Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 0: Table of Contents, Glossary and Abbreviations

May 2022

0.0 Table of Contents, Glossary and Abbreviations

Glossary of Terms	
Term	**Description**
Access Tracks	The tracks within the Site constructed to provide primary access around the Site.
Additionality	The difference between what would happen anyway and the change resulting from the delivery of the project i.e. net change.
Ancillary Buildings	The office, warehouse and plant buildings which may be located within the Solar PV Site.
Applicant	Mallard Pass Solar Farm Limited
DCO Application	The proposed application for a Development Consent Order (DCO) to be submitted by the Applicant to provide the Proposed Development on the Site.
Best and Most Versatile Agricultural Land	Land in grades 1, 2 and 3a of the Agricultural Land Classification.
Central Container Inverters	Central Container Inverters are located throughout the Solar PV Site, housed in containers.
Central Transformers	Central Transformers are located within the container that houses the Central Container Inverter.
Construction Environmental Management Plan (CEMP)	A specific plan developed to ensure that appropriate environmental management practices are followed during the construction phase of a Proposed Development.
Development Consent Order (DCO)	The order required for consent of a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008.

Glossary of Terms	
Term	**Description**
Displacement	Displacement measures the extent to which benefits of a development are offset by reductions in output or employment elsewhere
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended)
Fixed South Facing (FSF) PV Arrays	PV Tables that are mounted to fixed Mounting Structures that face south.
Glint	A momentary flash of light that may be produced as a direct reflection of the sun in the solar panel.
Glare	A continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the PV Panel.
Grid Connection Cable	The buried 400kV cables connecting the Primary Onsite Substation to the National Grid Ryhall Substation at Uffington Lane. Located within the Grid Connection Route.
Grid Connection Route	The corridor for the Grid Connection Cable between the Primary Onsite Substation and the National Grid Ryhall Substation and the new connection at National Grid Ryhall Substation.
Inverters	Inverters convert the direct current (DC) electricity collected by the PV Modules into alternating current (AC), which allows the electricity generated to be exported to the National Grid.
Leakage	Leakage effects are the benefits to those living outside the socio-economic study area.

Glossary of Terms	
Term	**Description**
Low Voltage Distribution Cables/Cabling	33 kV cables, which transmit electricity from the Solar Station to the Primary Onsite Substation, located within the Site.
National Grid Ryhall Substation	The location for the National Grid Substation known as Ryhall substation at Uffington Lane.
Mitigation and Enhancement Areas	The area within the Site that is being considered for mitigation and enhancement.
Mounting Structure	The structure that is fixed to the ground and onto which the PV Modules are attached.
Potential Highway Works Site	The area within the Site that is being considered for potential improvement works to facilitate access to the Solar PV Site.
Primary Onsite Substation	The Primary Onsite Substation comprising electrical infrastructure such as the transformers, switchgear and metering equipment required to facilitate the export of electricity from the Proposed Development to the National Grid.
Proposed Development	A Nationally Significant Infrastructure Project (NSIP) for the installation of solar photovoltaic (PV) Modules and associated infrastructure which would allow for the generation and export of electricity at land at Mallard Pass, Essendine.
PV Array	A PV Array is a distinct grouping of PV Tables. The PV Arrays are arranged within the Solar PV Site.
PV Module	A panel comprising a grouping of photovoltaic cells connected to each other and set within a single physical frame. The PV Panel is attached

Glossary of Terms	
Term	**Description**
	to a Mounting Structure. Also referred to as a PV Module.
PV Tables	PV Modules mounted onto the Mounting Structure, forming tables, which are then set out in rows.
PV String	A row of PV Modules mounted onto the Mounted Structure that are connected to one another to form a PV string which is either connected to a string inverter or a central inverter
Single Axis Tracker (SAT) Arrays	PV Modules that are mounted to Mounting Structures that allow the PV Table to rotate and track the movement of the sun.
Site	The land required temporarily and/or permanently for the construction, operation and maintenance of the Proposed Development at Mallard Pass, Essendine and as shown on Figure 1.1.
Solar Farm	Electricity generating station comprising of solar PV modules connected to the National Grid via a substation.
Solar PV Site	The area within the Site that is being considered for potential PV Arrays, Solar Stations and the Primary Onsite Substation.
Solar Station	A Solar Station comprises a combination of an inverter, a transformer and switchgear (subject to which inverter technology is chosen). The individual components will be grouped together and distributed throughout the PV Arrays.

Glossary of Terms	
Term	**Description**
String Inverters	String Inverters are located throughout the Solar PV Site, mounted on the Mounting Structures underneath the PV Modules.
String Transformers	String Transformers are located within the container are distributed throughout the Solar PV Site.
Switch Gears	Switchgears are the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment
Transformers	Transformers control the voltage of the electricity generated across the Site before it reaches the primary onsite substation.

