determined from its local characteristics and how far it deviates from national trends, in consideration with the local policy requirements for the creation of new employment opportunities.
- 18.3.6 The methodology for determining the impact magnitude is described below and has been determined by quantifying the predicted deviation from baseline conditions. This will be considered both with and without mitigation. The magnitude of change will be used for either beneficial or adverse impacts.

Environmental Receptors – Socio-Economic

- 18.3.7 The Scheme is likely to have impacts on socio-economic receptors at the local and regional level, and to a more minor extent, the national level. These effects are predominantly focussed on economic impacts (particularly during construction), given the nature of the Scheme. Impacts on socio-demographic receptors are likely to be limited to those as a result of the anticipated construction workforce and the related indirect impacts on socio-demographic characteristics. The sensitivity of these receptors will be assessed in accordance with **Table 18.2**.
- 18.3.8 The Scheme is of a nationally strategic scale, and as such will provide a significant number of employment opportunities for direct and indirect sectors of the local and regional economy during construction. These will also have knock-on impacts on other socio-economic factors such as wages, unemployment, and deprivation as a result of increased access to employment. The magnitude of these impacts will be quantified in full for the construction and operational phases of the Scheme and estimated for the Scheme's decommissioning (considered for the purposes of the EIA to be in 2066) in accordance with the metrics set out in **Table 18.3**.
- 18.3.9 The Scheme is likely to impact on existing economic sectors within the local and regional impact areas as a result of competition for resources, labour force, and direct and indirect conflicts with economic sectors such as the agricultural economy and in the tourism and recreation economies. Additional localised economic impacts may occur where the location of the Scheme impacts on the operation of businesses near to or adjacent to the Site where their location, landscape setting, and long views are fundamental to their economic success.

Table 18.2 Sensitivity and Importance of the Identified Environmental Receptor

Sensitivity	Definition
High	Receptor is likely to experience direct and significant socio-economic challenges with fundamental change to present characteristics. Accorded a high priority in local, regional or national economic regeneration policy. Receptor is of regional or national importance.
Medium	Receptor is likely to experience some socio-economic challenges, which may be indirect, but will materially change its present characteristics. Change relating to receptor has medium priority in local, regional and national economic and regeneration policy. Receptor is of significant local importance.
Low	Indiscernible to minor socio-economic challenges relating to receptor resulting in non-material changes to baseline conditions. Receptor is accorded a low priority in local, regional and national economic and regeneration policy. Receptor is of low importance.
Negligible	The identified receptor can accommodate change without material effect, and is of limited importance.

Table 18.3 Magnitude of Change for the Identified Environmental Receptor

Magnitude	Definition
High	The total loss or major change/substantial alteration to key elements/features of the baseline conditions, such that the post-development characteristics will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions, such that post-development characteristics of the baseline will be materially changed.
Low	A minor shift away from baseline condition. As change arising from the loss/alteration will be discernible/detectable but not material. The post-development characteristics of the baseline condition will be similar to pre-development conditions.
Negligible	Very little change from baseline conditions. The change will be barely distinguishable and approximating to a non-change situation.
Neutral	No change from baseline conditions.

Environmental Receptors – Agricultural Circumstances

- 18.3.10 The Scheme is likely to have an effect on agricultural circumstances such as land use, and the agricultural economy.
- 18.3.11 The Scheme, being located on existing agricultural land, will directly impact on the use of the land for agricultural use for a temporary period from the point of construction through until the Site is decommissioned. The Scheme may impact on the wider agricultural economy, and on the soil quality within the Scheme

development area. These will be addressed through this PEIR and subsequent ES chapter, and as part of the emerging soil management strategy to ensure the quality and productivity of the agricultural land across the Scheme's Sites and cable routes are retained and protected for when the land is returned to agricultural use following the Scheme's decommissioning.

- 18.3.12 The ES will identify and assess the impact on key agricultural circumstances including but not limited to:
- Agricultural Land Classification;
 - Agricultural land use and productivity;
 - Soil quality and damage limitation; and
 - Local and regional agricultural economy.
- 18.3.13 The receptors associated with the above agricultural circumstances are identified in below:
- Quantum of land in agricultural use;
 - Quantum of Best and Most Versatile land;
 - Soil quality; and
 - The local and regional agricultural economy.
- 18.3.14 The ES will assess the sensitivity of receptors and magnitude of impact on key agricultural circumstances based on the metrics in **Table 18.4** and **Table 18.5** respectively.

Table 18.4 Sensitivity and Importance of the Identified Environmental Receptor

Sensitivity	Definition
High	Receptor is likely to experience significant direct and indirect challenges with regard to agricultural circumstances, with fundamental change to present characteristics. Afforded a high priority in local, regional or national agricultural policy. Receptor is land of the highest agricultural quality and productivity, or economic receptor is of regional or national importance.
Medium	Receptor is likely to experience some direct and indirect agricultural and economic challenges, that will materially change its present characteristics. Change relating to receptor has medium priority in local and regional agricultural policy. Receptor is land of medium-high agricultural quality (BMV) and productivity or is of significant local economic importance.
Low	Indiscernible to minor direct or indirect agricultural and economic challenges relating to receptor resulting in non-material changes to baseline conditions. Receptor is accorded a low priority in local and regional agricultural policy. Receptor is of low importance.
Negligible	The identified receptor can accommodate change without material effect, and is of limited importance.

Table 18.5 Magnitude of Change for the Identified Environmental Receptor

Magnitude	Definition
High	The total loss or major change/substantial alteration to key elements/features of the baseline conditions, such that the post-development characteristics will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions, such that post-development characteristics of the baseline will be materially changed.
Low	A minor shift away from baseline condition. As change arising from the loss/alteration will be discernible/detectable but not material. The post-development characteristics of the baseline condition will be similar to pre-development conditions.
Negligible	Very little change from baseline conditions. The change will be barely distinguishable and approximating to a non-change situation.
Neutral	No change from baseline conditions.

Environmental Receptors – Tourism and Recreation

- 18.3.15 The Scheme is likely to have an impact on tourism and recreation receptors, albeit these are likely to be limited to those receptors that are directly impacted by the location of the Scheme such as Public rights of way. The ES will assess the sensitivity of receptors and magnitude of impact on key tourism and recreation receptors based on the metrics in **Table 18.6** and **Table 18.7** respectively.
- 18.3.16 The Scheme is likely to have an effect on both landscape visual receptors and on local heritage assets that rely on their setting for their value to the tourism and recreational economy. These impacts are likely to be felt at a local level only as a result of direct visual impacts, or indirectly as a result of changes to their desirability for tourism and recreational use. The impacts on landscape visual receptors, including those at key tourist locations (such as important viewpoints) and on recreational routes have been discussed in greater depth in **Chapter 8: Landscape and Visual**. The impacts on local heritage assets have been explored in **Chapter 13: Cultural Heritage**.
- 18.3.17 The Scheme, being located on existing agricultural land, is not anticipated to directly impact on the use and accessibility of dedicated recreational spaces and tourist attractions. The Scheme may impact on the use of Public Rights of Way which cross the Sites or cable routes during the project's construction, but this will be addressed as part of the emerging construction management strategy to ensure these features are retained and protected.
- 18.3.18 The ES will identify and assess the impact on key local tourism and recreational receptors including but not limited to:
- Public rights of way;

- Long distance walking and cycling routes;
- Navigable waterways; and
- Recreational hubs and key tourist attractions likely to be impacted by the development.

Table 18.6 Sensitivity and Importance of the Identified Environmental Receptor

Sensitivity	Definition
High	Receptor is likely to experience significant direct and indirect tourism and economic challenges with fundamental change to present characteristics. Accorded a high priority in local, regional or national tourism and recreation policy. Receptor is of regional or national importance.
Medium	Receptor is likely to experience some direct and indirect tourism and economic challenges, that will materially change its present characteristics. Change relating to receptor has medium priority in local and regional tourism and recreation policy. Receptor is of significant local importance.
Low	Indiscernible to minor direct or indirect tourism and economic challenges relating to receptor resulting in non-material changes to baseline conditions. Receptor is accorded a low priority in local and regional tourism and recreation policy. Receptor is of low importance.
Negligible	The identified receptor can accommodate change without material effect, and is of limited importance.

Table 18.7 Magnitude of Change for the Identified Environmental Receptor

Magnitude	Definition
High	The total loss or major change/substantial alteration to key elements/features of the baseline conditions, such that the post-development characteristics will be fundamentally changed.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions, such that post-development characteristics of the baseline will be materially changed.
Low	A minor shift away from baseline condition. As change arising from the loss/alteration will be discernible/detectable but not material. The post-development characteristics of the baseline condition will be similar to pre-development conditions.
Negligible	Very little change from baseline conditions. The change will be barely distinguishable and approximating to a non-change situation.
Neutral	No change from baseline conditions.

Significance

- 18.3.19 The degree of significance of impacts, in respect of socio-economics, agriculture, and tourism and recreation, is determined using the matrix below in **Table 18.8**, taking into consideration both receptor sensitivity to change and magnitude of change to baseline conditions. Effects assessed to be moderate, major-moderate, or major, are deemed to be significant effects.

Table 18.8 Significance

Sensitivity	High	Medium	Low
Magnitude			
High	Major	Major/Moderate	Moderate
Medium	Major/Moderate	Moderate	Moderate/Minor
Low	Moderate	Moderate/Minor	Minor
Negligible	Moderate/Minor	Minor	Negligible
Neutral	Neutral	Neutral	Neutral

- 18.3.20 The degree of significance can be described either in terms of beneficial or adverse magnitudes of scale and should be used to determine which impacts from the Scheme need to be considered further in the ES, and therefore which effects require mitigation measures to be implemented in the design, construction, operation, and decommissioning of the Scheme.

Cumulative and In-Combination effects

- 18.3.21 The assessment will consider potential cumulative and in-combination effects related to relevant projects, within the ES, where they are considered likely to have significant environmental effects. These will include assessing the cumulative impact of the construction of this Scheme and its operational lifetime, against other nearby NSIPs and relevant TCPA planning applications and approvals which will also have effects within the Local Impact Area. A list of these cumulative sites has been included at **Appendix 2.2**.

18.4 Baseline Conditions

- 18.4.1 The scale and geographic distribution of the proposals means that its effects have the potential to impact a significant geographic area and the associated population. The Scheme is situated across both West Lindsey District and Bassetlaw District. The solar PV Sites CO1, CO2, CO3a, CO3b and the eastern portion of the cable route are located in West Lindsey, whilst WB4 the western part of the cable route and the connection point are within Bassetlaw District. As such, both district areas are assessed jointly as the Local Impact Area for socio-economic, agriculture, tourism and recreation, and human health impacts. Where the two districts have significantly differing baseline characteristics, these will be identified. Wider regional impacts from the Scheme are assessed across the East Midlands official statistical region. Receptors discussed within this chapter are also comparatively assessed against national trends across the United Kingdom.

- 18.4.2 Other than population projections, which are discussed below, the future baseline is likely to be the same as the existing baseline for socio-economics and land use. Businesses may open and close; however, the exact details of this cannot be known in advance. It is expected that there will not be any significant changes to the local economic baseline assessment and the Scheme should be assessed against current baseline conditions and policies.

Socio-Economic

Resident Population Size and Growth

- 18.4.3 The Local Impact Area, which comprises Bassetlaw and West Lindsey Districts had a combined population of 202,113 in 2011⁶¹, of which 56% live in Bassetlaw. The population of the Local Impact Area is estimated to have increased to 215,900 in 2021⁶², representing a 6.8% increase over the last decade. This compares to an estimated 8.5% population increase in the wider East Midlands region, and an estimated 6.9%⁶³ population increase across the United Kingdom.
- 18.4.4 The population of the Local Impact Area is projected to rise by a further 2.8% from 2021 to 2026, by which time the solar farm is anticipated to be operational. In the same decade, the projected population growth in Regional Impact Area is estimated to be 3.3%, and nationally 2.1%. The Scheme has an estimated operational life of 40 years, and for the purposes of the EIA the Scheme is anticipated to be decommissioned in 2066, at which point, the national population of the UK is projected to reach 75.4 million, approximately 19.3% higher than the 2011 Census population⁶⁴.
- 18.4.5 As the projected population increase in the Local Impact Area from 2021-2026 is somewhat above national projections, it should be designated as being of medium sensitivity to change. The regional population is of a high sensitivity due to projected population growth being far higher than national projections.

Resident Population Age Demographics

- 18.4.6 The Local Impact Area demonstrates a significantly older-biased population than the East Midlands region, as taken from 2021 population projections⁶⁵. In Bassetlaw and West Lindsey Districts in 2021, the largest age bracket for both men and women is 55-59 years old, with the ages 50-74 comprising a total of 35.4% of the population. There is a secondary, smaller mode between 5- and 14-year-olds. This is likely to be exaggerated by 2026, as shown in **Figure 18.1**, which demonstrates the largest

⁶¹ Nomis Web: 2011 Census KS101UK – Usual resident population

⁶² ONS: Population projections – local authority based by single year of age (2018 base)

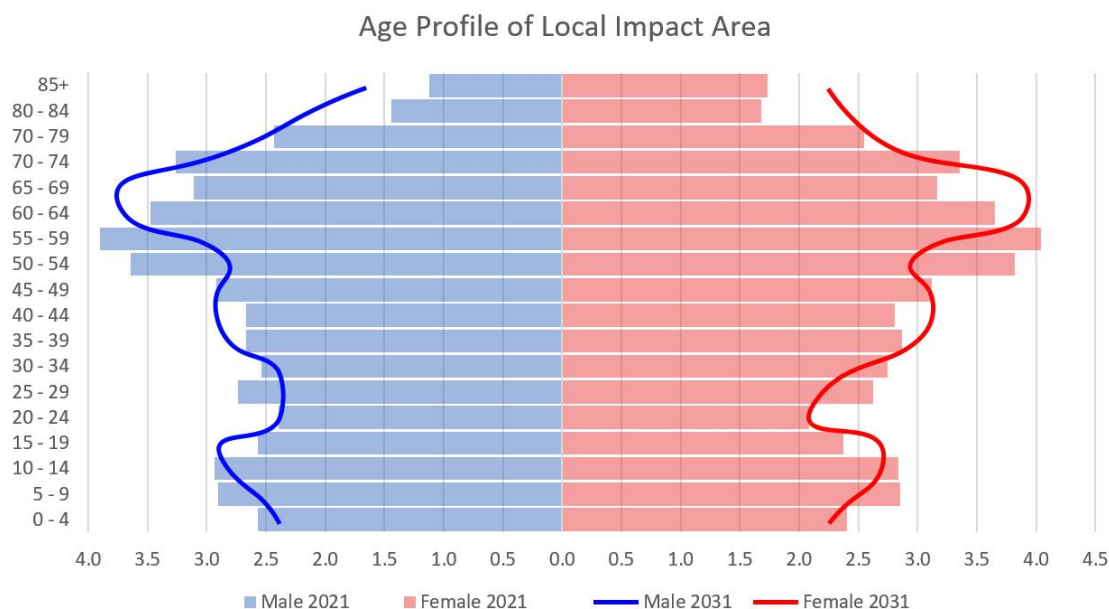
⁶³ ONS: National population projections by single year of age (2021)

⁶⁴ ONS: National population projections by single year of age (2021)

⁶⁵ ONS: Population projections – local authority based by single year of age (2021)

population age groups will be 55-59, and 60-64 years old, with the ages 20-24 years old being significantly smaller than most other age brackets.

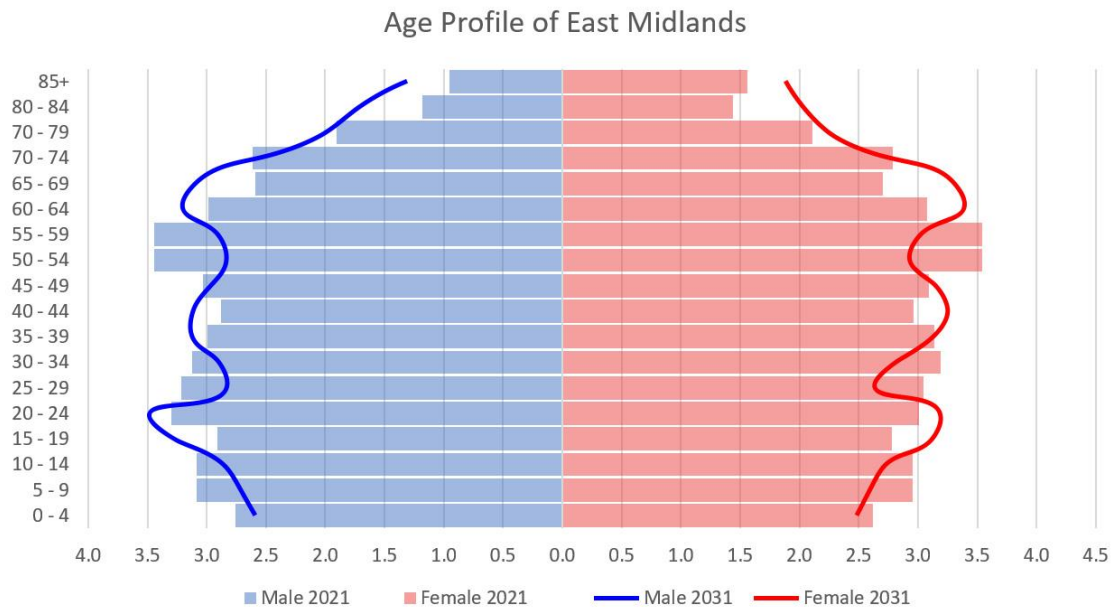
Figure 18.1: Age Profile of Bassetlaw and West Lindsey (Local Impact Area)



18.4.7 In comparison, The East Midlands region has a tri-modal age profile with the ages 50-59, then 20-34, then 5-14 years old as the descending largest age brackets⁶⁶. The population age profile of the East Midlands region is projected to age in a consistent manner by 2026, with the tri-modal shape remaining defined but aged by 5 years. This is shown in **Figure 18.2**.

⁶⁶ ONS: Population projections – local authority based by single year of age (2021)

Figure 18.2: Age Profile of the East Midlands (Regional Impact Area)



18.4.8 The age profile of the local and regional impact areas demonstrate that the areas are likely to see a significant number of their populations reaching or nearing retirement age over the course of the project's construction and delivery. This is particularly exaggerated in the Local Impact Area. That, combined with a notable shortfall in the proportion of the population in their 20s and 30s in the Local Impact Area, implies that the population and resultant labour market in the area will be of a medium sensitivity to impacts from the development of the Scheme. These trends are less pronounced at the regional level, and as such the Regional Impact Area is of a low sensitivity.

Accommodation Stock

- 18.4.9 The Local Impact Area falls across the boundary of the Central Lincolnshire Local Plan area and the Bassetlaw Local Plan area. As both Local Plans are in draft and substantively progressed, the housing stock, housing need, and projected housing supply rates set out in the draft Local Plans can be deemed as the most up-to-date.
- 18.4.10 The Central Lincolnshire Plan covers West Lindsey District, as well as North Kesteven District and Lincoln City. The Housing Needs Assessment (April 2020), undertaken to support the emerging plan, indicates that the required housing need for Central

Lincolnshire is 1,325 dwellings per year from 2020 to 2040⁶⁷. In the shorter term, the 2021 Central Lincolnshire Five Year Land Report (Oct 2021) calculates the housing need over the next five years is a minimum of 8,619 units, equalling 1,724 units per year. With the required 5% NPPF uplift, this shows a requirement of 1,810 dwellings per year over 5 years. Central Lincolnshire have calculated they are able to deliver 9,683 units, thus can demonstrate a 5.35-year housing land supply⁶⁸.

- 18.4.11 Likewise, the Bassetlaw Local Plan estimates it can deliver a supply of 12,938 homes over the plan period 2020-2038⁶⁹, equating an average of 718 units per year. In the shorter-term, the April 2021 baseline Five Year Housing Land Supply Statement for Bassetlaw calculates the housing need over the next five years is a minimum of 281 units per year. With the required 5% NPPF uplift, this shows a requirement of 295 dwellings per year over 5 years. Bassetlaw have calculated they are able to deliver 3,755 units, thus can demonstrate a 12.7-year housing land supply⁷⁰.
- 18.4.12 These figures indicate that the Local Impact Area is well stocked with housing accommodation and is able to meet and exceed the needs of the local population. Therefore, the local housing market is of low sensitivity to additional pressures.
- 18.4.13 The 2020 Business Register and Employment Survey identifies that the Local Impact Area contains an approximate total of 425 business in the accommodation sector employing approximately 4,000 people⁷¹. As a result, it can be estimated that the local accommodation sector contains a minimum of 4-5,000 'bed spaces'. Given the small-scale nature of the local accommodation industry, it is likely that the sector would be of a medium sensitivity to additional pressures.