Acronyms	
AADT	Annual Average Daily Total
AAR	Average Annual Rainfall
AC	Alternating Current
AGL	Above Ground Level
AIL	Abnormal Intervisible Loads
ALC	Agricultural Land Classification
AMS	Arboricultural Method Statement
AIA	Arboricultural Impact Assessment
AOD	Above Ordnance Datum
AQMA	Air Quality Management Area
AQO	Air Quality Objective
ATC	Automatic Traffic Counts
BESS	Battery Energy Storage Scheme
BEIS	Department for Business, Energy and Industrial Strategy
BGL	Below Ground Level
BGS	British Geology Survey
BMV	Best and Most Versatile
BS	British Standard
BSI	British Standards Institute
CCIA	Climate Change Impact Assessment
CCTV	Closed Circuit Television
CDM	Construction Design and Management
CEMP	Construction Environmental Management Plan

Acronyms	
CIRIA	Construction Industry Research and Information Association
CO_2	Carbon Dioxide
COMAH	Control of Major Accidents Hazard
CRTN	Calculation of Road Traffic Noise
dB	Decibels
DC	Direct Current
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DEMP	Decommissioning Environmental Management Plan
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
DTMP	Decommissioning Traffic Management Plan
DUKES	Digest of UK Energy Statistics
EC	European Commission
ECOW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic Frequency
EPUK	Environmental Protection UK
ES	Environmental Statement
FRA	Flood Risk Assessment

Acronyms	
FTE	Full Time Equivalent
GEART	Guidelines for the Environmental Assessment of Road Traffic
GHG	Greenhouse Gas
GI	Green Infrastructure
GIS	Geographic Information System
GPP	Guidance for Pollution Prevention
GVA	Gross Value Added
GW	Giga Watt
GWD	Groundwater Directive
HCA	Homes and Communities Agency
HDD	Horizontal Directional Drilling
HDV	Heavy Duty Vehicle (>3.5 tonnes)
HGV	Heavy Goods Vehicle
IDB	Internal Drainage Board
IEA	Institute of Environmental Assessment
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
JNCC	Joint Nature Conservation Committee
LAQM	Local Air Quality Management
LCC	Lincolnshire County Council

Acronyms	
LDV	Light Duty Vehicles (<3.5 tonnes)
LEMP	Landscape and Ecology Management Plan
LGV	Light Goods Vehicle
LLFA	Lead Local Flood Authority
LRN	Local Road Network
LWS	Local Wildlife Site
MAFF	Ministry of Agriculture, Fisheries and Food
MW	Mega Watt
NIC	National Infrastructure Commission
NIEA	Northern Ireland Environment Agency
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPS	National Policy Statement
NRFA	National River Flow Archive
NRMM	Non-Road Mobile Machinery
NSIP	Nationally Significant Infrastructure Project
NVQ	National Vocational Qualification
oCEMP	Outline Construction Environmental Management Plan
oCTMP	Outline Construction Traffic Management Plan
oLEMP	Outline Landscape Ecology Management Plan

Acronyms	
oDEMP	Outline Demolition Traffic Management Plan
OS	Ordnance Survey
oTP	Outline Travel Plan
PEIR	Preliminary Environmental Information Report
PID	Passive Infra-red Detector
PINS	Planning Inspectorate
PPG	Pollution Prevention Guidelines
PPP	Pollution Protection Plan
PPV	Peak Particle Velocity
PRoW	Public Rights of Way
PWS	Private Water Supply
RCC	Rutland County Council
SEPA	Scottish Environment Protection Agency
SKDC	South Kesteven District Council
SoP	Standard of Protection
SPA	Special Protection Area
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
TAG	Transport Analysis Guidance
TP	Travel Plan
TPP	Tree Protection Plan

Acronyms	
UKCP	UK Climate Projections
WFD	Water Framework Directive

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Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 1: Introduction

May 2022

1.0 Introduction

1.1. What is the Mallard Pass Solar Farm Project?

1.1.1. Mallard Pass Solar Farm is a proposed Solar Farm which would allow for the generation and export of electricity exceeding 50 megawatts (MW) at land providing the Proposed Development on the Site.

1.1.2. The Proposed Development and associated works required to facilitate the construction and operation of the Proposed Development is the subject of the DCO Application. The location of the Site is shown on Figure 1.1 and is described in further detail within Chapter 3 of this Preliminary Environmental Information Report (PEIR).

1.1.3. The principal components of the Proposed Development comprise the following:

- PV Arrays;
- Mounting structures;
- Inverters;
- Transformers;
- Switchgears;
- Primary Onsite Substation and Ancillary Buildings;
- Low Voltage Distribution Cabling;
- Grid Connection Cables;
- Fencing, security and ancillary infrastructure;
- Access Tracks; and
- Green infrastructure (GI).

1.1.4. The Proposed Development is described in further detail within Chapter 5 (Project Description) of this PEIR.

1.1.5. The Proposed Development is classed as a NSIP under the Planning Act 2008, as the capacity exceeds 50MW and, as such, requires a DCO to proceed. The Applicant intends to submit the DCO Application to construct, operate and maintain the Proposed Development to the Planning Inspectorate (PINS) in late 2022. Prior to submission of the DCO Application, the Applicant will continue to carry out consultation, Environmental Impact Assessment (EIA) and refinement of the design of the Proposed Development.

1.2. The Applicant

1.2.1. The Applicant is a subsidiary of Windel Energy Ltd.

1.2.2. Windel Energy Ltd, founded in 2018, is a privately held company that specialises in the development and asset management of renewable energy projects and low carbon, including solar, Battery Energy Storage Systems, onshore wind and green hydrogen technologies with projects ranging from 10MW to 320MW output across England and Wales. Windel Energy work closely with landowners, giving them the opportunity to diversify their income stream by leasing their land for solar development.