Population Health and Wellbeing

- 18.4.14 The 2011 Census collected information on the long-term health of residents, including proportions of people with limited activity due to long-term physical and mental disabilities in the whole population, and in the working age (16-64 years old) population. It also collected data on self-assessed personal health⁷².
- 18.4.15 Within the Local Impact Area, limited activity as a result of a long-term disability within the population (in 2011) stood at 21.0%, which is significantly higher than both the regional and national rates at 18.6% and 18.1% respectively. Within the working age population (15-64-year-olds), the proportion of population with limited activity

⁶⁷ Turley (2020). Housing Needs Assessment: Central Lincolnshire. Sleaford: North Kesteven District Council.

⁶⁸ North Kesteven District Council, Lincoln City Council, West Lindsey District Council (2021). Central Lincolnshire Five Year Land Supply Report: 1 April 2022 to 31 March 2027. Sleaford: North Kesteven District Council.

⁶⁹ Bassetlaw District Council (2022). Bassetlaw Local Plan 2020-2038 Publication Version Second Addendum. Workshop: Bassetlaw District Council.

⁷⁰ Bassetlaw District Council (2021). Five Year Housing Land Supply Statement – Bassetlaw's Housing Land Availability for the Period: 1 April 2021 to 31 March 2026. Workshop: Bassetlaw District Council.

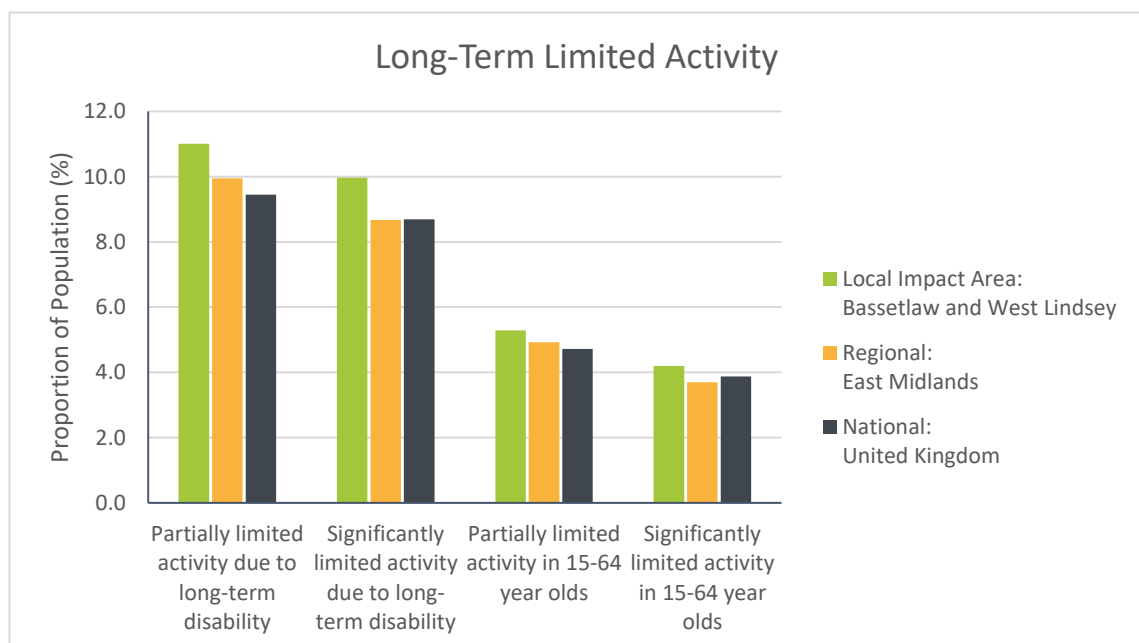
⁷¹ Business Register and Employment Survey: 2-Digit Sector 55 – Accommodation Employment for 2020

⁷² Nomis Web: 2011 Census KS301UK – Health and Wellbeing

is more consistent at the regional and national level, although still higher at 9.5%, compared to 8.6% regionally and nationally. This is shown in **Figure 18.3**.

- 18.4.16 Furthermore, the proportion of the population in the Local Impact Area claiming Disability Living Allowance in August 2021 is approximately 2.2%. This is significantly higher than the rate in the East Midlands region (1.9%) and somewhat higher than the rate across the UK (2.1%)^{73 74}.
- 18.4.17 As a result of the higher rates of both limited activity and receiving disability benefits, the population of the Local Impact Area is highly sensitive to impacts that could affect short-term and long-term disability.

Figure 18.3: Long-Term Limited Activity in the Population



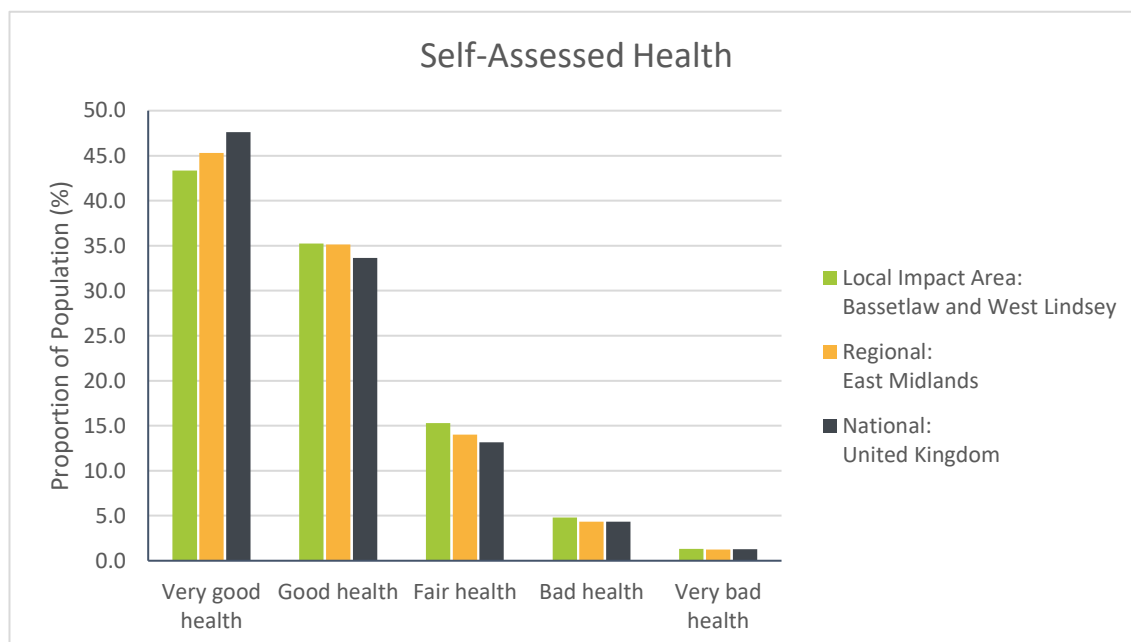
- 18.4.18 The 2011 Census found that in regard to self-assessment of health, the proportion of the population in the Local Impact Area who considered themselves to have “bad” or “very bad” health was slightly higher than the regional and national rate. The proportion within the Local Impact Area was 6.1%, compared to 5.6% regionally and nationally. **Figure 18.4** demonstrates the self-assessment of health in greater detail and demonstrates that the Local Impact Area also has a higher than regional or national rate of reporting of ‘fair’ and ‘good’ health. This demonstrates that the Local Impact Area is of a medium sensitivity to impacts affecting general population health. As regional rates of self-assessed health are more consistent with national

⁷³ DWP Stat-Xplore Web Tool: Disability Living Allowance claimants (August 2021)

⁷⁴ Communities NI: Benefits Statistics Summary Publication (National Statistics) – November 2021

trends, the Regional Impact Area can be assigned a low sensitivity to impacts from the Scheme.

Figure 18.4: Self-Assessment of Health in the Population



18.4.19 The level of access to healthcare across the Local Impact Area is unevenly split between the two constituent districts.

18.4.20 The number of full-time equivalent general practitioners (FTE GP) per 100,000 population in an area is a metric for identifying the level of general healthcare available and can be used to make a judgement on the accessibility of general healthcare in the target area. As of February 2022, the English national average number of FTE GPs per 100,000 is 45.1 (equivalent to 2,220 patients per FTE GP)⁷⁵. The Local Impact Area falls across both Bassetlaw and Lincolnshire NHS Care Commissioning Group (CCG) areas, the latter of which West Lindsey District falls entirely within. Bassetlaw NHS CCG has a greater than average 50.0 FTE GPs per 100,000 population (equivalent to 2,000 patients per FTE GP)⁷⁶, whilst the collective of surgeries in the West Lindsey part of Lincolnshire NHS CCG has a comparatively low 43.2 FTE GPs per 100,000 (equivalent to 2,320 patients per FTE GP)⁷⁷.

⁷⁵ NHS Digital Data Services: General Practice Workforce, Selected Information (February 2022)

⁷⁶ NHS Digital Data Services: NHS Bassetlaw CCG General Practice Workforce, Selected Information (February 2022)

⁷⁷ NHS Digital Data Services: NHS Lincolnshire CCG General Practice Workforce, Selected Information (February 2022) – data from Caistor Health Centre, Caskgate Street Surgery, Cleveland Surgery, The Glebe Practice, The

- 18.4.21 Conversely, the Indices of Multiple Deprivation 2019⁷⁸ demonstrates that residents in Bassetlaw are more likely than the national average to be deprived with regard to healthcare and disability, whilst in West Lindsey, access is at, or slightly better than, national expectations. This apparent reversal of local circumstances compared to general healthcare provision indicates that issues ranging beyond access to general healthcare, such as physical distance and accessibility to healthcare providers, emergency healthcare, and impacts of disability are likely to be greater concerns in Bassetlaw than West Lindsey.
- 18.4.22 The disparity between the circumstances in Bassetlaw and West Lindsey means that an average sensitivity for the Local Impact Area is unlikely to be representative of the experience in the areas potentially affected by the development of the Scheme. As a result, it would be pertinent to use the worst-case scenario, and thus describe the Local Impact Area as being medium sensitivity to impacts from the Scheme that could impact healthcare provision and accessibility, and thus population health and wellbeing.

Skills and Qualification Attainment

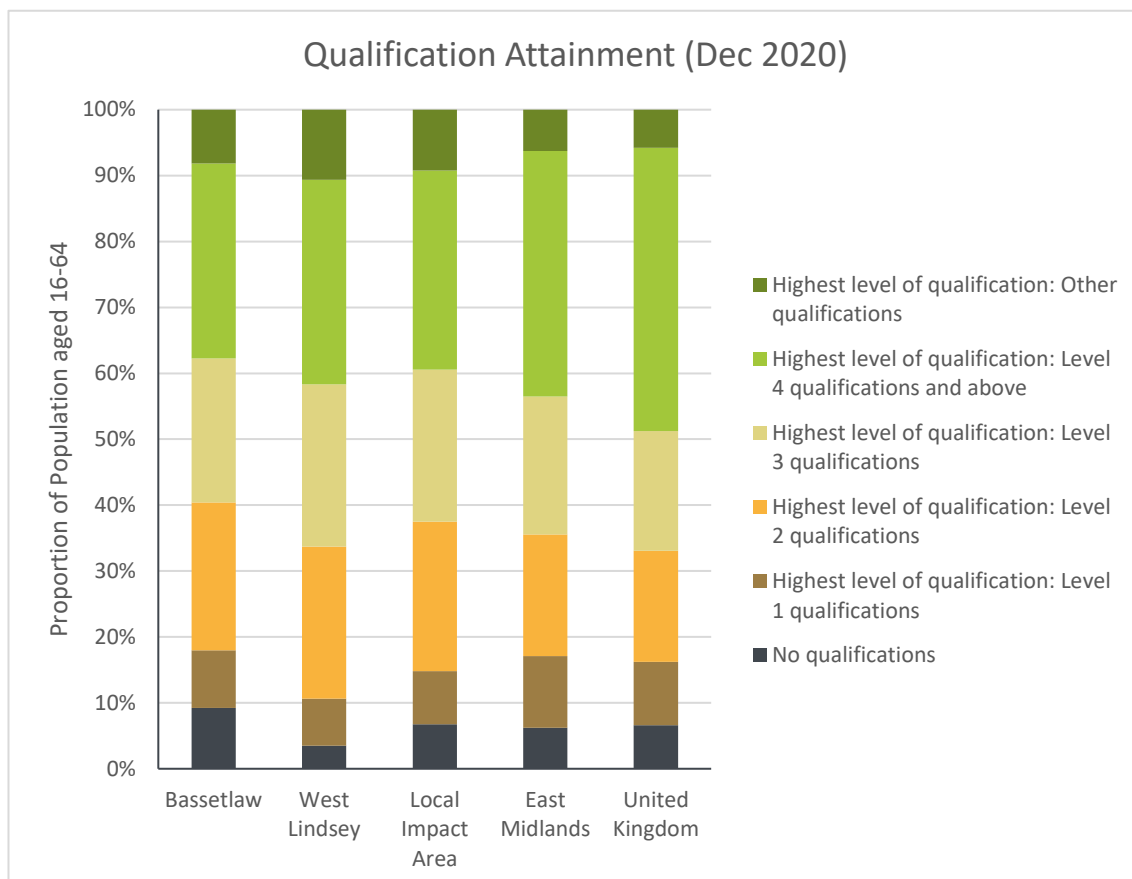
- 18.4.23 The qualification attainment rate within the Local Impact Area at the time of the December 2020 Annual Population Survey indicated a significant variance in skills and qualification between the two subject local authority areas and the national qualification attainment rate. The proportion of the population between the ages 16-64 years old achieving no qualifications varies significantly, with Bassetlaw having a significant high 9.2% of the working age population achieving no qualifications, compared to the very low rate of 3.5% in West Lindsey, and 6.6% in the UK. However, the Local Impact Area is more consistent in its lower-than-average attainment of NVQ Level 4 and higher qualification rates, at about 29-31%, compared to 37% in the East Midlands, and 43% across the UK⁷⁹. However, the Local Impact Area does contain a far greater (than regional or national) proportion of the population attaining “other qualifications”, such as apprenticeships. These can be seen in more detail in **Figure 18.5** below. As a result of the significant disparity between conditions in the Local Impact Area and those at the regional and national scale, the population is highly sensitive to changes in qualification attainment. The Regional Impact Area also shows a similar albeit less pronounced trend towards populations achieving lower rates of higher level qualifications. As a result, the Regional Impact Area is of a low sensitivity to change.

Ingham Surgery, Market Rasen Surgery, Nettleham Medical Practice, Trent Valley Surgery, Welton Family Health Centre, Willingham-by-Stow Surgery

⁷⁸ DCLG: Indices of Multiple Deprivation by LSOA Map App

⁷⁹ Nomis Web: ONS Dec 2020 Annual Population Survey

Figure 18.5: Qualification Attainment in ages 16-64 in December 2020



Deprivation

18.4.24 The Indices of Multiple Deprivation 2019 provides the most up-to-date information regarding measures of population deprivation across England. The Scheme is located in both Bassetlaw and West Lindsey districts, which are respectively the 108th and 146th most deprived of 317 authority areas in England⁸⁰. The populations within both districts in the Local Impact Area are more likely to be deprived (than the national average) of access to employment, whilst those in Bassetlaw are more likely (than the national average) to be deprived of access to education and skills, and to suitable incomes⁸¹. As a result, it is in these areas that the local population is of a high sensitivity to impacts as a result of the Scheme.

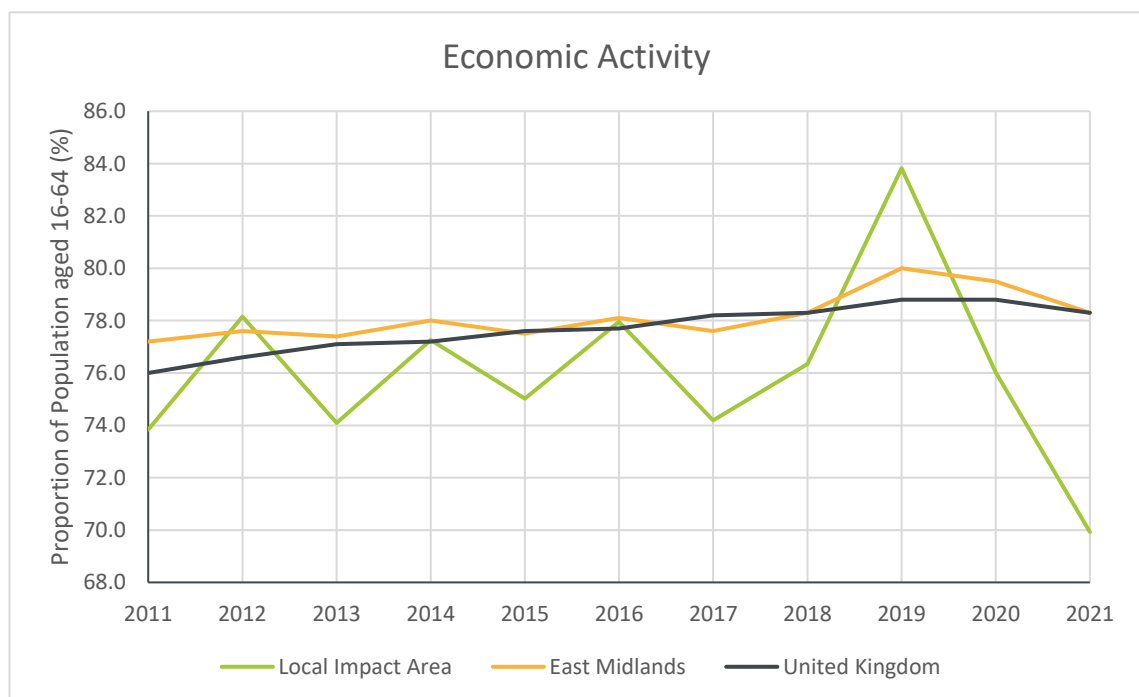
⁸⁰ DCLG: Indices of Multiple Deprivation by LSOA Map App

⁸¹ DCLG: Indices of Multiple Deprivation by LSOA Map App

Economic Activity and Unemployment

- 18.4.25 The economically active population is defined as the members of the working age (16-64-year-old) population being in employment, and those who are seeking employment and are able for work. Economically inactive members of a population are predominantly categorised by retirement, those in full-time education not seeking employment, full-time carers of family members, and long-term sick and disabled people.
- 18.4.26 The September 2021 Annual Population Survey indicates that the Local Impact Area has an economic activity rate of 69.9%. This figure is significantly lower than both the regional and national rates (78.3%)⁸². Trends in economic activity since 2011, as can be seen in **Figure 18.6**, show that the Local Impact Area has had a far more fluctuating activity rate than the regional and national trends (which have remained relatively consistent).

Figure 18.6: Economic Activity from 2011-2021



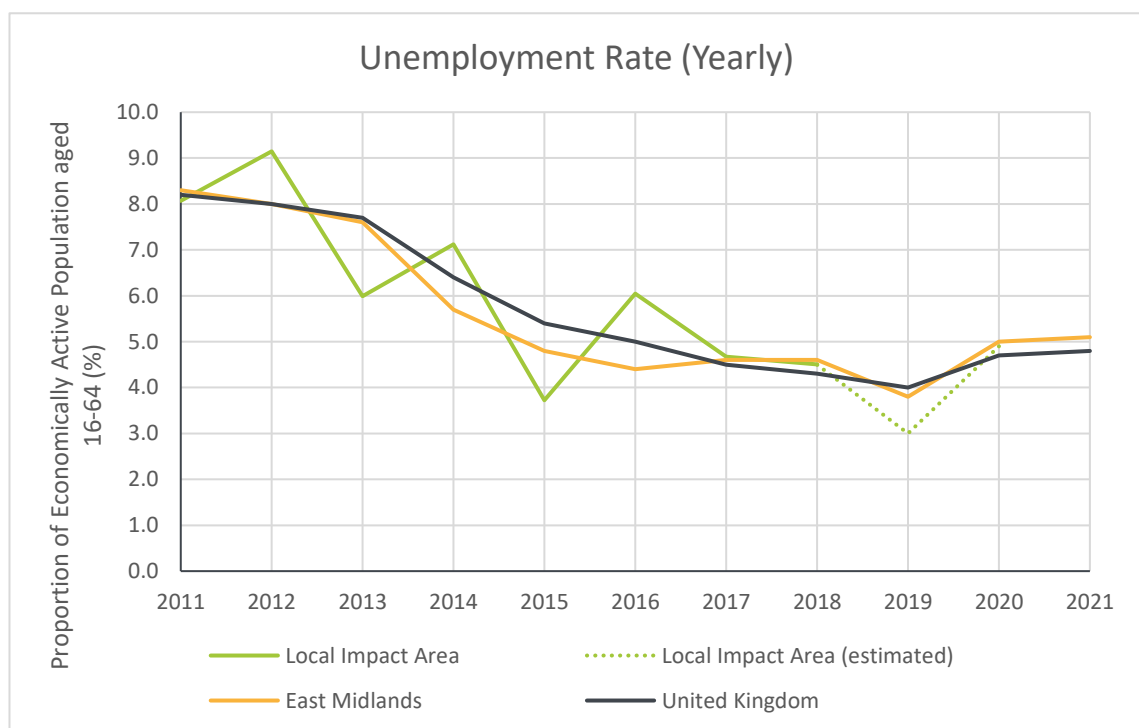
- 18.4.27 Notably in the period 2019-2021, the economic activity rate in the Local Impact Area has dropped from a peak of 83.8% down to low of 69.9%. In the same period, the national rate dropped from 78.8% to 78.3%. Whilst this may be the result of several underlying factors, it is likely that the economy of the Local Impact Area has been disproportionately affected by the COVID-19 pandemic. As a result, the level of

⁸² Nomis Web: ONS Annual Population Survey

economic activity in the Local Impact Area is likely to be of a high sensitivity to impacts as a result of potential economic effects. Conversely, the East Midlands demonstrates a largely consistent, and often higher than national level of economic activity. As such, the Regional Impact Area is of a low sensitivity to change.

- 18.4.28 The Annual Population Survey⁸³ measures the unemployment rate as being the proportion of the economically active population who are not in active employment. National trends from 2011-2021 show unemployment has fallen from 8.0% in 2011 to a low of 4.0% in 2019, before rising to 4.8% in 2021, likely as a result of economic impacts from the COVID-19 pandemic. The trend in the East Midlands region has broadly tracked the national trend over the decade. Data for the Local Impact Area is incomplete from 2019 onwards. The overall trend for the Local Impact Area also follows the national trend but shows far more exaggerated year-on-year fluctuations, indicating the area has a medium sensitivity to economic factors. This is shown in **Figure 18.7** below.

Figure 18.7: Unemployment Rate from 2011-2021



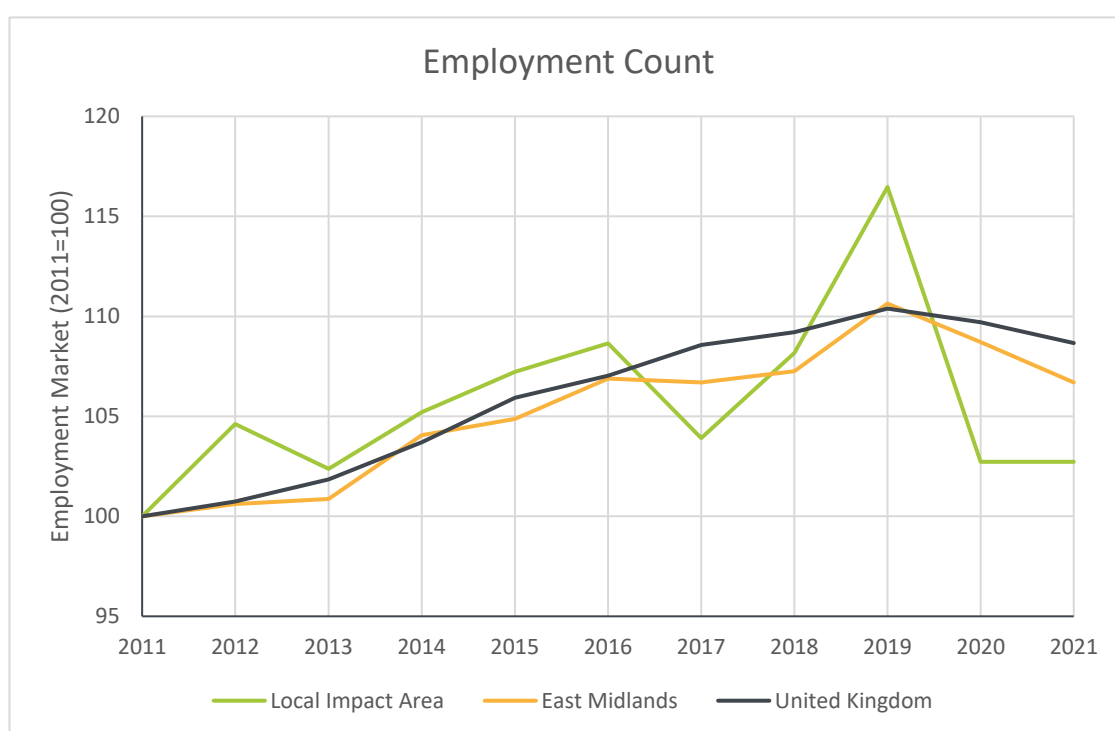
Employment and Wages

- 18.4.29 Closely related to the rates of economic activity, the number of residents in the Local Impact Area between 16 and 64 years of age who are in employment has fluctuated

⁸³ Nomis Web: ONS Annual Population Survey

around the regional and national trends, and from 2011-2021 has grown by 2.7% (equivalent to approximately 2,300 people). The employment count peaked in 2019 at 98,300, some 16.5% higher than in 2011. This is shown in **Figure 18.8** below. This correlates with the peak in employment count in the East Midlands and in the UK, although both regionally and nationally, this peak was approximately 10.5% of the 2011 baseline⁸⁴. As with economic activity, 2019-2021 saw a notable drop in employment at all levels, but most explicitly in the Local Impact Area, which indicates that the level of employment is of a medium sensitivity to change. Regional trends are consistent with national trends, and as a result the Regional Impact Area is of a low sensitivity to impacts from the Scheme.

Figure 18.8: Employment Count 2011-2021 related to 2011 baseline

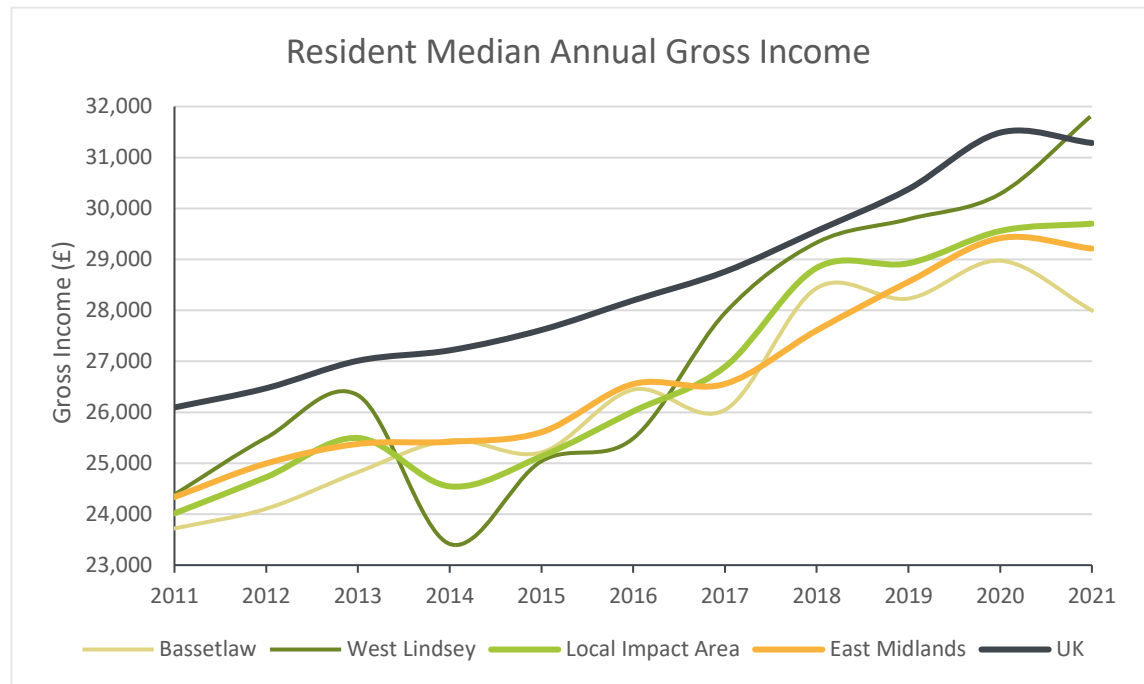


- 18.4.30 The rates of employment and unemployment within the Local and Regional Impact Areas are to be explored in more detail in the ES to identify where sensitivities to socio-economic receptors lie, and where there is ongoing resilience to economic instability and disparities in employment at the differing impact levels.
- 18.4.31 For residents within the Local Impact Area, the median annual gross salary for full-time workers (in 2021) was £29,702. This is marginally higher than that of the East Midlands region, at £29,212, but notably lower than the UK median, at £31,285. As indicated previously when discussing indices of deprivation, income is uneven

⁸⁴ Nomis Web: ONS Sept 2021 Annual Population Survey

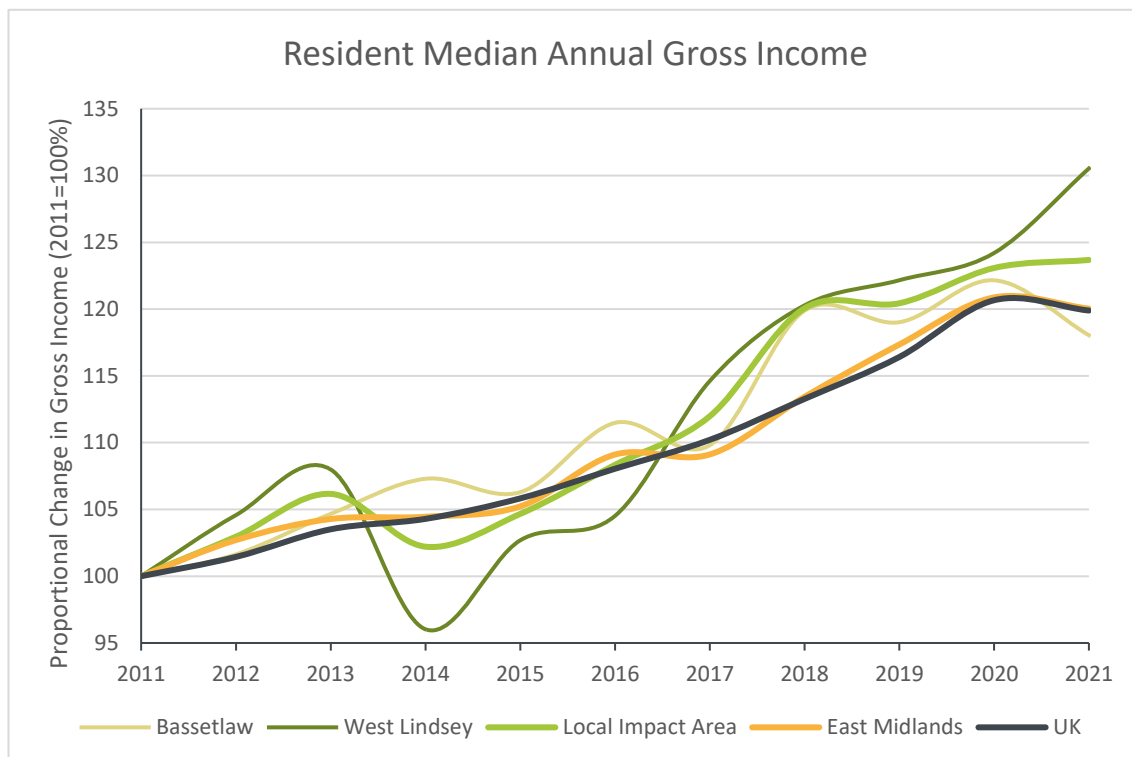
across the two constituent districts, with residents in West Lindsey earning approximately £3,800 more than their counterparts in Bassetlaw. Since 2011, median wages in the Local Impact Area have risen by approximately 23.7% (£5,686). This is proportionally greater than wage rises in the region (20.0% – £4,875) or nationally (19.9% – £5,190) in the last decade⁸⁵. These trends are shown in **Figure 18.9** and **Figure 18.10**.

Figure 18.9: Resident Median Annual Gross Income 2011-2021



⁸⁵ Nomis Web: ONS June 2021 Annual Survey of Hours and Earnings – resident analysis

Figure 18.10: Resident Median Annual Gross Income 2011-2021 related to 2011 baseline



18.4.32 For workers within the Local Impact Area, the median annual gross salary for full-time employment (in 2021) was £28,158. Unlike resident median wages, this is marginally lower than that of the East Midlands region, at £28,416, and notably lower than the UK median, at £31,285. This difference between resident and workplace median pay indicated that it is likely that employees travel outside the local and regional areas to access higher-paid work, or that lower-paid workers are more likely to travel into the area. As with residents' median pay, those working in West Lindsey are paid on average £4,500 more than those in Bassetlaw. Since 2011, median wages for workers in the Local Impact Area have risen by approximately 25.7% (£5,765). This is proportionally significantly greater than wage rises in the region (18.4% – £4,414) or nationally (19.9% – £5,190) for the same period⁸⁶. These trends are shown in **Figure 18.11** and **Figure 18.12**.

⁸⁶ Nomis Web: ONS June 2021 Annual Survey of Hours and Earnings – workplace analysis

Figure 18.11: Workplace Median Annual Gross Income 2011-2021

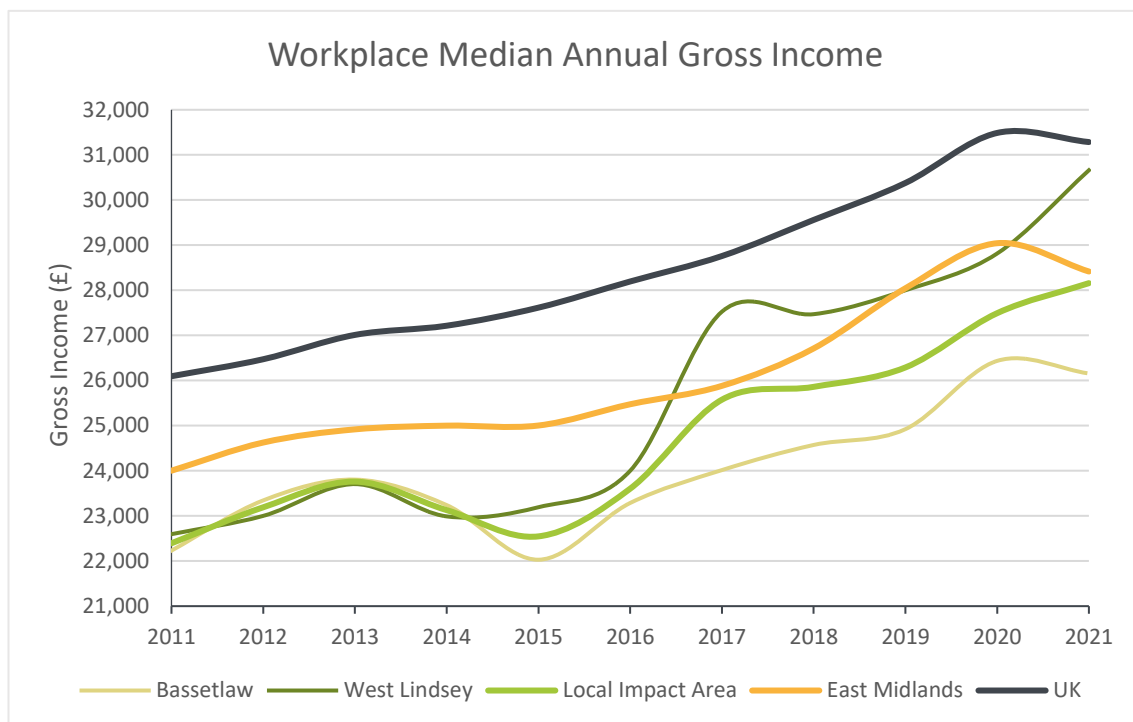
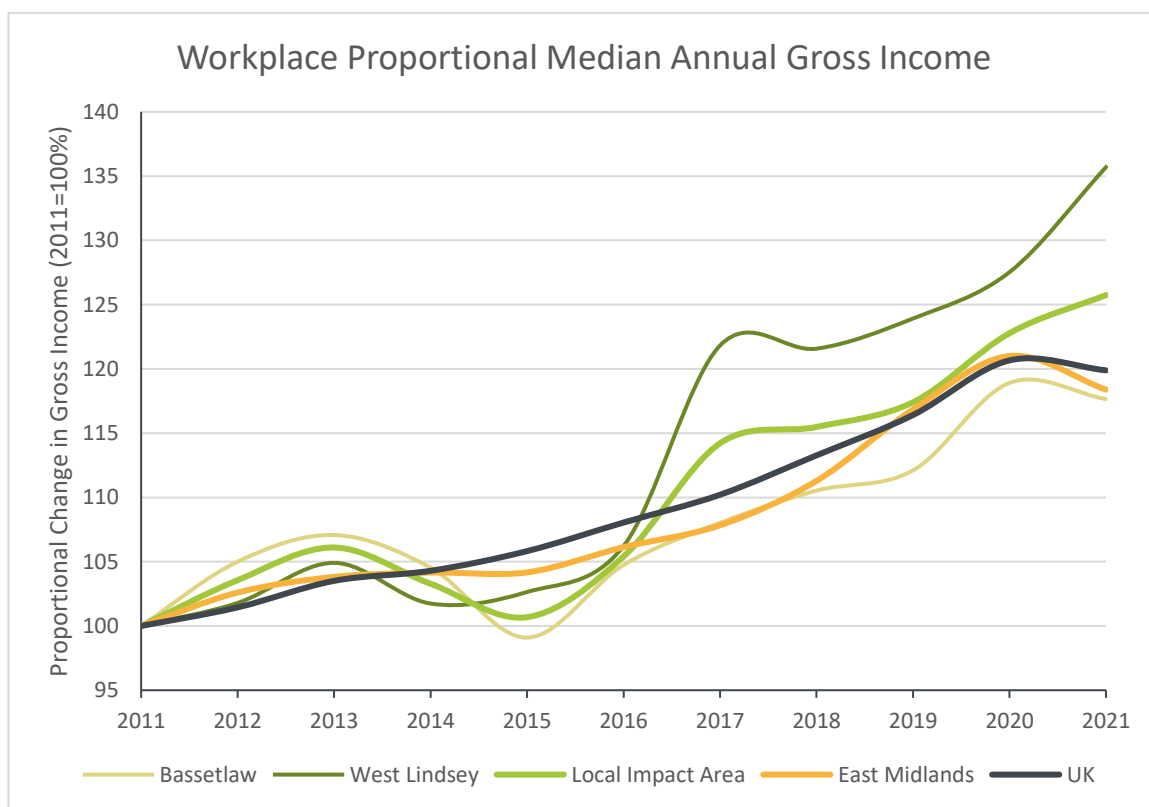


Figure 18.12: Workplace Median Annual Gross Income 2011-2021 related to 2011 baseline



- 18.4.33 Although there are significant differences between the two constituent districts within the Local Impact Area, the overall conditions with regard to median annual gross income are of a medium sensitivity to change due to their difference from national trends. The Regional Impact Area is also significantly below the national average for resident and workforce population median gross annual income. As a result, this is also of a medium sensitivity to impacts.

Working Population

- 18.4.34 Data for the location of residence vs. workplace⁸⁷, commuting distance⁸⁸, and commuting method⁸⁹, has been taken from the 2011 Census, and thus is likely to have considerably changed since then, particularly in response to dramatic changes to the working environment as a result of the 2020-21 COVID-19 pandemic. These changes may be able to be explored in the final ES if early data from the 2021 Census is published in July 2022 as anticipated.
- 18.4.35 The workplace population of the Local Impact Area is 65,605, significantly lower than the population of residents in employment of 82,900.
- 18.4.36 A substantial number of people, 17,229, travel into the Local Impact Area from the surrounding neighbouring districts and authority areas. The largest inflows of commuters are from Rotherham (2,226), Doncaster (2,435), and Lincoln City (2,615). A further 6,277 people commute into the Local Impact Area from other areas in the UK, predominantly other parts of the East Midlands and Yorkshire and the Humber.
- 18.4.37 A significant number of residents from the Local Impact Area, approximately 23,600, commute out for work. This includes almost 3,400 working in North Lincolnshire, over 3,600 in Doncaster, and nearly 8,300 in Lincoln. Approximately 9,500 people commute out to further parts of the East Midlands and Yorkshire and the Humber, and the rest of the UK. Approximately 300 people from the local impact area work in offshore installations or outside the UK.
- 18.4.38 This trend is also continued at the regional level, as in the East Midlands, the workplace population is approximately 95% of the usual resident employed population, indicating a net movement of commuters to areas out of the region.
- 18.4.39 Commuters from the Local Impact Area on average travel 14.5km to work, which is consistent with the distance travelled by commuters across England and Wales. This is however notably more than the average for the East Midlands of 12.8km.