1.2.3. Canadian Solar Inc is the development partner of Windel Energy. It was founded in 2001 in Canada and is one of the world's largest solar power companies. It is a leading manufacturer of PV Modules and provider of solar energy solutions and has a geographically diversified pipeline of utility-scale solar power projects in various stages of development. Over the past 19 years, Canadian Solar Inc has successfully delivered over 49 GW of premium-quality, PV Modules to customers in over 150 countries.

1.3. Preliminary Environmental Information Report

1.3.1. The PEIR presents the current findings of the environmental and social-economic studies for the Proposed Development, to inform the statutory consultation process for the proposed DCO Application.

1.3.2. The Proposed Development is considered to be 'EIA development' as defined by the EIA Regulations, requiring an Environmental Impact Assessment ('EIA') to be submitted in support of the DCO Application. Under Regulation 12 of the EIA Regulations, and in accordance with Section 47 of the Planning Act 2008, the Applicant is required to set out in its Statement of Community Consultation how it intends to publicise and consult on preliminary environmental information relating to the Proposed Development. Regulation 12(2) 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). Advice Note 7 from PINS (Section 8) 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 has been produced. This PEIR therefore presents the preliminary findings of the EIA undertaken for the Proposed Development for the purposes of statutory consultation in accordance with the Planning Act 2008.

1.4. Structure and Content of the PEIR

1.4.1. The following paragraphs provide a brief description of how the PEIR is structured to aid navigation of the document.

Volume 1:

1.4.2. Volume 1 of the PEIR sets out the background, the EIA process, a description of the Proposed Development along with the consideration of the environment effects associated with different environmental topics. Volume 1 is broken down into chapters as set out below:

1) Chapter 1: Introduction
2) Chapter 2: Overview of the EIA Process;
3) Chapter 3: Description of the Site and Natural Evolution of the Baseline;
4) Chapter 4: Alternatives and Design Development;
5) Chapter 5: Project Description;
6) Chapter 6: Landscape and Visual;
7) Chapter 7: Ecology and Biodiversity;
8) Chapter 8: Cultural heritage and Archaeology;
9) Chapter 9: Access and Highways;
10) Chapter 10: Noise and Vibration;
11) Chapter 11: Air Quality;
12) Chapter 12: Water Resources and Ground Conditions;
13) Chapter 13: Agricultural Land Use;
14) Chapter 14: Glint and Glare;
15) Chapter 15: Climate Change;
16) Chapter 16: Socio-economics;
17) Chapter 17: Arboriculture
18) Chapter 18: Major Accidents and/or Disasters;
19) Chapter 19: Cumulative Effects;
20) Chapter 20: Summary of Mitigation and Conclusions; and
21) Chapter 21: Next Steps

1.4.3. To assist with the navigation of this PEIR and ensure that the PEIR includes all the information as required by Schedule 14(2) of the EIA Regulations, the environmental topic chapters (Chapters 6-18) have been structured as follows:

1) Section 1: Introduction
2) Section 2: What might be affected by the Proposed Development?
3) Section 3: How have we assessed the effects relating to this topic?
4) Section 4: What are the potential environmental effects?
5) Section 5: How would we mitigate the environmental effects?
6) Section 6: What environmental effects would remain?
7) Section 7: In-combination Effects
8) Section 8: Conclusion and Next Steps

Volume 2

1.4.4. Volume 2 of the PEIR includes the supporting figures for Volume 1 to aid the readers' understanding. The supporting figures are provided in a separate volume so that they can be shown at a suitable scale and more easily interpreted.

Volume 3

1.4.5. Volume 3 of the PEIR includes a set of appendices which comprise of background data, survey data, technical reports/modelling which support the assessments within the PEIR.

Non-technical Summary

1.4.6. A Non-technical Summary (NTS) is presented as a separate document to provide a concise description of the Proposed Development, the considered alternatives, baseline, assessment methodology, potential environmental effects and mitigation measures. The NTS is designed to provide information in an accessible format using non-technical language which can be understood by a wide audience and to assist stakeholders with their understanding of Proposed Development.

1.5. Legislative and Planning Policy Context

1.5.1. The following sections provide an overview of the legislative and planning policy context for the Proposed Development.

Net Zero: Opportunities for the Power Sector

1.5.2. In June 2019 the Government raised the UK's ambition on tackling climate change by legislating for a net-zero greenhouse gas emissions target for the whole economy by 2050. Decarbonising the power sector is integral to achieving this goal and requires major investment in proven technologies, such as solar, which are supported by planning policy at local and national level.

1.5.3. The NIC, official advisor to the Government on infrastructure, has subsequently produced a report, ‘Net Zero: Opportunities for the Power Sector, in March 2020, which sets out the infrastructure required in order to meet the 2050 target, including the amount of new renewable energy development that would need to be deployed. Importantly, the NIC recommends the generation mix is up to around 90% renewables. The report recommends that across all scenarios significant solar, onshore wind, and offshore wind, with between 129-237 GW of renewable capacity is in operation by 2050, including:

- 56-121 GW of solar;
- 18 -27 GW of onshore wind; and
- 54 - 86 GW of offshore wind.

1.5.4. The above requires an increase in installed capacity, including up to nine times more solar than is currently installed in the UK, which is presently around 13GW according to the Department for Business, Energy & Industrial Strategy (BEIS).