⁸⁷ Nomis Web: 2011 Census WU01UK – Location of usual residence and place of work by sex

⁸⁸ Nomis Web: 2011 Census WP702EW – Distance travelled to work (Workplace population)

⁸⁹ Nomis Web: 2011 Census WP703EW – Method of travel to work (2001 specification) (Workplace population)

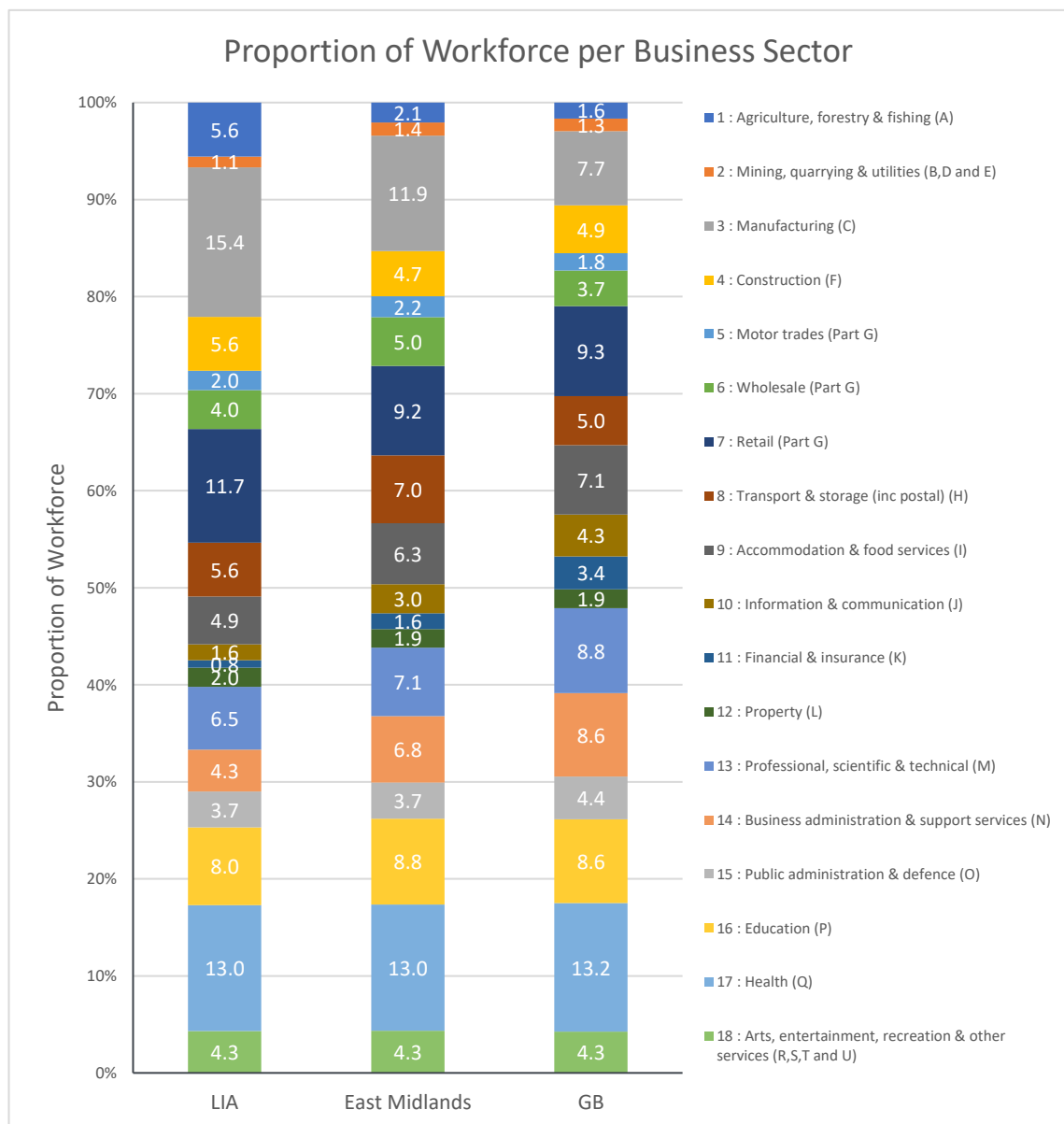
- 18.4.40 Commuters within the Local Impact Area are more likely, at 13.5%, to work mainly at or from home than at a regional (10.5%) or national (England and Wales) level (10.3%). Travelling to work by foot and by bicycle is relatively consistent at all levels, at ~10% and ~2.8% respectively. The Local Impact Area is distinct from commuting trends at a regional and national level due to the much heavier reliance on private vehicles (cars, van, motorcycles, taxis), at 70.8%. Across the East Midlands, private vehicle use for commuting is at 68.6%, whilst across England and Wales is 60.8%. Resultantly, the Local Impact Area has comparatively little commuting by public transport or larger shared vehicles (minibuses/coaches etc.). Use of these methods for commuting stands at 2.9% across the Local Impact Area, versus 7.3% in the East Midlands region, and 15.9% across England and Wales. The working population is therefore of a medium sensitivity to impacts on labour market movement and competition, commuting distance and method.

Business Sectors

- 18.4.41 The 2020 Business Register and Employment Survey⁹⁰ also shows the largest business sector by percentage of employed workforce in the Local Impact Area is manufacturing (15.4%), followed by health (13.0%), and retail (11.7%). The local manufacturing, agriculture, and retail sectors are all significantly larger by business proportion than at the regional and national level, whilst sectors including accommodation and food services, financial and insurance, and public administration are all significantly smaller. As a result, it is these sectors, where the Local Impact Area has a significantly higher or lower proportion of the workforce, that there will be of a medium to high sensitivity to change. The grouped arts, entertainment, recreation, and other services sector is of a near identical proportion at local, regional and national level. Therefore it can be assumed that the tourism and recreation employment sector is of a low sensitivity (in the long-term) to impacts from the Scheme.

⁹⁰ Nomis Web: 2020 Business Register and Employment – open data analysis

Figure 18.13: Proportion of Workforce per Business Sector



Agriculture

- 18.4.42 The Sites, along with the cable route corridor occupy predominantly agricultural land. As a result, the ES will address the potential impact of the development on the agricultural land resource associated with that agricultural land, and farm businesses at and around the Site.

Agricultural Land and Soil Quality

- 18.4.43 Detailed Agricultural Land Classification (ALC) reports have been undertaken to classifying land according to its physical or chemical characteristics which may impose long-term limitations on agricultural use. This survey work has been undertaken in accordance with Natural England's 2012 document Agricultural Land

Classification: protecting the best and most versatile agricultural land (TIN049). These are appended to this document at **Appendix 3.2**. The limitations can operate in one or more of four principal ways: they may affect the range of crops that can be grown, the level of yield, the consistency of yield and the cost of obtaining it.

- 18.4.44 The principal physical factors influencing agricultural production are climate, site and soil and the interactions between them which together form the basis for classifying land into one of 5 grades: grade 1 being of excellent quality and grade 5 being land of very poor quality. Grade 3 land, which constitutes approximately half of all agricultural land in the United Kingdom is divided into two subgrades – 3a and 3b. Land graded as Grade 1, 2, or 3a is referred to as “Best and Most Versatile” (BMV) agricultural land, and it is afforded greater policy and legislative protection against loss to non-agricultural development. Thus, this land has been sought to be avoided where possible by the Applicant. Table 5.6 in **Chapter 5: Alternatives and Design Evolution** demonstrates where this has been implemented in the Scheme design at PEIR stage.
- 18.4.45 The agricultural land classification as surveyed up to February 2022, has been summarised by land area in hectares and as a percentage in the tables below. These results are subject to confirmation from further testing due to be undertaken ahead of DCO submission.

Table 18.9: Assessed Land Grading by Site Area (hectares)

Grade	1	2	3a	3b	4	5	Non-Agri	BMV	Total
Site									
CO1	0.0	25.2	55.7	843.0	0.0	0.0	0.0	80.9	923.9
CO2	0.0	0.0	15.4	115.8	0.0	0.0	0.0	15.4	131.2
CO3a	0.0	1.4	7.7	171.4	0.0	0.0	0.0	9.1	180.5
CO3b	0.0	0.0	2.7	69.6	0.0	0.0	0.0	2.7	72.3
TOTAL	0.0	26.6	81.5	1199.8	0.0	0.0	0.0	108.1	1307.9

Table 18.10: Assessed Land Grading by Site Area (percentage)

Grade	1	2	3a	3b	4	5	Non-Agri	BMV	Total
Site									
CO1	0.0	2.7	6.0	91.3	0.0	0.0	0.0	8.8	100.0
CO2	0.0	0.0	11.7	88.3	0.0	0.0	0.0	11.7	100.0
CO3a	0.0	0.8	4.3	94.9	0.0	0.0	0.0	5.0	100.0
CO3b	0.0	0.0	4.0	96	0.0	0.0	0.0	3.7	100.0
TOTAL	0.0	2.0	6.2	91.7	0.0	0.0	0.0	8.3	100.0

- 18.4.46 The figures identified in the tables above demonstrate the agricultural land classification grading across the entirety of the Site areas. The preliminary findings demonstrate that approximately 8.3%, or 108.1ha of the Sites are BMV land. These findings relate to the full red line area of the sites. Notably, as can be seen from the emerging layouts in **Appendix 4.1**, the full extent of land will not be occupied by solar panels and their associated infrastructure which will reduce overall, the amount of BMV that is impacted. The presence of the Solar Farm will constrain agricultural management options for the duration of the temporary consent. However, unlike built development, the agricultural land resource will not be lost and can continue in agricultural production (grazing sheep and other small livestock below and between solar panels) throughout the consent period. Notwithstanding, some BMV land will be unavailable for agricultural use for the lifetime of the Scheme. As more than 100ha of BMV land is anticipated to be temporarily affected during the Scheme's lifetime, the availability of BMV agricultural land is highly sensitive in the Local Impact Area, and of a low sensitivity in the Regional Impact Area to the impacts of the Scheme.
- 18.4.47 The cable route corridor presented for PEIR is still indicative and will be subject to further refinement. Desk-based assessment of the cable route, utilising Natural England's Likelihood of BMV mapping⁹¹ indicated that the cable route corridor is of low to moderate likelihood of being BMV.

Soil Quality

- 18.4.48 The types of soils across the Sites are described in the ALC report in **Appendix 3.2**. Given the importance of soil quality to productive agricultural land, the preliminary sensitivity can be gauged as medium. This will be assessed in detail in the ES.

Farming Circumstances

- 18.4.49 Farming circumstances for the agricultural businesses occupying the site will be considered in the ES supporting the DCO application. The assessment will consider the nature and scale of the occupants agricultural enterprises to determine likely effects. The potential for offsite impacts on offsite farm enterprises will also be addressed, for instance transport and access effects during construction can be an issue for sensitive farm enterprises such as dairy units.
- 18.4.50 The impact of a solar farm on a farm business can be positive with a diversified enterprise obtained without commitments for farm capital, manpower or machinery time. Solar farms can also provide opportunities for local sheep grazing enterprises.

⁹¹ Natural England (2017). Likelihood of Best and Most Versatile (BMV) Agricultural Land - Strategic scale map East Midlands Region (ALC017)

- 18.4.51 To assess farming circumstances, agricultural occupants and/or landowner's land agents will be interviewed regarding farm scale, tenure, enterprises and constraints.
- 18.4.52 The ES will also consider this matter in combination and cumulatively with other significant developments (including solar NSIPs) on agricultural land in the locality and at a wider scale, as required by Bassetlaw District Council, Natural England, North Kesteven District Council, Lincolnshire County Council, and West Lindsey District Council in their responses to the EIA Scoping Opinion Request.

Tourism and Recreation

- 18.4.53 The Local Impact Area falls across two counties (Lincolnshire and Nottinghamshire), each with their own economic strategies for tourism. In 2019, the Nottinghamshire visitor economy is worth approximately £1.75 billion and supported 15,000 jobs⁹², within which Bassetlaw provides a small number of key attractions such as the Pilgrims Gallery, Clumber Park, Sundown Adventureland and the Harley Gallery at the Welbeck Estate. Likewise, the Greater Lincolnshire (Lincolnshire County, North Lincolnshire, North East Lincolnshire, and Rutland) visitor economy was worth approximately £2.4 billion and accounted for approximately 30,000 jobs in 2019⁹³, with West Lindsey contributing to the visitor economy through hosting attractions such as the Hemswell Antiques Centre, RAF Scampton Heritage Centre, Woodside Wildlife Park, and the Blyton Park motorsports venue. Given their importance to the visitor economy, these attractions are of a medium sensitivity to impacts from the Scheme.
- 18.4.54 It is of note that the baseline data available for the tourism industry in from 2019, before the COVID-19 pandemic, which had very significant effects on both domestic and international tourism. As a result, the year 2020-2021 would have received a dramatically reduced number of visitors from abroad and from around the UK, with any tourism being highly localised as a result of travel and movement restrictions. ONS statistics for July-September 2021 show international tourism in the UK was 86% lower with regard to visitor numbers, and 87% down with regard to visitor spending compared with July-September 2019⁹⁴. Whilst 2022 likely will see a recovery in tourism and recreation, it is going to be very apparent that the tourism economy in the Local and Regional Impact Areas are going to be highly sensitive to changes in the short-term.
- 18.4.55 The Site and its near surroundings hosts a number of Public Rights of Way and is located nearby to a small number of long-distance recreational walking and cycling routes. The local network of Public Rights of Way is important to the local population, and is thus of a medium sensitivity to impacts.

⁹² Nottinghamshire Visitor Economy Strategy 2019

⁹³ VisitLincoln: About

⁹⁴ ONS Overseas travel and tourism, UK, provisional: July to September 2021

- 18.4.56 The long-distance walking routes near to the Site include: the county/regional Plogsland Round (3.2km to south of CO1) and Towers Way (5.2km to east of CO1), and the national Trent Valley Way⁹⁵, which crosses the cable route corridor via the western bank of the River Trent⁹⁶. The National Byways cycle route passes within 2km of the Cottam connection point, and crosses parts of the cable route though White's Bridge, Coates (Nottinghamshire) and Littleborough⁹⁷. As a result of their regional and national importance, these recreational routes are of high sensitivity to impacts from the Scheme.
- 18.4.57 Additionally, Lincoln Golf Club⁹⁸ is located near Brampton village, approximately 1.5km to the south of the proposed cable route. This, and other dedicated outdoor recreation centres are of low sensitivity to changes.
- 18.4.58 There are a number of navigable waterways within proximity of the Site. The River Trent lies between CO1, CO2, and CO3, and the Cottam Connection Point, and as such is crossed by the cable route. The Fossdyke Navigation Canal runs from Lincoln to Torksey Lock, which at nearest is approximately 1km from the Connection Point. The recreational use of these waterways is of a medium sensitivity to impacts from the Scheme due to their level of regional importance and separation from the Scheme.
- 18.4.59 The smaller River Till runs through the western portions of CO1. Whilst accessible at Saxilby and Sturton by Stow for fishing, navigability of the river is uncertain. There are a number of recreational fishing lakes near to the Sites, with Ingham and Blyton less than 1km away from the Sites at CO1 and CO3 respectively.
- 18.4.60 A full survey of the accessibility and navigability of waterways for recreational uses is continuing through ongoing dialogue with statutory stakeholders and through public consultation. Updated information will be made available in the final ES.
- 18.4.61 The Scheme is predominantly set within agricultural land, which due to its existing use, is not in itself a key tourist attraction or destination. The land does however play a role in providing a landscape context to recreational use of waterways and walking and cycling routes. The potential impacts to the tourism economy are explored in this chapter, whilst the landscape impacts on the use of Public Rights of Way and Cycle Routes are explored in **Chapter 8: Landscape and Visual**, and likely effects on local heritage assets are assessed in **Chapter 13: Cultural Heritage**.

⁹⁵ Long Distance Walkers Association: Long Distance Paths Map

⁹⁶ Trent Rivers Trust: Trent Valley Way

⁹⁷ OpenStreetMap: CycleMap

⁹⁸ Lincoln Golf Club website

18.5 Identification and Evaluation of Key Effects

18.5.1 The likely significant environmental effects, both positive and negative, resulting from the Scheme are identified in the following section. These have been broken down into the three major Scheme stages: construction, operation, and decommissioning, each of which will have differing impacts on the local and regional socio-economic, agricultural, and tourism and recreation environment.

18.5.2 The likely significance of these effects is to be assessed in full in the ES submitted with the DCO application, on the basis of completed baseline data being available, and the full scale of the anticipated Scheme impacts is known.

18.5.3 Where suitable, the pre-mitigation impacts described below will be subject to mitigatory design and procedural alterations to ensure negative impacts are minimised.

Construction

18.5.4 The construction of the Scheme is proposed to be phased over a two-year period and subject to when the DCO is made, the earliest construction may start is 2024.

Socio-Economics

18.5.5 The anticipated Gross Value Added the Scheme will generate is to be estimated ahead of the DCO submission so that the estimated number of employees generated by the Scheme can be calculated, thus allowing the expected impacts to be fully assessed.

18.5.6 The Scheme's construction is likely to bring a medium-term, partially temporary uplift in residential population from the relocation of construction workers, contractors, and technical professionals to the areas surrounding the Sites to supplement the number of workers likely to be found locally. The full extent of anticipated workforce uplift will be explored in full in the ES to provide a detailed assessment of the impacts on socio-demographic characteristics, and housing availability. At this stage, the magnitude of impact is estimated to be medium at the local level and low at the regional level.

18.5.7 Whilst some of the construction workers employed on the Scheme will be relocated temporarily, there can be an expected level of permanent relocated workers and families to the local impact area as a result of the Scheme. This uplift in population is likely to be composed of working age people, with a proportional uplift in the number of children. This will therefore likely have a positive, albeit unlikely to be significant, impact (in EIA terms) on the age demographic profile of the local impact area as the local population will be proportionally less elderly.

18.5.8 As the population is anticipated to be impacted on a medium-term, temporary basis with a medium magnitude, so too will the local level of accommodation stock. Given

the likely mix between temporary and permanently located construction workers, there is likely to be an impact on all types of accommodation stock including hotel rooms, temporary accommodation, and rented and market properties. This is likely to be beneficial (in EIA terms) to the local housing market as this population uplift will help to fill the local supply of housing.

- 18.5.9 The number of temporary accommodation units required by construction workers is likely to have a minor negative impact on the local accommodation industry as a result of the limited estimated number of bed spaces, and the resultant impact on the availability of accommodation for tourists.

- 18.5.10 The impact of an increase in working age population is that there is likely to be a proportional improvement in general population health and wellbeing as a result of an increased working age and actively employed population. This is as a result of lower instances of age-related health and wellbeing issues and disabilities, and an anticipated proportional increase in self-assessed wellbeing. This effect is likely to be low in magnitude and thus not significant. However, there is likely to be a significant negative impact on local access to healthcare services, particularly for general practice healthcare as a result of increased demand.

- 18.5.11 The Scheme is anticipated to bring significant economic prosperity to the Local Impact Area as a result of the scale of the Gross Value Added to the local economy. The full extent of this will be assessed in the ES. The scale of the Scheme is likely to require a large construction labour force, which will attract employees from outside the Local Impact Area. There is therefore likely to be a negative impact on labour market competition, however the magnitude of this is likely to be low due to the pre-existing larger than regional or national scale proportion of the construction industry with regard to workforce.

- 18.5.12 The location of the Scheme within the Local Impact Area will provide a focus for local opportunities for schemes such as apprenticeships or training. Practicable opportunities to promote these schemes will be explored through the Outline Skills, Supply Chain and Employment Plan to be submitted with the DCO. This will seek to have a positive impact on education and skills attainment in fields such as construction, engineering, and energy technology throughout the operational lifetime of the Scheme. There is therefore opportunity for longer-term positive impacts to local skills and qualification attainment in sectors related to and supported by the Scheme. This is especially significant with regard to improving access to education which is a known area within which the Local Impact Area is somewhat deprived.

- 18.5.13 In the medium-term, the Scheme should also bring a positive impact to levels of deprivation regarding access to employment, as a result of increased labour opportunities from the construction of the Scheme.