1.5.5. Although the above figures are high-level, they demonstrate the amount of new infrastructure that is required. The scale of this need is such that it must be shared throughout the UK and in recognition that climate change is a national and global issue.

Net Zero Strategy: Build Back Greener

1.5.6. The Net Zero Strategy, published by Government on 19th October 2021, builds on Government's commitments made in the Energy White Paper (2020) and sets out the long-term strategy, policy and proposals to keep the UK on track for future carbon budgets and sets the vision for a decarbonised economy by 2050. Key policies in the Strategy related to UK power generation include:

- *"By 2035 the UK will be powered entirely by clean electricity, subject to security of supply; […]*
- *40 GW of offshore wind by 2030, with more onshore, solar and other renewables – with a new approach to onshore and offshore electricity networks to incorporate new low carbon generation and demand in the most efficient manner that takes account of the needs of local communities […]*
- *Deployment of new flexibility measures including storage to help smooth out suture price spikes."*

1.6. Planning Act 2008

1.6.1. The Proposed Development constitutes NSIP development, in accordance with the Planning Act 2008, as it comprises:

- The construction or extension of a generating station (Part 3, Section 14(1)(a)); and
- Its capacity is more than 50MW (Part 3, Section 15(2)(c)).

1.6.2. Therefore, an application for a DCO pursuant to the Planning Act 2008 is required and will be made to PINS as the examining authority on behalf of the Secretary of State.

1.7. National Policy Statements

1.7.1. In accordance with Section 104(2) of the Planning Act 2008, the Secretary of State is required to have regard to any relevant national policy statement (NPS), amongst other matters, when deciding whether or not to grant a DCO. However, the Proposed Development is not specifically referenced by an NPS, therefore, the DCO will be determined in accordance with Section 105 of the Planning Act 2008.

1.7.2. Section 105(2) of the Planning Act 2008 provides the basis for deciding the DCO Application and the Secretary of State must have regard to the provisions set out in this section of the Planning Act 2008. This includes any matters which the Secretary of State thinks are both important and relevant to its decision. Therefore, the following NPSs are relevant to the Proposed Development:

- Overarching NPS for Energy (EN-1);
- NPS on Renewable Energy Infrastructure (EN-3); and

1.7.3. NPS for Electricity Networks Infrastructure (EN-5).If granted, the DCO has the effect of provided consent for development and additional other consents and authorisation, where specified, removing the need for some consents (such as planning permission). Section 115 of the Planning Act 2008 also states that a DCO can include consent for ‘associated development’, which is development that is not an NSIP in its own right but is associated with the Proposed Development.

Overarching National Policy Statement for Energy (EN-1)

1.7.4. The Overarching NPS for Energy (EN-1), adopted by the Department of Energy and Climate Change (DECC) in July 2011, sets out the national policy for delivering major energy infrastructure in England and Wales. EN-1 has effect in combination with the relevant technology specific NPS, National Policy for Renewable Energy Infrastructure (EN-3), and together they provide the primary basis for decisions made by the examining authority.

1.7.5. Part 3 of EN-1 identifies the need that exists for nationally significant energy infrastructure. With regards to decision making, paragraph 3.1.1. of EN-1 states how "*the UK needs all the types of energy infrastructure covered in this NPS in order to achieve energy security at the same time as dramatically reducing greenhouse gas emissions*".

1.7.6. Paragraph 3.1.2 states: "It is for industry to propose new energy infrastructure projects within the strategic framework set by Government. The Government does not consider it appropriate for planning policy to set targets for or limits on different technologies".

1.7.7. Paragraph 3.3.11 notes that renewable energy sources, such as solar, are intermittent and, as a result, back-up sources are required at times when the availability of intermittent renewable sources is low. Paragraph 3.3.12 goes on to identify how electrical storage technologies can be used to compensate for intermittence.

1.7.8. Paragraph 4.1.3 of EN-1 states that in considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the examining authority should take into account:

- Its potential benefits including its contribution to meeting the need for energy infrastructure, job creation and any long-term or wider benefits; and
- Its potential adverse impacts, including any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.

1.7.9. Section 4.2 of the EN-1 is related to the requirement for assessment of likely significant environmental effects and reporting within an Environmental Statement for projects that are subject to the European Environmental Impact Assessment Directive (85/337/EEC).

1.7.10. Paragraph 4.2.2 of EN-1 states that:

"To consider the potential effects, including benefits, of a proposal for a project, the IPC [now PINS] will find it helpful if the applicant sets out information on the likely significant social and economic effects of the development, and shows how any likely significant negative effects would be avoided or mitigated. This information could include matters such as employment, equality, community cohesion and well-being."

1.7.11. Paragraph 4.3.2 continues:

"For the purposes of this NPS and the technology-specific NPSs the ES should cover the environmental, social and economic effects arising from pre-construction, construction, operation and decommissioning of the project."

1.7.12. Paragraph 4.2.4 states that when considering a proposal, the examining authority should:

"Satisfy itself that likely significant effects including any significant residual effects taking account of any proposed mitigation measures or any adverse effects of those measures, have been adequately assessed. In doing so the IPC should also examine whether the assessment distinguishes between the project stages and identifies any mitigation measures at those stages. The IPC [now PINS] should request further information where necessary to ensure compliance with the EIA Directive."

1.7.13. Where relevant, the EIA process will take into account the requirements of the EN-1. Table 1.1 presents details of where information requirements of EN-1 are addressed within this PEIR.

Source	Topic	Chapter of this PEIR
EN-1 (Part 4 Assessment Principles)	Environmental Statements	An ES will be submitted in support of the DCO Application
	Habitats and Species Regulations	Chapter 7
	Alternatives	Chapter 4
EN1 (Part 5 Generic Impacts)	Air quality and emissions	Chapter 11
	Biodiversity and geological conservation	Chapter 7
	Dust, odour, artificial light, smoke, steam and insect infestation	Chapter 11
	Flood risk	Chapter 12
	Historic environment	Chapter 8
	Landscape and visual	Chapter 6
	Land use including open space, green infrastructure and Green Belt	Chapter 13
	Noise and vibration	Chapter 10
	Socio-economic	Chapter 16
	Traffic and transport	Chapter 9
	Waste management	Chapter 5
	Water quality and resources	Chapter 12

National Policy Statement on Renewable Energy Infrastructure (EN-3)

1.7.14. The NPS on Renewable Energy Infrastructure (EN-3), published by the DECC in July 2011, taken together with EN-1, provides the primary basis for decisions by the examining authority on applications it receives for nationally significant renewable energy infrastructure.

1.7.15. The importance of generation of electricity from renewable sources is stated at Paragraph 1.1.1 of EN-3:

"Electricity generation from renewable sources of energy is an important element in the Government's transition to a low-carbon economy. There are ambitious renewable energy targets in place and a significant increase in generation from large-scale renewable energy infrastructure is necessary".

1.7.16. EN-3, whilst providing an assessment and technology-specific information on certain renewable energy technologies, does not include Solar Farm development, and only covers projects for biomass/waste and offshore and onshore wind. This is because at the time of publishing EN-3, utility scale solar development was not feasible.

1.7.17. National Policy Statement for Electricity Networks Infrastructure (EN-5)The NPS for Electricity Networks Infrastructure (EN-5) was published by the DECC in July 2011 and forms part of the suite of energy NPSs and is to be read in conjunction with the Overarching NPS for Energy (EN-1).

1.7.18. NPS EN-5 is relevant to the Proposed Development as the policy recognises electricity networks as "transmission systems (the long distance transfer of electricity through 400kV and 275kV lines), and distribution systems (lower voltage lines from 132kV to 230V from transmission substations to the end-user) which can either be carried on towers/poles or undergrounded" and "*associated infrastructure, e.g. substations (the essential link between generation, transmission, and the distribution systems that also allows circuits to be switched or voltage transformed to a useable level for the consumer) and converter stations to convert DC power to AC power and vice versa*."

1.7.19. NPS EN-5 sets out further technology-specific considerations, in addition to those impacts covered in NPS EN-1, for: Biodiversity and Geological Conservation; Landscape and Visual; and Noise and Vibration. Furthermore, NPS EN-5 sets out technology-specific considerations for the impact of electromagnetic frequencies (EMFs).

1.8. Draft National Policy Statements

1.8.1. The light of the commitment to reduce reliance on fossil fuels in favour of cleaner energy sources set out in the Energy White Paper (2020), Government determined that NPS documents EN-1 to EN-5 required updating.

1.8.2. In September 2021, (draft) NPS's for Energy were laid before Parliament. The House of Commons Report, with recommendations to Government, was published in February 2022. The report welcomed the intention to update the NPS for energy in line with Government policy commitments. The report recommended that the revised NPS needed to place greater emphasis on the impact of climate change and the speed at which new infrastructure will need to be built to meet the Government's net zero target. A summary of the draft NPS for energy as relevant to Mallard Pass Solar Farm is set out below.

Draft Overarching National Policy Statement for Energy (EN-1), 2021

1.8.3. In contrast to EN-1, the Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy and recognises that there is an urgent need for new electricity generating capacity to meet UK objectives.

1.8.4. Paragraph 3.2.1 of the Draft NPS EN-1 states that: "wind and solar are the lowest cost ways of generating electricity, helping reduce costs and providing a clean and secure source of electricity supply (as they are not reliant on fuel for generation). Our analysis shows that a secure, reliable, affordable, net zero consistent system in 2050 is likely to be composed predominantly of wind and solar." The Draft NPS EN-1 highlights that Government requires a sustained growth in the capacity of solar in the next decade and recognises that solar development needs to be coupled with technologies which optimise energy generation even when conditions for solar generation are not optimal.

1.8.5. Paragraph 3.3.24 of the Draft NPS EN-1 recognises that that energy storage is key in achieving net zero and providing flexibility to the energy system, so that high volumes of low carbon power can be integrated and to reduce the costs of the electricity system and increase reliability by storing surplus electricity in times of low demand to provide electricity when demand is higher.

Draft National Policy Statement for Renewable Energy Infrastructure (EN-3), 2021

1.8.6. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are ones of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. Paragraph 2.47.1 states that the government has committed to sustained growth in solar capacity to ensure that the UK is on the pathway to meet net zero emissions by 2050, and as such, solar is a key part of Government's strategy for low-cost decarbonisation of the energy sector.

1.8.7. Section 2.48 of the Draft NPS EN-3 sets out key influences that developers should consider when selecting sites for solar development, including the following factors:

- Irradiance and site topography;
- Proximity of a site to dwellings;

- Capacity of a site;
- Grid connection;
- Agricultural Land Classification and land type; and
- Accessibility.