- 18.5.14 The Scheme is likely to have focussed impacts on some of the key business sectors within the Local Impact Area. The agricultural industry is likely to have a negative impact as a result of the loss of agricultural land, as explained more in the following paragraphs. Conversely, manufacturing and construction are likely to considerably benefit from the Scheme during the construction period. The accommodation and services sector will see a positive economic impact as a result of construction workers using temporary accommodation. This however may be offset by a negative impact as a result of impacts on the tourism and recreation sector, leading to an overall negligible or neutral impact.

Agricultural Circumstances

- 18.5.15 The Scheme is proposed to lead to a temporary loss of up to 1,308ha of predominantly agricultural land, of which up to 8.3% (108.1ha) is BMV. Whilst this land take (which will happen incrementally during the phasing of the Scheme's construction) has the potential to have significant temporary negative impact (i.e. the impact is reversible), the agricultural land resource is still present, without loss of extent or future potential.
- 18.5.16 There is potential for construction activities to have a medium-term negative impact on soil quality as a result of construction traffic compacting surface soil structures, screw piling damaging soil in hyper-localised area, and for concrete foundations needed for major site infrastructure to degrade nearby soils.
- 18.5.17 Although baseline conditions are yet to be established for farming circumstances, it can be anticipated that the Scheme will impact agricultural land management from the outset of the construction period. In particular arable land management will be curtailed in favour of a forage crop for an extended fallow period. The installation of the cable route is likely to cause minor short-term impacts to local farming, although this is likely to be in focussed areas and will be phased to spread temporal impacts. The full impact of the Scheme is to be determined in the ES submitted with the DCO application.

Tourism and Recreation

- 18.5.18 Impacts on the tourism and recreation economy and industry from the Scheme are likely to be felt during the construction period. Tourist attractions that rely on views over the landscape, for example the Till Bridge Lane Viewpoint, and the Torksey Viaduct, are likely to be impacted negatively during construction due to construction machinery and visual impact prior to the planting and maturing of landscape mitigation screening. Construction traffic may also negatively impact on accessibility to tourist attractions and to the desirability of the area for recreational visits. To a lesser extent, this may also impact outdoor recreation venues, although there are none on or directly adjacent to the Sites.

- 18.5.19 The Scheme could lead to the significant temporary change in character, diversion, or closure of Public Rights of Way near or on the Sites and cable route, which will likely reduce their patronage and thus their value as a recreational amenity. This could also impact on local human health and wellbeing as a result of reduced access to recreational walking and cycling routes. There is also a possibility that navigable waterways may be affected by the Scheme construction if for example, the River Trent is to be used for the transportation of oversized goods (such as transformers). These movements are likely to be small in number and have adequate advance notice to ensure the safety of recreational river users. There is also minor potential for disruption to watercraft during cable burying operations where directional drilling under waterways is not required or feasible.

Operation

- 18.5.20 The operational lifetime of the Scheme for the EIA is estimated to be 40 years.

Socio-Economics

- 18.5.21 The ongoing workforce associated with the operation of the Scheme throughout the Scheme's operation is likely to be limited to maintenance crews, landscaping teams, and occasional repair units. The anticipated full time equivalent operational workforce is to be estimated finalised ahead of DCO application submission.
- 18.5.22 The limited number of workers associated with the Site's operation means that the Scheme is likely to have only a minor beneficial long-term impact on local employment and business, and a negligible impact on socio-demographic receptors. There is potential for a positive impact with regard to skills and qualification attainment if the siting of the Scheme leads to increased energy and engineering sector training locally and regionally.

Agricultural Circumstances

- 18.5.23 The loss of agricultural land, specifically the BMV land lost to during the Scheme's lifetime, has the potential to be a significant negative impact, albeit reversible. However, the change in farming activity for the land may allow for the land to rest, particularly where soil health has declined through typical arable cultivation⁹⁹, enabling recovery of soil health. This would be managed through applying good soil husbandry practices through a soil management strategy throughout the lifetime of the Scheme.
- 18.5.24 The Scheme will prevent arable management of the land for the lifetime of the development, however, there are opportunities for farming practices such as livestock farming – specifically sheep grazing, to be undertaken on the land beneath

⁹⁹ Building Research Establishment (2014). Agricultural Good Practice Guidance for Solar Farms. BRE National Solar Centre. www.bre.co.uk/nsc

the PV panels. The feasibility of farm diversification practices to be undertaken will be assessed in full as part of the ES submitted with the DCO application.

Tourism and Recreation

- 18.5.25 The tourism and recreation economy is likely to be impacted only where specific locations and views across the land are important to its economic value. These impacts are anticipated to be negligible on established tourist attractions. Existing Public Rights of Way are intended to be kept open throughout the operational lifetime of the development. The potential for introducing new permissive paths is also being explored. The operation of the Scheme is not anticipated to impact on the use or accessibility of Public Rights of Way, however there may be a minor negative impact on their attractiveness as recreational amenities.
- 18.5.26 The operation of the Scheme is not anticipated to have an impact on outdoor recreation venues or navigable waterways during its operation.

Decommissioning

- 18.5.27 The decommissioning of the Scheme is expected to take 12-24 months at the end of the life of the Scheme (which is estimated to be 2066 for the EIA), and will be undertaken in phases, under direction of an Outline Decommissioning Plan to be submitted as part of the DCO application. The effects of decommissioning are similar to, or often of a lesser magnitude than construction effects, and the estimated number of workers required to undertake the decommissioning of the Scheme will be presented as part of the final ES for DCO submission. It should however be noted that there is a far greater degree of uncertainty in estimating the sensitivity of the receptors and magnitude of the impacts due to them being projected up to 2066. This uncertainty is borne from ranged estimates with regard to socio-economic, agricultural, and tourism and recreational factors, and the engineering approaches and technologies that are likely to change over the operational life of the Scheme.

Socio-Economics

- 18.5.28 It can be assumed that the impacts of decommissioning will be of a nature similar to the construction, although the uncertainty in baseline data for the time means that it is uncertain if the receptors will have the same level of sensitivity as at the construction stage.
- 18.5.29 The medium-term uplift in labour force is likely to impact resident age demographics, accommodation stock, and access to healthcare in the same manner as during construction. Likewise, the Scheme is likely to bring about a positive change to economic activity, and the local employment and labour markets. That notwithstanding, there will be a minor negative impact in long-term employment as a result of the Scheme being decommissioned.

Agricultural Circumstances

- 18.5.30 As a result of the Scheme being returned to agricultural use upon completion of the Scheme's decommissioning, there will likely be a positive impact on the availability of agricultural land, including BMV.
- 18.5.31 Soil health may improve at the Site. However, without appropriate mitigation, decommissioning activities could impact the improved soil quality if compaction and damage are incurred. Whilst it is possible that decommissioning methods and mitigation measures may have advanced at the point of decommissioning, for the purposes of the EIA the potential impacts will be measured as if by today's technology.
- 18.5.32 There is potential for the breaking up of hardstanding and concrete foundations during decommissioning to degrade the quality of the soil.
- 18.5.33 The decommissioning of the Scheme would allow for the land to be returned to its current agricultural use, thus allowing the landowner to grow arable crops or reuse the land for other farming practices. Future agricultural land use, as at present, will be subject to market conditions, environmental regulations, and any farm subsidy system in place at that time.

Tourism and Recreation

- 18.5.34 The primary impacts on tourism and recreation receptors as a result of the Scheme's decommissioning are those impacts as a result of visual and auditory effects from deconstruction equipment, and potential impacts on accessibility to key attraction as a result of increased heavy goods traffic movements.
- 18.5.35 The decommissioning of the Scheme is likely to impact on Public Rights of Way due to diversions, and potential route closures. These impacts will be of a similar nature to the construction stage. Furthermore, should any permissive footpaths be opened for recreational use within the Site, these may be liable to closure upon completion of the Scheme's operational lifetime.
- 18.5.36 As with construction, the decommissioning process may utilise the River Trent for movement of large-scale equipment, machinery, and site waste and recycling material. This will be explored further through the Outline Decommissioning Plan to be submitted as a supporting document to the DCO application.

Summary

- 18.5.37 The anticipated impacts resulting from the development on socio-economic, agricultural circumstances, and tourism and recreation receptors are summarised in **Table 18.11**, demonstrating the receptor sensitivity, and the likely significant impact associated with that receptor. A full assessment of the magnitude of the

impact against the sensitivity of the receptor, and thus the significance of the effect pre-mitigation will be undertaken for the ES ahead of the DCO submission.

- 18.5.38 Where the estimated significance of the described effects has been identified, those deemed to be moderate, major-moderate, or major are key significant effects. These have been shown with bold text in **Table 18.11** overleaf.

Table 18.11: Summary of Preliminary Magnitude and Significance of Effects

Receptor	Sensitivity	Description of Impact	Estimated Pre-Mitigation Magnitude of Impact	Estimated Significance of Effect
CONSTRUCTION				
Resident population	Medium (LIA) High (Regional)	Uplift in population from construction workforce and families	Medium positive (LIA) Low positive (Regional)	Moderate mid-term beneficial Moderate mid-term beneficial
Resident age demographic	Medium (LIA) Low (Regional)	Uplift in working age and youth age groups	Low positive (LIA) Negligible (Regional)	Moderate-minor mid-term beneficial Negligible
Accommodation stock (housing)	Low	Increase in accommodation requirement for workers and families	Medium positive	Moderate-minor mid-term beneficial
Accommodation stock (visitor)	Medium	Increase in accommodation requirement for temporary or short-term workers	Minor negative	Moderate-minor short-term adverse
Self-assessed health	Medium (LIA) Low (Regional)	Uplift in working age and youth age groups from construction workforce and families	Low positive (LIA) Negligible (Regional)	Moderate-minor mid-term beneficial Negligible
Access to primary healthcare	Medium (LIA)	Uplift in population looking to access primary healthcare facilities	Medium negative	Moderate mid-term adverse
Skills and qualification	High (LIA) Low (Regional)	Increase in sector-based skills training and qualification opportunities	Medium positive (LIA) Low positive (Regional)	Major-moderate mid-term beneficial Minor mid-term beneficial
Access to education (IMD)	High (LIA)	Increase in sector-based skills training and qualification opportunities	Medium positive	Major-moderate mid-term beneficial
Access to employment (IMD)	High (LIA)	Increase in employment opportunities generated from Scheme construction	Medium positive	Major-moderate mid-term beneficial
Economic activity and employment	High (LIA) Low (Regional)	Increase in employment opportunities generated from Scheme construction	Medium positive	Major-moderate short-term beneficial
Construction and manufacturing sector employment	Medium (LIA)	Increase in employment opportunities generated from Scheme construction	Medium positive	Moderate short-term beneficial
Accommodation and services	Medium (LIA)	Increase in demand for temporary accommodation units Decrease in tourism demand	Neutral	Neutral effect

Receptor	Sensitivity	Description of Impact	Estimated Pre-Mitigation Magnitude of Impact	Estimated Significance of Effect
sector employment				
Tourism and recreation sector employment	High (short-term) Low (long-term) (LIA)	Decrease in tourism and recreation demand due to visual, accessibility, and traffic impacts of Scheme	Low negative	Moderate short-term adverse Minor long-term adverse
Labour market competition	Medium (LIA)	Increase in labour force from outside local impact area	Low negative	Moderate-minor short-term adverse
Economic prosperity	Medium (LIA) Medium (Regional)	GVA associated with construction of Scheme	Medium positive (LIA) Low positive (Regional)	Moderate short-term beneficial Moderate-minor short-term beneficial
BMV agricultural land	High (LIA) Low (Regional)	Loss of up to 183.9 hectares of BMV	High negative (LIA) Low negative (Regional)	Major long-term adverse Minor long-term adverse
Soil quality	Medium	Soil compaction and damage, degradation of soil quality	Medium negative	Moderate long-term adverse
Farming circumstances	Medium	Loss of land for arable crop farming	Medium negative	Moderate long-term adverse Moderate-minor short-term adverse
Tourist attractions	Medium	Segregation of land due to cable routing	Low negative	Moderate-minor short-term adverse
Outdoor recreation centres	Low	Impacts from construction noise, traffic, and views on desirability and use	Negligible	Negligible
Public Rights of Way	Medium	Impacts from construction noise, traffic, views, and diversions and closures of routes on PRoW desirability and use	High negative	Major-moderate short-term adverse
Regional and national walking and cycling routes	High	Impacts from construction noise, traffic, views, and diversions and closures of routes on route desirability and use	High negative	Major short-term adverse
Recreational use of navigable waterways	Medium	Impacts from construction noise, traffic, views, and diversions and closures of routes on desirability and use	Low negative	Moderate-minor short-term adverse
OPERATION				

Receptor	Sensitivity	Description of Impact	Estimated Pre-Mitigation Magnitude of Impact	Estimated Significance of Effect
Skills and qualification	High (LIA) Low (Regional)	Increase in sector-based skills training and qualification opportunities	Low positive (LIA) Negligible (Regional)	Moderate long-term beneficial Negligible
Access to education (IMD)	High (LIA)	Increase in sector-based skills training and qualification opportunities	Low positive	Moderate long-term beneficial
Access to employment (IMD)	High (LIA)	Increase in employment opportunities generated from Scheme operation	Low positive	Moderate long-term beneficial
Economic activity and employment	High (LIA) Low (Regional)	On-site employment due for maintenance, landscaping, and monitoring	Low positive (LIA) Negligible (Regional)	Moderate long-term beneficial Negligible
Tourism and recreation sector employment	Low	Decrease in tourism and recreation demand due to visual, accessibility, and traffic impacts of Scheme	Negligible	Negligible
Economic prosperity	Medium (LIA) Medium (Regional)	GVA associated with operation of Scheme	Medium positive (LIA) Low positive (Regional)	Moderate long-term beneficial Moderate-minor long-term beneficial
BMV agricultural land	High (LIA) Low (Regional)	Loss of up to 183.9 hectares of BMV	High negative (LIA) Low negative (Regional)	Major long-term adverse Minor long-term adverse
Soil quality	Medium	Soil resting from non-intensive land use	Medium positive	Moderate long-term beneficial
Farming circumstances	Medium	Opportunity for low-level livestock farming such as sheep grazing	Low positive	Moderate-minor long-term beneficial
Tourist attractions	Medium	Impacts from views on desirability and use	Low negative	Moderate-minor long-term adverse
Outdoor recreation centres	Low	Impacts from views on desirability and use	Negligible	Negligible
Public Rights of Way	Medium	Impacts from views on PROW desirability and use	Low negative	Moderate-minor long-term adverse
Regional and national walking and cycling routes	High	Impacts from views on route desirability and use	Low negative	Moderate-minor long-term adverse

Receptor	Sensitivity	Description of Impact	Estimated Pre-Mitigation Magnitude of Impact	Estimated Significance of Effect
Recreational use of navigable waterways	Medium	Impacts from views on desirability and use	Negligible	Minor long-term adverse
DECOMMISSIONING				
Resident population	Medium (LIA) High (Regional)	Uplift in population from site decommissioning workforce and families	Medium positive (LIA) Low positive (Regional)	Moderate mid-term beneficial Moderate mid-term beneficial
Resident age demographic	Medium (LIA) High (Regional)	Uplift in working age and youth age groups	Low positive (LIA) Negligible (Regional)	Moderate-minor mid-term beneficial Moderate-minor mid-term beneficial
Accommodation stock	Uncertain	Increase in accommodation requirement for workers and families	Uncertain	Uncertain
Economic activity and employment	Uncertain	Increase in employment opportunities generated from Scheme decommissioning	Medium positive	Moderate short-term beneficial
Economic activity and employment	Uncertain	Termination of on-site employment for maintenance, landscaping, and monitoring	Low negative (LIA) Negligible (Regional)	Minor mid-term adverse Negligible
Construction and manufacturing sector employment	Uncertain	Increase in employment opportunities generated from Scheme decommissioning	Medium positive	Moderate short-term beneficial
Accommodation and services sector employment	Uncertain	Increase in demand for temporary accommodation units Decrease in tourism demand	Low positive	Minor short-term beneficial
Tourism and recreation sector employment	Uncertain	Decrease in tourism and recreation demand due to visual, accessibility, and traffic impacts of Scheme decommissioning	Low negative	Minor short-term adverse
BMV agricultural land	High (LIA) Low (Regional)	Return of up to 183.9 hectares of BMV	High positive (LIA) Low positive (Regional)	Major long-term beneficial Minor long-term beneficial
Soil quality	Medium	Soil compaction and damage, degradation of soil quality	Low negative	Moderate-minor long-term adverse

Receptor	Sensitivity	Description of Impact	Estimated Pre-Mitigation Magnitude of Impact	Estimated Significance of Effect
Farming circumstances	Medium	Return of land for arable crop farming	Medium positive	Moderate long-term beneficial
Tourist attractions and outdoor recreation	Medium	Impacts from decommissioning noise, traffic, and views on desirability and use Removal of solar panel areas and infrastructure	Low negative Low positive	Moderate-minor short-term adverse Moderate-minor long-term beneficial
Public Rights of Way	Medium	Impacts from decommissioning noise, traffic, views, and diversions and closures of routes on PRoW desirability and use Removal of solar panel areas and infrastructure	High negative Low positive	Major-moderate short-term adverse Moderate-minor long-term beneficial
Regional and national walking and cycling routes	High	Impacts from decommissioning noise, traffic, views, and diversions and closures of routes on route desirability and use Removal of solar panel areas and infrastructure	High negative Low positive	Major short-term adverse Moderate long-term beneficial
Recreational use of navigable waterways	Medium	Impacts from decommissioning noise, traffic, views, and diversions and closures of routes on desirability and use Removal of solar panel areas and infrastructure	Low negative Low positive	Moderate-minor short-term adverse Moderate-minor long-term beneficial

18.6 Mitigation Measures

- 18.6.1 Where significant adverse effects are anticipated as a result of the development of the Scheme, a series of mitigation measure will be included in the design, operation, and management of the Scheme where feasible to ensure these impacts can be minimised. These mitigation measures will also aim to reduce the impacts of the development with other developments being built out over a similar timeframe.
- 18.6.2 Key mitigation effects with regard to the construction of the Scheme have been presented in the Draft Outline Construction Environment Management Plan, found at **Appendix 4.3**, and the Draft Construction Traffic Management Plan, found at **Appendix 14.1**. These documents will set out how the environmental effects across the Scheme are to be minimised and controlled.
- 18.6.3 Specifically, construction is anticipated to be phased across a two-year period to ensure environmental impacts are not concentrated geographically or temporally. Construction timescales for concurrent DCO solar schemes, West Burton Solar Project and Gate Burton Energy Park will also be phased and partially staggered to reduce cumulative impacts on socio-economic and tourism and recreation receptors. These three identified projects are currently proposing to share a cable route from the east of Marton, crossing the River Trent, up to the east of Coates (Nottinghamshire). This option would allow for reduced construction impacts with regard to labour, and reduced disruption to affected public rights of way and recreation use of the River Trent.
- 18.6.4 During operation, the key significant impacts from the development are based primarily on landscape impact, which is discussed in Chapter 8 of the PEIR. The impact on tourist and recreational attractions and venues will be mitigated through on-site landscape planting, and through the careful determination of the areas requiring different panel types or being unsuitable for the locating of panels altogether. These measures have indicatively been included in the site layout designs provided for statutory consultation alongside the PEIR and are to be progressed further ahead of the DCO application submission.
- 18.6.5 Decommissioning will see the return of significant impacts to socio-economic, agriculture and tourism and recreation along a similar vein to those experienced during construction. Whilst a detailed assessment on the anticipated effects cannot be reliably made due to uncertainty as to future baseline conditions, mitigatory measures can still be implemented through the DCO application submission via the Outline Decommissioning Statement at **Appendix 4.4**.
- 18.6.6 A tabulated list of the anticipated significant effects of the Scheme, and the proposed mitigation measures can be found in **Table 18.12** overleaf. Where the estimated significance of the described effects has been identified, those deemed

to be moderate, major-moderate, or major are key significant effects. These have been shown with bold text.

Table 18.12: Summary of Mitigation and Enhancement Measures and Residual Effects

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
CONSTRUCTION				
Resident population	Moderate mid-term beneficial (LIA) Moderate mid-term beneficial (Regional)	Uplift in population from construction workforce and families	None required	Moderate mid-term beneficial (LIA) Moderate mid-term beneficial (Regional)
Resident age demographic	Moderate-minor mid-term beneficial (LIA)	Uplift in working age and youth age groups	None required	Moderate-minor mid-term beneficial (LIA)
Accommodation stock (housing)	Moderate-minor mid-term beneficial	Increase in accommodation requirement for workers and families	None required	Moderate-minor mid-term beneficial
Accommodation stock (visitor)	Moderate-minor short-term adverse	Increase in accommodation requirement for temporary or short-term workers	Phasing of Scheme construction and staggering with cumulative projects	Minor short-term adverse
Self-assessed health	Moderate-minor mid-term beneficial (LIA)	Uplift in working age and youth age groups from construction workforce and families	None required	Moderate-minor mid-term beneficial (LIA)
Access to primary healthcare	Moderate mid-term adverse	Uplift in population looking to access primary healthcare facilities	Phasing of Scheme construction and staggering with cumulative projects	Minor mid-term adverse
Skills and qualification (LIA)	Major-moderate mid-term beneficial	Increase in sector-based skills training and qualification opportunities	Enhancement measures through Outline Skills, Supply Chain and Employment Plan	Major mid-term beneficial
Access to education (IMD)	Major-moderate mid-term beneficial	Increase in sector-based skills training and qualification opportunities	Enhancement measures through Outline Skills, Supply Chain and Employment Plan	Major mid-term beneficial
Access to employment (IMD)	Major-moderate mid-term beneficial	Increase in employment opportunities generated from Scheme construction	Enhancement measures through Outline Skills, Supply Chain and Employment Plan	Major mid-term beneficial

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
Economic activity and employment	Major-moderate short-term beneficial	Increase in employment opportunities generated from Scheme construction	Phasing of Scheme construction and staggering with cumulative projects	Major-moderate mid-term beneficial
Construction and manufacturing sector employment	Moderate short-term beneficial	Increase in employment opportunities generated from Scheme construction	Phasing of Scheme construction and staggering with cumulative projects	Moderate mid-term beneficial
Accommodation and services sector employment	Neutral effect	Increase in demand for temporary accommodation units Decrease in tourism demand	Phasing of Scheme construction and staggering with cumulative projects to limit impact on tourism	Minor short-term beneficial
Tourism and recreation sector employment	Moderate short-term adverse	Decrease in tourism and recreation demand due to visual, accessibility, and traffic impacts of Scheme	CEMP to minimise construction impacts	Negligible
Labour market competition	Moderate-minor short-term adverse	Increase in labour force from outside local impact area	Phasing of Scheme construction and staggering with cumulative projects	Minor short-term adverse
Economic prosperity (LIA)	Moderate short-term beneficial	GVA associated with construction of Scheme	None	Moderate mid-term beneficial
BMV agricultural land (LIA)	Major long-term adverse	Loss of up to 183.9 hectares of BMV, plus cumulative loss of BMV	Opportunities for farm diversification and alternative farming practices to be undertaken during Scheme operation	Moderate long-term adverse
Soil quality	Moderate long-term adverse	Soil compaction and damage, degradation of soil quality	CEMP to manage soil damage during construction through dedicated working practices	Minor long-term adverse
Farming circumstances	Moderate long-term adverse	Loss of land for arable crop farming	Opportunities for farm diversification and alternative farming practices to be undertaken during Scheme operation	Minor long-term adverse Negligible

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
	Moderate-minor short-term adverse	Segregation of land due to cable routing	Cable routing optioneering to limit land segregation	
Tourist attractions	Moderate-minor mid-term adverse	Impacts from construction noise, traffic, and views on desirability and use	CEMP to minimise construction impacts	Negligible
Outdoor recreation centres	Negligible	Impacts from construction noise, traffic, and views on desirability and use	CEMP to minimise construction impacts	Negligible
Public Rights of Way	Major-moderate short-term adverse	Impacts from construction noise, traffic, views, and diversions and closures of routes on PRoW desirability and use	CEMP to minimise construction impacts. Temporary closures supported by appropriate amount of notice and diversions where feasible	Minor mid-term adverse
Regional and national walking and cycling routes	Major short-term adverse	Impacts from construction noise, traffic, views, and diversions and closures of routes on route desirability and use	CEMP to minimise construction impacts. Temporary closures supported by appropriate amount of notice and diversions where feasible	Minor mid-term adverse
Recreational use of navigable waterways	Moderate-minor short-term adverse	Impacts from construction noise, traffic, views, and diversions and closures of routes on desirability and use	CEMP to minimise construction impacts. Temporary closures supported by appropriate amount of notice and diversions where feasible	Minor mid-term adverse
OPERATION				
Skills and qualification (LIA)	Moderate long-term beneficial	Increase in sector-based skills training and qualification opportunities	Support for local businesses and education centres through Outline Skills, Supply Chain, and Employment Plan	Moderate long-term beneficial
Access to education (IMD)	Moderate long-term beneficial	Increase in sector-based skills training and qualification opportunities	Enhancement measures through Outline Skills, Supply Chain and Employment Plan	Moderate long-term beneficial

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
Access to employment (IMD)	Moderate long-term beneficial	Increase in employment opportunities generated from Scheme operation	Enhancement measures through Outline Skills, Supply Chain and Employment Plan	Moderate long-term beneficial
Economic activity and employment (LIA)	Moderate long-term beneficial	On-site employment due for maintenance, landscaping, and monitoring	Enhancement measures through Outline Skills, Supply Chain and Employment Plan	Moderate long-term beneficial
Tourism and recreation sector employment	Negligible	Decrease in tourism and recreation demand due to visual, accessibility, and traffic impacts of Scheme	Landscape planting and integrated design measures	Negligible
Economic prosperity (LIA)	Moderate long-term beneficial	GVA associated with operation of Scheme	None required	Moderate long-term beneficial
BMV agricultural land (LIA)	Major long-term adverse	Loss of up to 183.9 hectares of BMV, plus cumulative loss of BMV	Opportunities for farm diversification and alternative farming practices to be undertaken during Scheme operation	Moderate long-term adverse
Soil quality	Moderate long-term beneficial	Soil resting from non-intensive land use	Planting to support soil retention and soil quality management scheme	Major-moderate long-term beneficial
Farming circumstances	Moderate-minor long-term beneficial	Opportunity for low-level livestock farming such as sheep grazing	Support for local farming business through opportunities for farm diversification and alternative farming practices to be undertaken during Scheme operation	Moderate-minor long-term beneficial
Tourist attractions	Moderate-minor long-term adverse	Impacts from views on desirability and use	Landscape planting and integrated design measures	Negligible
Outdoor recreation centres	Negligible	Impacts from views on desirability and use	Landscape planting and integrated design measures	Negligible
Public Rights of Way	Moderate-minor long-term adverse	Impacts from views on desirability and use	Landscape planting and integrated design measures	Negligible

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
Regional and national walking and cycling routes	Moderate-minor long-term adverse	Impacts from views on route desirability and use	Landscape planting and integrated design measures	Negligible
Recreational use of navigable waterways	Minor long-term adverse	Impacts from views on desirability and use	Landscape planting and integrated design measures	Negligible
DECOMMISSIONING				
Resident population	Moderate mid-term beneficial (LIA) Moderate mid-term beneficial (Regional)	Uplift in population from site decommissioning workforce and families	None required	Moderate mid-term beneficial (LIA) Moderate mid-term beneficial (Regional)
Resident age demographic	Moderate-minor mid-term beneficial (LIA)	Uplift in working age and youth age groups	None required	Moderate-minor mid-term beneficial (LIA)
Accommodation stock	Uncertain	Increase in accommodation requirement for workers and families	None required	Moderate-minor mid-term beneficial
Economic activity and employment	Moderate short-term beneficial	Increase in employment opportunities generated from Scheme decommissioning	Implementation of decommissioning plan	Major-moderate short-term beneficial
Economic activity and employment	Minor long-term adverse	Termination of on-site employment for maintenance, landscaping, and monitoring	Implementation of decommissioning plan with support for employees to be integrated into wider employment sector where practicable	Negligible
Construction and manufacturing sector employment	Moderate mid-term beneficial	Increase in employment opportunities generated from Scheme decommissioning	None required	Moderate mid-term beneficial
Accommodation and services sector employment	Minor mid-term beneficial	Increase in demand for temporary accommodation units Decrease in tourism demand	Implementation of decommissioning plan	Moderate mid-term beneficial

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
Tourism and recreation sector employment	Minor mid-term adverse	Decrease in tourism and recreation demand due to visual, accessibility, and traffic impacts of Scheme decommissioning	Implementation of decommissioning plan	Negligible
BMV agricultural land	Major long-term beneficial	Return of up to 183.9 hectares of BMV	None required	Major long-term beneficial
Soil quality	Minor long-term adverse	Soil compaction and damage, degradation of soil quality	Implementation of decommissioning plan	Negligible
Farming circumstances	Moderate long-term beneficial	Return of land for arable crop farming	None required	Moderate long-term beneficial
Tourist attractions and outdoor recreation	Moderate-minor mid-term adverse Moderate-minor long-term beneficial	Impacts from decommissioning noise, traffic, and views on desirability and use Removal of solar panel areas and infrastructure	Decommissioning plan to minimise impacts. None required	Negligible Moderate-minor long-term beneficial
Public Rights of Way	Major-moderate mid-term adverse Moderate-minor long-term beneficial Major mid-term adverse	Impacts from decommissioning noise, traffic, views, and diversions and closures of routes on PRoW desirability and use Removal of solar panel areas and infrastructure	Decommissioning plan to minimise impacts. Temporary closures supported by appropriate amount of notice and diversions where feasible. None required	Minor mid-term adverse Moderate-minor long-term beneficial Minor mid-term adverse
Regional and national walking and cycling routes	Moderate long-term beneficial	Impacts from decommissioning noise, traffic, views, and diversions and closures of routes on route desirability and use Removal of solar panel areas and infrastructure	Decommissioning plan to minimise impacts. Temporary closures supported by appropriate amount of notice and diversions where feasible. None required	Moderate long-term beneficial

Receptor	Estimated Significance of Effect	Description of Impact	Mitigation/ Enhancement Measures	Residual Effects Post-Mitigation
Recreational use of navigable waterways	Moderate-minor mid-term adverse	Impacts from decommissioning noise, traffic, views, and diversions and closures of routes on desirability and use	Decommissioning plan to minimise impacts. Temporary closures supported by appropriate amount of notice and diversions where feasible.	Minor mid-term adverse
	Moderate-minor long-term beneficial	Removal of solar panel areas and infrastructure	None required	Moderate-minor long-term beneficial

18.7 Residual Effects

- 18.7.1 The residual likely significant effects of the Scheme with regard to socio-economic, agriculture, and tourism and recreation receptors have been indicatively identified in **Table 18.12** in the previous section.
- 18.7.2 During construction, the key residual effects are beneficial effects from the construction of the Scheme with regard to economic prosperity, employment uplift, and support across multiple business sectors. The likely significant adverse effects relate to the local agricultural business sector and the loss of BMV land during the lifetime of the Scheme. Due to the nature of the Scheme, these are not able to be directly mitigated against. Whilst long-term, these effects are however temporary, with the agricultural sector likely to see an equal recovery with the release of the BMV land at the conclusion of the Scheme's lifetime.
- 18.7.3 Due to its operational phase being more passive due to its low ongoing demands, the Scheme will still have a beneficial impact on local economic prosperity and will have the potential to offer opportunity for bolstering local skills and qualification attainment through local investment and training vacancies. Furthermore, the Scheme has the opportunity to provide significant improvement to soil quality through allowing the land to rest and sequester nutrients.
- 18.7.4 As with construction, decommissioning has the potential to offer key beneficial residual effects regard to economic prosperity, employment uplift, and support across multiple business sectors. The release of the land back to agricultural use will also be a highly significant benefit of the decommissioning of the Scheme.

18.8 In-Combination Effects

- 18.8.1 During construction, the Scheme has potential to incur combined effects with regard to socio-economic and human health impacts. This would be as a result of impacts of an increased labour force and resultant residential population impacting the accessibility of general practice healthcare combined with the pre-mitigation human health impacts from noise, dust, and emissions from the Scheme's construction and associated traffic movements.
- 18.8.2 Furthermore, there are potential long-term in-combination effects with combined impacts on agricultural land quality, soil quality, and ground contamination. Over the full lifetime of the Scheme there is the potential for mixed positive and negative impacts due to the resting of the agricultural land during the Scheme's operation against the potential impacts of intrusive foundations and risk of contamination to soils as a result of water runoff from surface water and from major accidents and disasters.
- 18.8.3 Impacts on tourism and recreation receptors could also have combined impacts on human health as a result of reduced access to walking and cycling routes as a result

of closures and diversions during construction and decommissioning, and to a lesser extent decreased desirability during the operation of the Scheme. The location of the development could also produce a combined effect on tourist attractions where their landscape setting and/or their cultural and heritage significance are affected.

- 18.8.4 The full extent and significance of in-combination effects will be assessed in full in the ES. There is potential for the identified effects to be magnified by the in-combination effects of all four generating stations that comprise the Scheme being constructed at the same time.

18.9 Cumulative Effects

- 18.9.1 A full list of cumulative schemes is shown in **Appendix 2.2** of the PEIR. This list will be refined in due course through consultation with statutory consultees and will be presented and assessed in the ES.
- 18.9.2 For the purpose of assessing socio-economic, agriculture, tourism and recreation impacts, **Table 18.13** below outlines the identified cumulative projects that will be considered. Where available, the ES will consider the scale of the cumulative project with regard to estimated economic value, estimated employment uplift, agricultural land take, and impact on regional or national tourist attractions and recreational receptors.

Table 18.13: Cumulative Projects Assessed for Socio-Economic, Agriculture, Tourism and Recreation Impacts

Reference	Location	Description
West Burton Solar Project	Broxholme, Ingleby, and Brampton, Lincolnshire; Clayworth, and West Burton, Nottinghamshire	NSIP 480MW four-part solar electricity generation generating station with associated infrastructure and 20MWh of energy storage
Gate Burton Energy Park	Gate Burton, Lincolnshire	NSIP 500MW solar power electricity generation station with associated infrastructure and energy storage
West Burton C	West Burton Power Station	NSIP 299MW gas-fired electricity generation station
West Burton A Decommissioning	West Burton Power Station	Decommissioning of West Burton A Power Station estimated 2024.
Heckington Fen Solar	East Heckington, Lincolnshire (41km south east of WB2)	NSIP >50MW solar electricity generation generating station
Saxilby Heights 131174 137071 141615	N of Saxilby	Outline planning application for 230 residential development

132286, 138472 138574, 139469 140143, 140813 142022, 142107	N of Saxilby	Hybrid application to include outline planning application for the erection of up to 133 dwelling
142855	Blyton Park Driving Centre	Automotive Research and Development Centre, including; garaging, circuit viewing facilities, 2 no. wind turbines and ground mounted solar panels
20/00117/FUL	Land NW and S of Field Farm, Wood Lane, Sturton Le Steeple	Installation and operation of a solar farm ~50MW
22/00358/FUL	Land East of Bumble Bee Farm, Gainsborough Road, Saundby	Installation of a solar farm (49.9MW) and battery storage facility
High Marnham Policy ST51	High Marnham former power station	Unadopted allocation for proposed site as an 'Area of Best Fit' for renewable generation
Cottam Priority Regeneration Area Policy ST6	Cottam Power Station	Unadopted allocation for comprehensive redevelopment
F/0800 ES/2089	Land to the N & E of Sturton le Steeple	Sand and gravel extraction (extant permission from 2006)

- 18.9.3 Cumulative effects from the identified developments above are most likely to be felt during the construction phase of the development, and then to a lesser extent during the Scheme's decommissioning. Although it is not known when all the developments in **Table 18.13** are due to be constructed, a worst-case scenario could reasonably anticipate them being developed out over a 5-year period.
- 18.9.4 In this scenario, the cumulative impact on employment, the local labour force, and accommodation are likely to be significant. The impact on the availability of agricultural land, specifically Best and Most Versatile land is also likely to be significant and long-term (projected up to approximately 2066). However, it is important to distinguish that the impacts on BMV for solar projects is temporary for the lifetime of the project, whereas for housing and business developments, the impacts are permanent.
- 18.9.5 Construction and landscape impacts from the identified developments are likely to be cumulative with regard to the attractiveness and accessibility of tourist attractions and recreational amenities. These could be significant where impacts on PRoWs and long-distance walking and cycling routes of regional or national significance are impacted at multiple points in the same or a running timescale. This is likely to be as a result of combined construction traffic and on-site diversions and closures of PRoWs.

- 18.9.6 During the operational phase of the development, the greatest cumulative impact is likely to be on agricultural circumstances as a result of changes to farming practices, and any ongoing cumulative impacts on the desirability and use of tourist attractions and recreational walking and cycling routes.
- 18.9.7 Decommissioning of the Scheme is likely to be undertaken in the same general timeframe as that for West Burton Solar Project and Gate Burton Energy Park due to their similar operational timescale. Where other temporary developments are also identified in this list, the timescales for their removal are more difficult to establish, thus cannot be assessed with any degree of certainty. As during the construction phase, the key significant cumulative impacts are likely to be felt with regard to employment, and the local labour force. The release of land from these solar projects back to agricultural use will also see a significant positive impact with regard to agricultural circumstances. Tourism and recreation receptors are also likely to see some significant cumulative effects due to predicted decommissioning traffic, and the uncertainty of the need for diversions and closures of PRowS during decommissioning works across the identified cumulative sites.

19 Waste

19.1 Introduction

- 19.1.1 This chapter of the PEIR considers the likely waste streams arising from the Scheme and any likely significant effects during the construction, operation and decommissioning phases.
- 19.1.2 The chapter describes the methodology, the existing baseline scenario and the nature of change. It identifies the effects upon receptors arising as a result of the Scheme and the significance associated with the identified effects based on the sensitivity of those receptors to change and magnitude of any change that will likely occur.
- 19.1.3 The chapter presents as much information as is possible at this stage in the Scheme's development. Where information is not yet available, the chapter sets out how it will be dealt with in the ES at the DCO application stage.

19.2 Consultation

- 19.2.1 An EIA Scoping Report was submitted to The Planning Inspectorate (PINs) in January 2022 with the scoping opinion received in March 2022. Table 19.1 provides a summary of the waste related comments made by Ins and relevant stakeholders and the responses to these in this PEIR.

Table 19.1 Summary of Consultation Responses

Consultee	Summary of Response	How response has been addressed	Reference to further information
The Planning Inspectorate	The Applicant proposes to scope out the whole aspect. The Inspectorate does not agree to scope waste out as the potential remains for significant effects to occur both from the Proposed Development alone and cumulatively with other developments during construction and decommissioning. The ES should include an assessment of waste impacts where	A waste chapter has been prepared for the PEIR and will form part of the ES.	Please refer to the whole of chapter 19.

	significant effects are likely to occur and include and outline what measures, if any, are in place to ensure that panels and any associated components are able to be diverted from the waste chain.		
Nottinghamshire County Council	Advised there are no existing waste facilities within the vicinity of the site whereby the proposed development could cause an issue in terms of safeguarding existing management facilities (as per Policy WCS10 of the Waste Local Plan).	Consideration of the location of existing waste facilities	Section 19.5

19.3 Policy Context

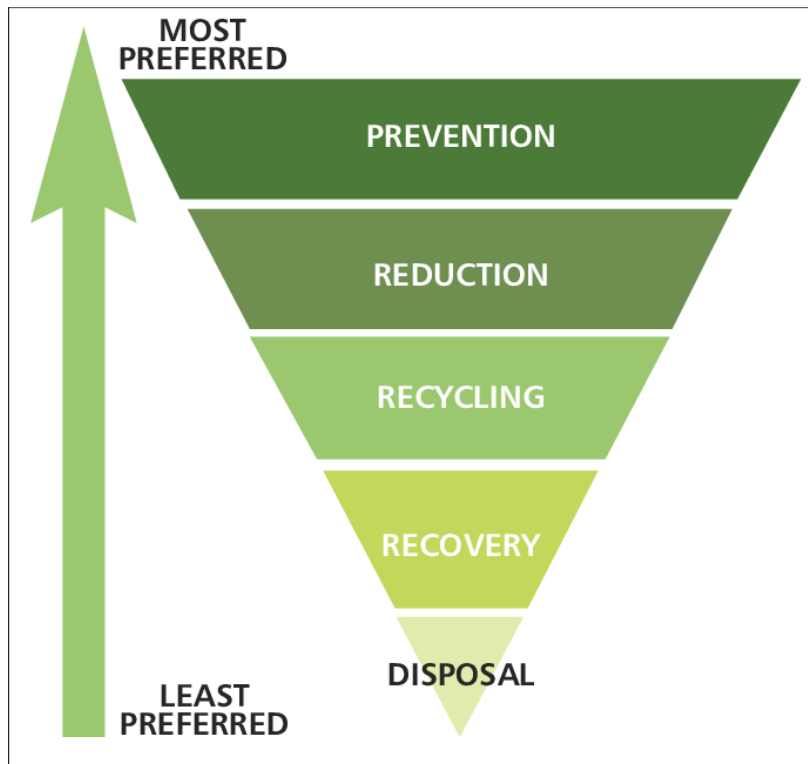
- 19.3.1 The Waste Framework Directive¹⁰⁰ provides the framework for the management of waste across the EU. The Waste (England and Wales) Regulations 2011 (as amended)¹⁰¹ transposed the Waste Framework Directive into domestic law in England and Wales.¹⁰² The framework requires waste prevention programmes and waste management plans that apply the waste hierarchy. The waste hierarchy is shown below in Figure 19.1.
- 19.3.2 The hierarchy will be applied throughout the lifetime of the Scheme during construction, operation and decommissioning.