1.8.8. Sections 2.50 – 2.54 of the Draft NPS EN-3 provides topic-specific requirements of how applicants should consider impacts within technical assessments, development of proposed mitigation measures and decision-making for solar development, for the following topics:

- Biodiversity and nature conservation;
- Landscape, visual and residential amenity;
- Glint and Glare;
- Cultural heritage; and
- Construction including traffic and transport noise and vibration.

Draft National Policy Statement for Electricity Networks Infrastructure (EN-5)

1.8.9. The Draft NPS EN-5 was published in 2021 and recognises that new electricity networks required for electricity generation, storage and interconnection infrastructure are vital to achieving the nation's transition to net zero. Draft NPS EN-5 includes a new section on 'Environmental and Biodiversity Net Gain' at Section 2.8, which states that when planning and evaluating a projects contribution to environmental and biodiversity net gain, it will be important, for both the Applicant and examining Authority, to recognise that *"the linear nature of electricity networks infrastructure allows excellent opportunities to: i) reconnect important habitats via green corridors, biodiversity stepping zones, and re-establishment of appropriate hedgerows; and/or ii) connect people to the environment, for instance via footpaths and cycleways constructed in tandem with biodiversity enhancements."*

1.9. National Planning Policy Framework

1.9.1. While not determinative under the Planning Act 2008, PINS as the Examining Authority can consider other important and relevant matters, including national and local planning policy. For example, the revised National Planning Policy Framework (NPPF). The NPPF also provides relevant context for individual assessment topics.

1.9.2. The NPPF was published by Ministry of housing, Communities and Local Government (formerly the Department for Communities and Local Government) in March 2012 and was updated in July 2021. The NPPF sets out Government's planning policies and how these should be applied for England.

1.9.3. The NPPF does not contain specific policies for NSIPs; however, Chapter 2 of the NPPF 'Achieving sustainable development' sets out that the planning system should contribute to the achievement of sustainable development, considering economic, social and environmental roles.

1.9.4. Paragraph 152 of the NPPF states:

"The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure."

1.9.5. Paragraph 158 continues to state that, whilst the local planning authority is not the determining authority for the application for development consent, when determining planning applications for renewable and low carbon development, local planning authorities should:

"a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects

provide a valuable contribution to cutting greenhouse gas emissions; and

b) approve the application if its impacts are (or can be made) acceptable …".

1.10. Local Planning Policy

1.10.1. Local development plans do not carry the same weight under the Planning Act 2008 in respect of decision making concerning NSIPs, as they do with determining planning applications made pursuant to the Town Country Planning Act 1990. The NPSs are the primary consideration for NSIP applications. Nevertheless, a local development plan is still a matter which can be considered important when determining an application for an NSIP. However, in the event of any conflict, the NPS prevails.

1.10.2. The Proposed Development lies within two administrative boundaries Rutland Country Council (RCC) and South Kesteven District Council (SKDC), as shown on Figure 1.2. Therefore, the relevant local planning policies of the adopted local development plans for each of the 'host' planning authorities will be considered as part of the assessment. The local planning relevant to the Proposed Development consist of the following:

Lincolnshire County Council

- Lincolnshire County Council Minerals and Waste Plan (adopted 2016)
- Lincolnshire County Council Green Masterplan 2020 – 2025 (adopted 2020)
- Joint Lincolnshire Flood Risk and Water Management Strategy 2019-2050
- 4th Lincolnshire Local Transport Plan 2013/14-2022/23 (adopted April 2013)

- Lincolnshire County Council Highway and Flood Authority, Development Road and Sustainable Drainage Specification and Construction March 2021

Rutland County Council

- Rutland Core Strategy 2011 – 2026 (adopted 2011)
- Rutland Site Allocation DPD 2011 – 2026 (adopted 2014)
- Leicestershire, Leicester, and Rutland Biodiversity Action Plan 2016 – 2026 (Adopted 2016)
- Minerals Core Strategy and Development Control Policies October 2010 (Adopted October 2010)

South Kesteven District Council

- South Kesteven Local Plan 2011 – 2036 (adopted 2020)

1.10.3. Rutland County Council Local Plan 2018 – 2036, had Regulation 19 consultation period on the RCC Local Plan (2018 – 2036) ran from 27th August to 6th November 2020. Following a special full council meeting, the Local Plan (2018 -2036) was withdrawn on 1st September 2021 and is anticipated that the new Local plan will be adopted in 2025

1.11. Consideration of Planning Policy in EIA

1.11.1. Within the ES, each of the environmental chapters will reference the national and local planning policies that are relevant to their topic of assessment. The PEIR does not consider the planning balance of the Proposed Development in line with planning policy. This will be undertaken and set out in the Planning Statement which will be submitted as a standalone document as part of the DCO Application.

Purpose of the PEIR

1.11.2. PINS has published guidance on the role of Preliminary Environmental Information (PEI) within 'Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements.'

1.11.3. Within this guidance, it makes clear that there is no prescribed format as to how a PEIR should be presented and it is not expected to replicate or be a draft of the Environmental Statement (ES). However, applicants may consider this approach if it is appropriate. The advice note goes onto state that:

"A good PEI document is one that enables consultees (both specialist and non-specialist) to understand the likely environmental effects of the Proposed Development and helps to inform their consultation responses on the Proposed Development during the pre-application stage."