¹⁰⁰ Directive 2008/98/EC on waste (as amended) (Waste Framework Directive).

¹⁰¹ The Waste (England and Wales) Regulations 2011 (as amended).

¹⁰² On 31 December 2020 the UK exited the "implementation period" provided for by the European Union (Withdrawal) Act 2018 (Withdrawal Act 2018). Sections 2-3 of the Withdrawal Act 2018, as amended, provide that direct EU legislation, and EU-derived domestic legislation, continue to have effect in domestic law after that date. In summary, the interpretation of any retained EU law is to be the same as it was before that date, subject to the necessary amendments set out in the Waste (Miscellaneous Amendments) (EU Exit) (No. 2) Regulations 2019

Figure 19.1 Waste Hierarchy



- 19.3.3 *Overarching National Policy Statement for Energy (EN-1)* sets out in Section 5.15 Resource and Waste Management the strategy that should be taken regarding reducing the amount of waste where possible and trying to use at a resource. Paragraph 5.15.6 states that “*The applicant should set out the arrangements that are proposed for managing waste produced and prepare a Site Waste Management Plan. The arrangement described and Management Plan should include information on the proposed waste receiver and disposal system for all waste generated by the development, and an assessment of the impact of the waste arising from development on the capacity of waste management facilities to deal with other waste arising in the area for at least five years of operation.*”
- 19.3.4 It goes on to further state that applicants should seek to minimise the volume of waste produced and the volume of waste sent to disposal. Construction best practices should be utilised in relation to storing of materials in an adequate and protected place on site to prevent waste.
- 19.3.5 *Lincolnshire Minerals and Waste Local Plan (June 2016)* sets out the key principles of waste management in the County up to 2031. The policies in the Local Plan focus on the provision of waste facilities.
- 19.3.6 *Nottinghamshire Waste Local Plan (2002) and Waste Core Strategy (2013)*. The Local Plan has saved policies with it partly replaced by the Core Strategy. The Core Strategy sets

out the approach to waste management in Nottinghamshire. The Council are working on preparing a new Local Plan which will replace both of these documents.

19.4 Assessment Methodology and Significance Criteria

- 19.4.1 Waste streams and quantities arising from the Scheme will be estimated based on industry standards, activities and material requirements during the construction, operation and decommissioning phases. The processing of these quantities has been considered in the assessment to identify whether any significant effects from the generation of waste are anticipated. These activities are considered in relation to the Waste Hierarchy.
- 19.4.2 The quantities of construction waste arisings cannot be estimated at this stage, as these will be based on a number of factors that include construction methodologies and the nature of the materials used. In the PEIR a qualitative description on the waste is provided. Further information will be presented in the ES supporting the DCO application, which will be based on details such as the number of panels to be used in the Scheme.

19.5 Baseline Conditions

- 19.5.1 The appropriate waste carriers and landfill sites will be determined by the appointed contractor at the pre-construction phase. The closest current authorised landfill sites which are located in proximity to the Scheme are in Gainsborough landfill, Whisby landfill and North Hykeham landfill. There are no existing waste facilities located in Nottinghamshire within the vicinity of the Scheme.

19.6 Assessment of Potential Effects

- 19.6.1 A description of the potential waste streams and a qualitative estimate of volumes is presented in this chapter. In addition to this, the CEMP, will set out how waste will be managed on-site, and opportunities to recycle waste will be explored.

Construction

- 19.6.2 The main construction activities associated with the Scheme are as follows:
- Piling of steel frame mounting systems in rows across the Sites;
 - Mounting of the solar panels onto the frame system;
 - Digging of trenches for laying of underground electrical cables;
 - Creation of concrete foundation/bases as required for structures such as substations;
 - Creation of access tracks within the Sites;

- Installation of mesh and timber post fencing and palisade fencing; and
- Installation of CCTV camera poles.

19.6.3 The majority of the construction equipment will be delivered to site for assembly, installation and connection. The types of waste streams associated with the removal of waste material during construction are summarised below in Table 19.2.

19.6.4 A qualitative estimate on the volume of waste materials is made in Table 19.2 given the information that is known at this stage.

Table 19.2 Estimated waste associated with construction and decommissioning

Waste	Destination	Estimated Volume
Paint	Authorised recycling or landfill	Limited
Solvents	Authorised recycling or landfill	Limited
Chemical cans and containers	Authorised recycling or landfill	Limited
Cardboard	Authorised recycling or landfill	Moderate - anticipated to be from packaging
Wood	Authorised recycling or landfill	Moderate - anticipated to be from packaging
Plastic	Authorised recycling or landfill	Moderate - anticipated to be from packaging
Metals	Authorised recycling	Limited

19.6.5 All waste transported offsite will be taken to the appropriately licensed sites for the relevant materials. The operators receiving any waste materials resulting from the Scheme will be subject to their own consenting procedures which are applicable at the time of the construction stage.

19.6.6 Where any of the equipment that is removed from the Sites still have an ongoing lifespan, the equipment will be removed and reused in their current form. Where there is no ongoing lifespan, they will be taken from Sites and then disposed of at a suitable waste recycling centre.

19.6.7 Any reusable waste materials that are generated as part of the Scheme such as soil which is excavated from trenches, roads, compound areas and foundations will be re-used wherever possible.

19.6.8 There may be a requirement to remove some soils from the Scheme for treatment or disposal, if it is found to be contaminated and cannot be treated on site. Any toxic and hazardous material will also be required to be dealt with by an authorised carrier and by a suitably qualified contractor as necessary. With the use of appropriate control measures, no significant effects are anticipated at this stage.

- 19.6.9 An assessment on the capacity of waste management infrastructure in the vicinity of the Scheme will be undertaken ahead of the DCO application submission. The likely anticipated waste stream quantities will be included to determine the likely effects caused on the receptors. At this stage with the information that is available, and the comments provided by statutory stakeholders that a waste capacity issue is not anticipated, the potential for a moderate effect during construction has been identified.

Operation

- 19.6.10 During the operational phase of the Scheme the Sites will be unmanned with personnel monitoring the site remotely. Waste arising during the operation phase is expected to be substantially less than during the construction and decommissioning phase and could include the following:
- Welfare facility waste;
 - Waste metals;
 - Equipment that requires replacing;
 - Waste associated with maintenance; and
 - General waste (paper, cardboard, wood etc).
- 19.6.11 A full description of waste arising during the operational phase will be provided in the ES. During the operational phase of the Scheme, waste arisings are expected to be minimal and as they will be considered to be commercial waste this will be managed by appropriately permitted carriers and facilities in line with the appropriate environmental permits and requirements. It is assumed that the local waste infrastructure has the capacity for this. As such it is anticipated at this time, that it will have a negligible effect

Decommissioning

- 19.6.12 The decommissioning of the Scheme will include the removal of all equipment, except the underground cables connecting the Sites to the grid connection point, and the reinstatement of the land returned to the landowners. Further details can be found within the Decommissioning Statement which can be found at **Appendix 4.4**.
- 19.6.13 The main decommissioning wastes associated with the Scheme are expected to be as follows:
- Solar panels and their associated mounting structures;
 - Breaking up of concrete foundation/bases;

- Rubble from any access tracks within the Sites;
- Electrical equipment including batteries, cables and inverters;
- Welfare facility waste; and
- Waste metals and wood.

19.6.14 The types of waste streams associated with the removal of waste material during construction and decommissioning is summarised below in Table 19.3. A qualitative estimate on the volume of waste materials is made in Table 19.3 given the information that is known at this stage.

Table 19.2 Estimated waste associated with decommissioning

Waste	Destination	Estimated Volumes
Solar PV equipment	Authorised recycling or landfill	Significant
Electrical equipment	Authorised recycling or landfill	Significant
Energy Storage	Authorised recycling or landfill	Moderate
Metal	Authorised recycling or landfill	Significant
Concrete	Authorised recycling or landfill	Moderate
Rubble	Authorised recycling or landfill	Moderate

- 19.6.15 Standard good practice for waste management will be implemented during decommissioning. As noted previously, the contractor will seek to reduce waste and reuse any of the decommissioned items as far as possible to reduce the waste going to landfill.
- 19.6.16 Prior to decommissioning, opportunities to minimise waste as far as possible will be explored. Possibilities to re-use or recycle materials will be explored before resorting to landfill options. There is a new industry emerging for recycling solar panels. This will be explored, in addition to any resale of any operational panels. Further details will be provided in the ES that is submitted with the DCO application.
- 19.6.17 Any hazardous materials that need to be removed from the Scheme during decommissioning suitably qualified contractors will be appointed to decommission and remove any items as necessary. The type of hazardous materials that may form part of the Scheme include lithium-ion batteries and transformer oil.
- 19.6.18 An assessment on the capacity of waste management infrastructure in the vicinity of the Scheme will be undertaken ahead of the DCO application submission. The likely anticipated waste stream quantities will be included to determine the likely effects caused on the receptors. At the decommissioning stage the Scheme will produce additional waste than at the construction phase due to the equipment that

will need to be removed. At this stage with the information that is available, and the unknowns around the process and level of recycling processes which will be available at the time of decommissioning a major moderate effect is anticipated

19.7 In-combinations Effects

19.7.1 The in-combination effects of waste generated from the Scheme will be fully assessed in the ES and likely to consist of:

- Potential combined effects of waste on traffic;
- Potential combined effects of all four of the generating stations, substation and energy storage being constructed at the same time and the traffic generation; and
- Potential combined effects of waste on human health.

19.8 Cumulative Effects

19.8.1 A long list of cumulative developments is provided in **Appendix 2.2** of the PEIR. This list will be refined in due course through consultation with statutory consultees and will be presented and assessed in the ES. It is assumed that each of the sites considered as part of the cumulative projects will deal with their waste streams in line with the waste hierarchy.

19.8.2 Within the ES consideration will be given to the West Burton Solar Project and Gate Burton, being the closest of the potential cumulative schemes. Consideration will be given to them being constructed and decommissioned at the same time. The capacity of the recycling and landfill sites in the vicinity will be considered along with the proposed waste stream quantities and the significance of the effects on the receptors.

19.9 Mitigation Measures

19.9.1 The Scheme will seek to minimise and design out waste streams where possible. Opportunities to re-use material resources will be sought where practicable. Where re-use and prevention are not possible, waste arisings will be managed in line with the waste hierarchy and detailed through the CEMP. A draft CEMP is included within the PEIR at **Appendix 4.3**.

19.9.2 The CEMP will be secured through a DCO Requirement, prior to the commencement of construction and decommissioning phases. A Decommissioning Statement has been prepared as part of the PEIR in **Appendix 4.4** and an Outline Decommissioning Plan will be submitted with the DCO application.

19.10 Residual Effects

- 19.10.1 At this stage of the EIA, residual effects have not been fully assessed. A full assessment will be included in the ES that is submitted with the DCO application.
- 19.10.2 Based on the information currently available, it is anticipated that through the use of mitigation measures as suggested above (e.g use of suitably qualified contractors, recycling and reuse waste wherever possible) that there will not be any significant residual effects.

20 Other Matters

20.1 Introduction

20.1.1 This chapter addresses other environmental topics that do not require individual chapters on the basis that they have either been scoped out of the ES or do not warrant a full assessment. This chapter addresses:

- Human health;
- Electromagnetic fields;
- Major accidents and disasters;
- Telecommunications, utilities, and television; and
- Light pollution.

20.1.2 In accordance with the scoping opinion, the following are addressed within this chapter:

- Impacts on **human health** during construction. This will be informed by assessments in other chapters of the ES and will consider issues including construction activity / compounds, construction traffic, light pollution, noise, vibration and dust. Impacts considered for the operational stage are limited to the potential risk of fires associated with technology such as batteries as a form of energy storage, and inverters which, although rare have the potential to cause safety concerns to human health.
- Impacts of **electromagnetic fields**. These have been scoped out subject to provision of technical reporting to demonstrate relevant design standards and mitigation measures have been met.
- Impacts of **major accidents and disasters** during construction, operation and decommissioning. This will be informed by assessments in other chapters of the ES and will consider issues including flooding, fire and explosions, road accidents, hazardous substances, rail accidents, aviation accidents, damage to utilities, disturbance of unexploded ordnance, unstable ground conditions, and vegetation pests and diseases.
- Impacts on **telecommunications, utilities, and television receptors**. These have been scoped out subject to inclusion of details to demonstrate how direct impacts from the Scheme's construction, operation, and decommissioning are to be avoided.

- Impacts on ecology and human health from **light pollution** during construction. This will be informed by assessments in the landscape and visual, and ecology, chapters of the ES, and summarised in this chapter.

20.2 Human Health

- 20.2.1 Baseline conditions and potential impacts on human health receptors, as far as can be determined at the PEIR stage, are addressed in the chapters as set out in Table 20.1 below:

Table 20.1: Signposting to Human Health effects

Human Health Receptor	Addressed within PEIR / ES
Risk from flooding	Chapter 10 (Flood / Hydrology)
Risk from groundwater contamination	Chapter 11 (Ground Conditions)
Noise and vibration	Chapter 15 (Noise and Vibration)
Risk from glint and glare	Chapter 16 (Glint and Glare)
Air quality (emissions and dust)	Chapter 17 (Air Quality)
Population health and wellbeing	Chapter 18 (Socio-Economics)
Waste	Chapter 19 (Waste)
Risk from major accidents and disasters	Chapter 20.4 (Major Accidents and Disasters)

- 20.2.2 Based on the work undertaken to date the following potential effects have been identified in PEIR. The baseline data and sensitivity to change, along with the preliminary assessment of level of impact has been detailed in each of the respective PEIR chapters identified above.

Table 20.2: Sensitivity of Human Health effects

Receptor	Identified Potential Key Effects
Flooding	Mud and debris blockages Temporary increase in impermeable area Compaction of soils Increase in permanent impermeable area Increase in discharge to local watercourses. Blockage of drainage networks
Groundwater	Leaching of existing contamination into groundwater Groundwater contamination from container failure/ leak of battery fire and associate fire waters
Noise and Vibration	Noise and vibration for construction traffic Vibration from on-site construction activities on residential properties Vibration from on-site construction activities on residential properties Noise from construction activities on residential properties Noise from operational activities

Air Quality	Generation of construction dust Increase in traffic emissions from construction traffic
Glint and Glare	Residential amenity impact from glint and glare towards dwellings
Population Health and Wellbeing	Uplift in population looking to access primary healthcare facilities during construction
Waste	Removal of contaminated soil, toxic and hazardous waste materials
Major Accidents and Disasters	Human health risks from fires and explosions Human health risks from increased risk of road accidents Human health risks from increased risk of rail accidents Human health risks from increased risk of aviation accidents Human health risks from severance of utilities Human health risks from ground instability Human health risks from pests and disease spread

20.2.3 An assessment of human health effects will be undertaken for the ES ahead of the DCO submission. Preliminary assessments to date at PEIR stage can be summarised as:

- The anticipated residual effects to human health receptors from flooding are assessed to be negligible, as a result of on-site mitigation strategies as set out in **Chapter 10: Hydrology** and the draft Outline Construction Environmental Management Plan (CEMP). These measures, along with embedded design for contamination containment from on-site sources, as set out in **Chapter 11: Ground Conditions and Contamination**, will also help to ensure residual effects related to human health from groundwater contamination are also negligible.
- As noise and vibration effects have not been fully assessed at this stage, the residual effects on human health receptors cannot be determined in detail, although are anticipated not to be significant, subject to embedded mitigatory design and construction in accordance with best industry practice. These residual effects will be assessed in the ES, in accordance with the methodology, baseline conditions, and preliminary effects set out in **Chapter 15: Noise and Vibration**.
- Glint and glare is expected to have no more than a negligible residual effect on human health due to the availability of on-site screening mitigation and panel back-tracking to be implemented to minimise direct impacts on residential dwellings as addressed in **Chapter 16** of the PEIR.
- As assessed in **Chapter 18: Socio Economics, Agriculture, and Tourism and Recreation**, the expected residual effects of the Scheme on human health, specifically in regard to access to healthcare, is deemed to be minor adverse.

This is as a result of cumulative effects from multiple developments known to have a similar construction period. Some mitigation measures including Scheme coordination with nearby DCO developments can be implemented to limit these impacts where practicable.

- Residual effects to human health from waste are not anticipated to be significant post-mitigation, subject to the Scheme being constructed to appropriate control measures and best industry practice. These will be assessed in full in **Chapter 19: Waste** of the ES, and in the draft CEMP.
- Residual effects to human health from major accidents and disasters are to be assessed in full in the ES. Where known and assessed at this stage, the residual effects can be found at **Section 20.4** below.

20.3 Electromagnetic Fields

- 20.3.1 Electromagnetic fields have been scoped out of the ES assessment. The DCO application will include a technical report that demonstrates that relevant design standards have been met for all cabling.

20.4 Major Accidents and Disasters

Introduction

- 20.4.1 This section of the PEIR provides an overview of the potential significant adverse effects of the development in respect of major accidents and/or disasters, which are relevant to the project.
- 20.4.2 The EIA Regulations require consideration to be given to the risks of major accidents and disasters. The new IEMA guidance document 'Major Accidents and Disasters in EIA' has been taken into account in the assessment of major accidents or disasters.
- 20.4.3 'Accidents' are considered to be an event arising during the course of construction, operation and decommissioning (e.g. major emission, fire or explosion). 'Disasters' are naturally occurring events such as extreme weather ground related hazard events (e.g. subsidence, landslide, earthquake).
- 20.4.4 The EIA scoping report identifies a range of factors relevant to the assessment of major accidents and disasters. These will be addressed in the relevant chapters of the ES as set out in Table 20.3 below:

Table 20.3: Signposting to Major Accidents and Disasters effects

Effect	Addressed within PEIR / ES
Risk from flooding	Chapter 7 (Climate Change) Chapter 10 (Flood / Hydrology)
Fires and explosion	Chapter 11 (Ground Conditions)

	Chapter 17 (Air Quality)
Road Accidents	Chapter 14 (Transport and Access) Chapter 16 (Glint and Glare)
Hazardous substances	Chapter 14 (Transport and Access)
Rail accidents	Chapter 14
Aviation accidents	Chapter 16
Damaged or severed utilities	Chapter 20.5 Telecommunications, Utilities, and Television
Disturbance of Unexploded Ordinance	Chapter 11
Unstable ground conditions	Chapter 11
Vegetation pests and diseases	Chapter 9 (Ecology)

Consultation

- 20.4.5 The consultation responses from the EIA scoping opinion are set out in the table below. In addition, ongoing consultation is being undertaken with a range of consultees relevant to this subject including environmental health officers, highways officers, the Environment Agency and local aviation establishments, in respect of this topic.

Table 20.4: EIA Scoping Responses re. Major Accidents and Disasters

Consultee	Comment	Response Addressed in PEIR/ES
Planning Inspectorate	<p>Scoping Report paragraph 19.2.1 sets out a list of potential impacts from major accidents and disasters to/from the Proposed Development and where these will be assessed in other Chapters in the ES. Impacts include:</p> <ul style="list-style-type: none"> • Flooding; • Fires and explosion; • Road Accidents; • Hazardous substances; • Rail Accidents; • Aviation accidents; • Damage or cut-off of utilities; • Disturbance of Unexploded Ordinance; • Unstable ground conditions; and • Vegetation pests and diseases. <p>The above impacts are proposed to be assessed in other chapters such as Human Health (Scoping Report paragraph 19.3.1), however, Human Health is also proposed to be assessed in other chapters, rather than a stand-alone chapter.</p> <p>The ES should not be a 'paperchase' and should clearly signpost where these</p>	<p>Human Health assessment summary provided at dedicated section 20.2 in Other Environmental Matters chapter. Signposting to human health assessment in other PEIR and ES chapters</p>

	impacts are assessed in other relevant chapters and where any relevant mitigation measures are secured.	
Bassetlaw District Council	Agreed to the approach set out in the scoping report.	No specific response required
Health and Safety Executive	<p>According to HSE's records the proposed DCO application boundary for this Nationally Significant Infrastructure Project is within multiple consultation zones of major accident hazard sites and major accident hazard pipelines.</p> <p>HSE's Land Use Planning advice would be dependent on the location of areas where people may be present. When we are consulted by the Applicant with further information under Section 42 of the Planning Act 2008, we can provide full advice.</p> <p>Regulation 5(4) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the assessment of significant effects to include, where relevant, the expected significant effects arising from the proposed development's vulnerability to major accidents. HSE's role on NSIPs is summarised in the following Advice Note 11 Annex on the Planning Inspectorate's website - Annex G - The Health and Safety Executive. This document includes consideration of risk assessments on page 3.</p> <p>Explosives sites - HSE has no comment to make as there are no licensed explosives sites in the vicinity.</p> <p>Electrical Safety - No comment from a planning perspective.</p>	<p>Major accident hazard sites and major accident hazard pipelines have been identified and preliminary offsets as required by easements and operator safety distances have been embedded in the Scheme design.</p> <p>Preliminary assessment of the impact of severance of gas and fuel pipelines, and risks from fire and explosions have been set out in Chapter 20 of the PEIR.</p> <p>Construction work will be undertaken under the highest safety standards as set out in the Outline CEMP to avoid major accidents.</p>
Lincolnshire County Council	Include details of crime prevention and in respect of major accidents to include [sic] sabotage criminal activity is assessed as pre-planned damage to the scheme could leave it vulnerable to a major accident.	Security measures have been embedded in the Scheme design, including internal-facing perimeter CCTV, palisade fencing around energy storage

		compounds and substations. A full security strategy will be provided in the DCO application.
West Lindsey District Council	Whilst it is proposed not to have a standalone chapter, the risk of battery fire / explosion should be clearly addressed with (sic) the ES. It is noted that this is picked up in the Air Quality and Socio-Economic chapters.	Baseline conditions for air quality are assessed in Chapter 17 of the PEIR. Preliminary identified impacts from fire and explosions, and impacts therefore on human health, are explored in Chapter 20 of the PEIR. These will be addressed in full in the ES.

Initial Baseline Findings

Flooding

- 20.4.6 Baseline data with regard to flooding risk both to on-site and off-site receptors has been considered in **Chapter 10** of this PEIR. Furthermore, baseline data related to the potential impacts of increased surface water flooding as a result of increased precipitation due to climate change have been explored in **Section 7.5**. Together, these conclude the Scheme's development area and areas downstream of it are of a medium sensitivity to impacts from the Scheme.

Fire and Explosions

- 20.4.7 Impacts from fires and explosions related to the scheme will impact on air quality and human health receptors. Baseline conditions for air quality have been explored in **Section 17.5** of this document, which indicate residential receptors are of a high sensitivity to air quality changes. The potential for the disturbance of unexploded ordnance have been explored in **Appendices 11.1-11.4**. The baseline risk from unexploded ordnance is deemed to be low across all parts of the Scheme, and thus is of low sensitivity.
- 20.4.8 Impacts from on-site equipment explosions are likely to impact human health directly based on proximity to equipment or infrastructure most vulnerable to explosion (lithium-ion batteries and substations), and from projected debris. The risk zones for fires and explosions are to be fully defined in the ES to determine the number of residential dwellings, and number of publicly accessible highways or rights of way that are of high or medium sensitivity to impacts from the Scheme.

Road Accidents

- 20.4.9 Baseline data for road accidents has been identified in **Section 14.5** to determine impacts from construction and operational traffic on the road network. Additionally, the Scheme may impact on road users as a result of glint and glare, which has been explored in **Section 16.4**. Due to the potential for hazardous materials – including lithium-ion batteries, transformer oil, and substation insulation gas – to be transported to and from the Site by road during construction and decommissioning, there may be impacts as a result of contamination from hazardous materials as a result of road accidents. These impacts will be assessed in the ES.

Rail Accidents

- 20.4.10 Baseline data for rail accidents will be addressed in the ES. Construction traffic from the Scheme, which includes oversized loads may have the potential to impact the rail network where railway crossings are required to transport equipment. Abnormal load analysis is being undertaken concurrently with the production of the ES and will include a scheme of dialog with Network Rail, including during statutory consultation. The result of this dialog will drive the preferred oversized load vehicle routing. Resultant impacts on the safety of the rail network will be assessed in the ES.
- 20.4.11 Additionally, the Scheme may impact on rail operators as a result of glint and glare, which has been explored in **Section 16.4**. Due to the requirement of the cable routes to cross rail infrastructure at multiple points, there is potential for railways to be undermined during construction as a result of directional drilling. Baseline conditions with regards to ground stability in the locations proposed for directional drilling under railways will be explored in the ES.

Aviation Accidents

- 20.4.12 Baseline data for civil and military aviation accidents are to be determined ahead of the full ES submission. The Scheme could give rise to impacts on civil and military aviation throughout its operational life as a result of glint and glare, which has been explored in **Section 16.4**. Consultation with key stakeholders has identified potential glint and glare conflicts with military aviation associated with RAF Scampton. Mitigation for these conflicts has been identified.

Damage or Severance of Utilities

- 20.4.13 Early consultation with the Health and Safety Executive (HSE), through the EIA Scoping process, has identified that the Scheme falls within the consultation zones of multiple major accident hazard sites and major accident hazard pipelines. HSE have advised that further information will be provided during the statutory consultation period.

- 20.4.14 The cable routes cross or falls near to four National Grid strategic overhead electricity transmission lines, including line 4ZM near the River Trent southwest of Marton, and lines 4VE, 4VK, and ZDA at and around the connection point at Cottam Power Station National Grid Substation.
- 20.4.15 A more expanded list of baseline conditions has been explored in **Section 20.5** of PEIR with regard to other telecommunications and utilities that have been identified as at risk of impact from the Scheme.

Unstable Ground Conditions

- 20.4.16 There is potential for unstable ground conditions within the Sites as a result of current and past mineral mining and extraction activity (as identified in **Appendices 11.1-11.4**). A full planning history search of the Site including a mining history survey and geophysical stability study have been undertaken. The ground conditions survey will inform any required mitigation in developing the design of the proposals.

Vegetation, Pests, and Diseases

- 20.4.17 The new planting proposed can be susceptible to disease and pests. Changing conditions due to climate change may exacerbate this. The failure of planting presents a risk to the natural environment. The existing baseline conditions within the local area with regard to susceptibility to impacts as a result of disease and pests will be explored in **Chapter 9: Ecology** in the ES. Mitigation of impacts, through a landscape planting strategy will take account of the need to plant a diverse range of species that will be tolerant to climate change.

Identification of Potential Impacts and Methods of Mitigation

- 20.4.18 A tabulated list of the potential impacts of the Scheme, and the type of mitigation that can be applied where effects are identified, can be found in Table 20.5 below. These potential impacts will be taken forward for assessment in the ES.

Table 20.5: Summary of Mitigation Measures and Residual Effects

Mitigation/ Enhancement Measures and Residual Effects	
Description of Potential Impact	
FLOODING	
Increased risk of on-site surface water flooding due to increased precipitation due to climate change	The preliminary anticipated cumulative effect across the Scheme area is moderate long-term adverse. Water management measures embedded in the CEMP, and the use of permeable hardstanding, planting of grass and wildflower mix under the PV panel arrays should ensure residual effects are minor, and therefore not significant.
Increased risk of off-site surface water flooding due to increased precipitation due to climate change	The cumulative effect on areas downstream of the Scheme and nearby DCOs is that there could be a moderate long-term adverse impact. Water management measures embedded in the CEMP, alongside the inclusion of embedded mitigation measures in the Scheme design such as vegetated landscape and ecology buffers to watercourses will aim to increase on-site water retention, thus reducing the residual effect to being negligible.
Increased off-site flooding due to increased water discharge to local watercourses	The cumulative effect on areas downstream of the Scheme and nearby DCOs is that there could be a moderate long-term adverse impact. Water management measures embedded in the CEMP, alongside the inclusion of embedded mitigation measures in the Scheme design such as vegetated landscape and ecology buffers to watercourses will aim to increase on-site water retention, thus reducing the residual effect to being negligible.
FIRE AND EXPLOSIONS	
Emission of smoke and particulate matter from major on-site fires	The impacts from major on-site fires on air quality, human health, and ecology are anticipated to be short-term adverse, with the scale of impact to be assessed in the ES. The inclusion of an Outline Battery Fire Safety Management Plan to accompany the ES will ensure that the risks of fire, and thus the residual environmental impacts can be minimised.
Disturbance of unexploded ordnance (UXO)	As a result of potential explosions from UXO, the estimated impacts are moderate short-term adverse. This is to be mitigated through site geophysical surveys to identify potential UXO. Construction workers will be held to strict health and safety standards, and a 'discovery strategy' protocol to be embedded in the CEMP to ensure UXO can be avoided or safely cleared if practicable. The residual effects are therefore expected to be negligible, subject to full assessment in the ES.
Injury and death from explosions	The impacts from on-site explosions are anticipated to be short-term adverse, with the scale of impact to be assessed in the ES. This is to be mitigated through site geophysical surveys to

Description of Potential Impact	Mitigation/ Enhancement Measures and Residual Effects
	<p>identify potential UXO and gas, fuel, and power utilities. Construction workers will be held to strict health and safety standards, and a 'discovery strategy' protocol to be embedded in the CEMP to ensure UXO can be avoided or safely cleared if practicable and utilities can be avoided. The residual effects are therefore expected to be negligible, subject to full assessment in the ES.</p> <p>The inclusion of an Outline Battery Fire Safety Management Plan to accompany the ES will ensure that the risks of fire, and thus the residual environmental impacts can be minimised.</p>
ROAD ACCIDENTS	
Increased risk of accidents from increased HGV use of local highways	<p>The preliminary assessment of road safety anticipates there is a negligible effect on road safety from the Scheme's construction, operation, and decommissioning. The implementation of a Construction Traffic Management Plan (CTMP) will ensure that the residual cumulative effects of the construction of the Scheme and any other concurrent DCO projects and other developments remains negligible.</p>
Glint and glare to vehicle drivers on national and regional roads	<p>Preliminary assessment indicated there is potential for glint and glare to have up to a moderate long-term adverse impact on road safety. This will be clarified through full assessment in the ES. On-site screening to obstruct views of solar panels, and backtracking of tracking panels to limit long-term glare to road users should provide sufficient mitigation that the residual impacts are negligible.</p>
Contamination from hazardous material being transported to site falling into watercourses and groundwater	<p>Direct impacts to watercourses and groundwater as a result of road accidents have not been assessed at PEIR. The likely effects can be estimated as being moderate short-term adverse from the initial assessment of contamination to these receptors from on-site hazardous material storage. A CTMP will be implemented to manage and control traffic movements in coordination with other developments. This will ensure that the residual cumulative effects of the construction of the Scheme and any other concurrent DCO projects and other developments is minimised.</p>
RAIL ACCIDENTS	
Increase risk of rail/road accidents due to abnormal loads crossing railways	<p>Abnormal load analysis is being undertaken concurrently with the production of the ES and will include a scheme of dialog with Network Rail, including during statutory consultation. The result of this dialog will drive the preferred oversized load vehicle routing. Any resultant impacts on the safety of the rail network will be assessed in the ES. The implementation of the CTMP will be in consultation with Network Rail to ensure residual effects are minimised.</p>

Description of Potential Impact	Mitigation/ Enhancement Measures and Residual Effects
Glint and glare to rail operators	Preliminary assessment indicated there is potential for glint and glare to have up to a minor long-term adverse impact on rail safety. This will be clarified through full assessment in the ES. On-site screening to obstruct views of solar panels, and backtracking of tracking panels to limit long-term glare to rail operators should provide sufficient mitigation that the residual impacts are negligible.
Risk of railway undermining due to directional drilling for cable route	Where required, directional drilling under railways is to be undertaken in consultation with Network Rail and in coordination with other developments. Initial impacts are anticipated to be short-term adverse and will be assessed in full in the ES. Best industry practice will be adhered to, and the discussions with Network Rail will be fed into the CEMP ahead of DCO submission to minimise the scale and severity on any anticipated impacts.
AVIATION	
Glint and glare to civilian pilots and air traffic controllers	Preliminary assessment indicated there is potential for glint and glare to have up to a minor long-term adverse impact on civilian aviation safety. This will be clarified through full assessment in the ES. On-site screening to obstruct views of solar panels, and backtracking of tracking panels to limit long-term glare to pilots and air traffic controllers should provide sufficient mitigation that the residual impacts are negligible.
Glint and glare to military pilots and air traffic controllers	Preliminary assessment indicated there is potential for glint and glare to have up to a moderate long-term adverse impact on military aviation safety. This will be clarified through full assessment in the ES. On-site screening to obstruct views of solar panels, and backtracking of tracking panels to limit long-term glare to pilots and air traffic controllers should provide sufficient mitigation that the residual impacts are negligible.
UNSTABLE GROUND CONDITIONS	
Risk of ground collapse due to construction activities over previous mining activity areas	Initial surveys have been undertaken to establish the baseline ground stability across the Scheme sites. Whilst a full assessment on the risks of ground collapse to on-site and off-site receptors, this will be assessed in full in the ES. Any initial survey findings are to be fed into the CEMP to ensure risks to on-site safety and the Scheme's integrity are minimised.
VEGETATION PESTS AND DISEASES	
New planting susceptible to diseases and pests	Assessment of the impacts of pests and diseases on the proposed planting on the Scheme have not been assessed at PEIR and will be completed for the ES. Identified risks are to be addressed in the Landscape and Ecological Management Plan, which is to be produced to accompany the ES.

Description of Potential Impact	Mitigation/ Enhancement Measures and Residual Effects
	This will provide a mitigation strategy to ensure the environmental effects of pests and diseases on vegetation are minimised.

20.5 Telecommunications, Utilities, and Television

20.5.1 Telecommunications, utilities, and television receptors have been scoped out of the ES assessment. Effects relating to existing infrastructure are not environmental effects and there is no requirement to include an assessment of these effects under the EIA Regulations. However, given the nature of solar park developments, they have the potential to affect existing utility infrastructure above and below ground.

Baseline

20.5.2 As is to be expected due to the geographical extent of the Scheme, there are a significant number of telecoms and utility services crossing the Sites and cable routes. These provide a large number of properties including residences, business and schools within the local area, which also benefit from access to television connections.

20.5.3 The telecommunications and utilities providers identified across the Scheme Sites are listed below:

- Openreach (telecoms);
- Virgin Media (telecoms);
- West Burton Energy (gas);
- Uniper (gas);
- Cadent (gas);
- Severn Trent Water (water);
- Anglian Water (water);
- Northern Powergrid (electricity);
- Western Power Distribution (electricity); and
- DIO (abandoned fuel pipelines).

20.5.4 Initial discussions have been undertaken with many of the utilities, telecommunications and television providers listed above, to identify potential assets across the Sites. A schedule of the discussions undertaken to date is included in Table 20.6 below.

Table 20.6: Schedule of Discussion with Providers to Date

Type of Provider	Provider	Discussions to date
Telecommunications	Openreach	Assets identified on the edges of CO1 and CO2 and across CO3a. Openreach will come out and mark up assets before construction. Safe dig procedure requires that mechanical borers and/or excavators shall not be used within 1 metre of apparatus or 2 metres of any pole without the supervisory presence of a Company Representative. And if for completion of the works the Contractor intends using pile driving equipment within 10 metres of Apparatus the Contractor shall advise the Company Representative, in writing, in order that any special protective measures for the Apparatus affected may be arranged.
Telecommunications	Virgin Media	Assets in the roads next to CO3a. Ongoing communication.
Utilities – Gas	West Burton Energy	Gas pipeline running through CO2. Easement within the 25m maintenance strip currently being discussed with operator's consultants. No pipelines running through CO3a. Gas pipeline identified within cable route search area.
Utilities – Water	Severn Water	No assets identified within CO2. Or CO3.
Utilities – Water	Anglian Water	Assets at the edges in surrounding roads and verges of CO3a. 3.5 metre maximum offset requested. Anglia Water scoping response identifies a range of pipelines within the search area with offset requirements ranging between 2.25m and 6m.
Utilities – Electricity	Northern Powergrid	11kV powerlines running across CO2. 11kV and 132kV overhead cables on CO3a. Standard 6 metre set back from these assets requested.
Utilities – Electricity	Western Power Distribution	11kV overhead lines require a 6.6m easement either side, and underground cables require 2m easement either side. All apparatus is required to be accessible.
Utilities – Fuel	DIO (MoD Abandoned Pipelines)	Oil pipeline identified within the cable route search area. Confirmation received from the operator that pipeline is disused and no separation distances are required.

Television	Television Providers	Given the low height of the proposed development this is not considered to be an issue. If during consultation with telecommunication providers, it is raised as a concern it will be considered through the design process.
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Identification and Evaluation of Key Effects

- 20.5.5 The proposed Scheme consists of three solar power electricity generation stations, each with associated on-site infrastructure including inverters, cabling, energy storage and substations, connected by underground cable routes to the Point of Connection at Cottam Power Station National Grid Substation.
- 20.5.6 Underground and overhead telecommunication and utility services have been identified across all Site areas and the cable routes through a desk-based mapping exercise drawing on information provided by all relevant utility providers. Continued discussions with these providers through the design stages of this project has helped to ensure legal, safe, and practical off-set distances to utilities have been actively integrated into the Scheme design. Locations of utilities have furthermore been confirmed on Site through topographical and geophysical surveys.
- 20.5.7 The survey and agreed off-set distance information will be fed into the Construction Environment Management Plan to ensure construction work is carried out such that impacts on services are minimised. Where direct conflict is anticipated, such as is of greater likelihood along the Scheme's cable routes, the crossing of utilities will be carried out in direct collaboration with the relevant utilities provider. The Scheme is therefore anticipated not to have any significant effects on telecommunications services and utilities.
- 20.5.8 The Scheme design is of a generally low height across the development area, with the tallest elements (up to a maximum 13m in height) likely to be found at the 400kV substation. As a result, the Scheme is not anticipated to impact on the reception of radio and television in residences, business, and other users.

Mitigation Measures

- 20.5.9 The design of the Scheme layout has utilised topographical and geophysical survey data, alongside mapping provided by telecommunication and utilities providers to ensure underground and overground utilities are adequately offset from. This will ensure safe working procedures can be maintained, access can be provided for utility maintenance, and crucially, construction impacts can be mitigated against. The measures set out in the final CEMP, to be submitted in support of the DCO application, will aim to ensure impacts on telecommunication and utilities can be

minimised. In addition, protective provisions for the benefit of statutory undertakers and electronic communications network code operators will be included in the DCO.

- 20.5.10 Furthermore, where the proposed cable routes cross telecommunication and utilities, the cables will be laid so that utilities are crossed at 90° where possible and will be suitably offset where running parallel. This will ensure construction impacts will be kept to a minimum.

Residual Effects

- 20.5.11 The Scheme is to be designed so that sufficient off-set distances are provided between on-site infrastructure associated with the development and underground and overground services. As such, no residual effects to telecommunications, utilities, and television are anticipated.

20.6 Light Pollution

- 20.6.1 The EIA scoping response states:

Impacts of lighting on ecological receptors and glint and glare impacts are proposed to be included in the Landscape and Visual and Ecology assessment Chapters of the ES respectively rather than being assessed in a separate Chapter.

The Inspectorate is content with this approach. As highlighted above, the ES should include a detailed description of the lighting philosophy and the measures taken to avoid or minimise lighting impacts on human and ecological receptors.

- 20.6.2 The ES will signpost where light pollution has been addressed in the Landscape and Visual and Ecology chapters. Preliminary effects from light on ecology receptors have been identified in **Section 9.6 of Chapter 9: Ecology**. Impacts on landscape and visual receptors will be assessed in the LVIA, and in the ES at **Chapter 8: Landscape and Visual**.
- 20.6.3 The ES will clearly explain the construction, operational and decommissioning lighting strategy on Site including details of directionality, intermittent lighting, and an assessment of associated effects. It will also describe any measures necessary to avoid or mitigate lighting effects.
- 20.6.4 Impacts from construction are already due to be mitigated against through the strategy set out in the draft Outline CEMP. For light pollution, the Outline CEMP and lighting strategy will together help to ensure lighting requirements for construction are temporary in nature and in operation during normal working hours only, except in specified circumstances. The direction, duration, and orientation of lighting will be controlled, ensuring that impacts are reduced on sensitive receptors.