1.11.4. The guidance confirms that PEIRs should include a clear explanation of information that is 'preliminary'. The progress of assessments for each environmental topic are at differing stages of completion, as will be set out in each environmental topic chapters. However, all topic chapters have considered the likely significant environmental effects of the Proposed Development in accordance with current industry good practice and relevant guidance.

1.11.5. The Applicant is seeking feedback from consultees on the information contained within this PEIR to inform both the design of the Proposed Development and the EIA. This is to allow the opportunity within the process, leading up to the submission of the DCO Application for both the EIA and project design to be refined.

1.11.6. Following statutory consultation on this PEIR and consideration of the feedback received, the design of the Proposed Development will be further refined and this PEIR will be developed into an ES, which will be submitted as part of the suite of DCO Application materials.

1.12. Consultation

1.12.1. Consultation is integral to the preparation of DCO applications and to the EIA process. The views of consultation bodies and the local community serve to focus the environmental studies and to identify specific issues that require further investigation, as well as to inform aspects of the design of the Proposed Development. Consultation is an on-going process and the publication of this PEIR forms an important part of that process.

1.12.2. The Planning Act 2008 requires applicants for DCOs to carry out formal (statutory) pre-application consultation on their proposals. There are several requirements as to how this consultation must be undertaken that are set out in the Planning Act 2008 and related regulations:

- Section 42 requires the applicant to consult with 'prescribed persons', which includes certain consultation bodies such as the Environment Agency and Natural England, relevant statutory undertakers, relevant local authorities, those with an interest in the land, as well as those who may be affected by the Proposed Development;
- Section 47 requires the applicant to consult with the local community on the development. Prior to this, the applicant must agree a Statement of Community Consultation (SoCC) with the relevant local authorities. The SoCC must set out the proposed community consultation and, once agreed with the relevant local authorities, a SoCC Notice must be published in local newspapers circulating within the vicinity of the land in question. The consultation must then be carried out in accordance with the final SoCC;

- Section 48 places a duty on the applicant to publicise the proposed application in the 'prescribed manner' in a national newspaper; The London Gazette, local newspapers circulating within the vicinity of the land and, where relevant, certain marine publications; and
- Section 49 places a duty on the applicant to take account of any relevant responses received to the consultation and publicity that is required by Sections 42, 47 and 48.

1.12.3. The Applicant has adopted a two-stage approach to pre-application consultation on the Proposed Development. An informal, non-statutory consultation was carried out during November 2021, and statutory consultation (Stage 2) will commence at the same time as the publication of this PEIR.

1.12.4. The issues that have been raised through consultation and how these have been considered and addressed within the design evolution of the Proposed Development and the EIA will be set out in the ES. The pre-application consultation undertaken by the Applicant will also be documented within the Consultation Report that will form part of the DCO Application.

1.12.5. The PEIR has been prepared to accompany formal consultation under Sections 42 and 47 of the Planning Act 2008.

Stage 2 Consultation

1.12.6. The Applicant is undertaking a second stage of consultation on the proposals for the Project between Thursday 26 May 2022 and Thursday 4 August 2022.

1.12.7. During this time, a copy of the PEIR (this document), together with a Non-Technical Summary, the Statement of Community Consultation (SoCC), and other consultation documents explaining our consultation process and details of the Proposed Development, may be inspected free of charge at the following locations*:

- Essendine Village Hall, Bourne Rd, Essendine, Stamford PE9 4LQ
- Stamford Arts Centre, 27 St Mary's St, Stamford PE9 2DL
- Ryhall Village Hall, Church St, Ryhall, Stamford PE9 4HR

* Please check the opening times with the venue.

1.12.8. All consultation materials and further details in relation to the Project can also be found on the Project website (www.MallardPassSolar.co.uk/documents) and will be kept online until at least 4 August 2022. These will be free to read, download and print.

1.12.9. Additional hard copies of the PEIR can be provided at a cost of £350 per copy. All other consultation documents can be made available in hard copy, large print, audio or braille format, free of charge upon request.

1.12.10. A full set of consultation documents can also be provided free of charge on USB upon request to the Applicant.

1.12.11. To can get in touch with members of the Project Team to request materials using any of the communications lines listed below:

Email: info@MallardPassSolar.co.uk

Freephone information line: 0808 196 8717

Freepost (no stamp required): FREEPOST Mallard Pass Solar Farm

1.13. IEMA Quality Mark

1.13.1. LDA Design is an Institute of Environmental Management and Assessment (IEMA) Registered Impact Assessor and holds the IEMA EIA Quality Mark as recognition of the quality of the way we coordinate

EIAs and the quality of our ESs. The ES will include a statement of competence, outlining the relevant experience, expertise and/or qualifications of the experts who prepared the ES.

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Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 2: Overview of the EIA Process

May 2022

2.0 Overview of the EIA Process

2.1. Purpose of EIA

2.1.1. The purpose of EIA is to ensure that the likely significant environmental effects of the Proposed Development are understood and properly taken into account when decision-makers consider an application for development consent.

2.1.2. Through the EIA process, likely significant environmental effects (adverse and beneficial) arising from the construction, operation and decommissioning phases of the Proposed Development will be identified, assessed and measures explored and proposed to mitigate or reduce any significant adverse effects on the environment caused by the Proposed Development.

2.1.3. The process is designed to produce an environmentally sensitive development by considering and assessing the effects of the Proposed Development against existing environmental baseline conditions. At the outset of the project, the EIA team undertook a review of the Site in order to identify potential environmental sensitive receptors. This initial study was used to inform the Stage 1 Concept Masterplan of the Proposed Development which was presented within the non-statutory consultation exercise undertaken in November 2021. Further design and assessment work has been undertaken following the conclusion of the non-statutory consultation. The Proposed Development, which is the subject of this PEIR, is described in Chapter 5.

2.2. EIA Regulations

2.2.1. EIA Regulations specify which developments are required to undergo EIA and schemes relevant to the NSIP planning process are listed under either of ‘Schedule 1’ or ‘Schedule 2’ of the EIA Regulations. Those developments listed in Schedule 1 must be subject to EIA, while developments listed in 'Schedule 2' must only be subject to EIA if they are considered "*likely to have significant effects on the environment by virtue of factors such as its nature, size or location*". The criteria on which this judgement must be made are set out in Schedule 3 of the EIA Regulations. The Proposed Development falls under Schedule 2 Part 3(a) development of the EIA Regulations, as it constitutes "*industrial installations for the production of electricity, steam and hot water*…".

2.2.2. Taking into account the criteria listed in Schedule 3, it is considered that due to the Proposed Development's nature, size and location that it has the potential to have significant effects on the environment and therefore constitutes EIA Development as defined in the EIA Regulations. In accordance with Regulation 8(1)(b) of the EIA Regulations, the Applicant will therefore provide an ES in support of the DCO Application.

2.2.3. The Proposed Development requires a DCO under the Planning Act 2008. The EIA for NSIPs is reported in two stages, as follows:

- A PEIR is prepared, to inform consultation of the public about the Proposed Development (in accordance with Regulation 12(1)(b) of the EIA Regulations 2017); and
- following consultation with the public, an ES is prepared to accompany the application for a DCO.

2.2.4. Preliminary Environmental Information is defined in the EIA Regulations 2017 at Regulation 12(2) as:

"information referred to in regulation 14(2) which-

a) has been compiled by the applicant; and

b) is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development (and of any associated development)."

2.2.5. The information referred to in Regulation 14(2) is set out below:

a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;

b) a description of the likely significant effects of the proposed development on the environment;

c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;

d) 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 option chosen, taking into account the effects of the development on the environment;

e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and

f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.

2.3. EIA Scoping

2.3.1. EIA Scoping is the process of identifying the issues to be considered within the ES and establishing the scope of the assessment. Although scoping is not a mandatory requirement under the EIA Regulations, it is recognised as a useful preliminary procedure which helps to identify the main effects that a proposed development is likely to have on the environment.

2.3.2. A formal request for a Scoping Opinion was submitted to PINS in accordance with Regulation 10(1) of the EIA Regulations on 7th February 2022. The Scoping Report is provided at Appendix 2.1. The Scoping Opinion was received from PINS on 18th March 2022 and is provided at Appendix 2.2.

2.3.3. A table outlining the key issues raised in the Scoping Opinion as well as how and where the PEIR, or the ES and other DCO Application documents will deal with them is included in the EIA Scoping Opinion Response Matrix, which is provided at Appendix 2.3.

2.3.4. The Scoping Report and the Scoping Opinion will inform further EIA work to be undertaken and the basis of the assessments that will be presented in the ES to accompany the DCO Application.

2.4. Purpose of the PEIR

2.4.1. The PEIR provides an initial statement of the main environmental information available for the study area relevant for the environmental assessment, the description of the likely environmental effects arising from the Proposed Development, and the mitigation measures envisaged to mitigate or reduce adverse environmental effects for the Proposed Development.

2.4.2. The information presented within this report is ***preliminary*** and is based on the design of the Proposed Development as set out in Chapter 5 (Project Description) of this PEIR. Further design and EIA work is currently being undertaken to refine the assessment of predicted likely environmental effects. The final findings of the EIA process will be reported within the ES, which will be submitted to support the DCO Application. It should be noted that the scope and content of the ES will be based upon the EIA Scoping Opinion and ongoing consultation with relevant stakeholders.

2.4.3. Whilst this PEIR does not seek to replicate a draft ES, as per PINS Advice Note Seven ‘Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements’, early consideration has been given to potential sensitivity and magnitude of impact in order to establish the significance of effect. Given the early stage of the design and assessment process, only a degree of certainty can be assigned to the significance of effects.

2.4.4. The likely effect that the Proposed Development may have on identified environmental receptors will be influenced by a combination of the sensitivity (or importance) of the receptor and the predicted magnitude of impact from the baseline conditions.

2.4.5. Each of the technical chapters provides further details on the assessment methodology used to quantify the level of effect. Where possible, this will be based upon quantitative and accepted criteria (for example, traffic assessment guidelines), together with the use of value judgement and expert interpretation to establish to what extent an effect is environmentally significant. Table 2.1 provides an illustrative example of how sensitivity and magnitude are combined to establish the significance of effect. As a rule, Moderate or Major effects are considered to be significant, whilst minor and negligible effects are considered to be not significant. However, professional judgement will be applied, including taking account of whether the effect is permanent or temporary, its duration / frequency, whether it is reversible, and / or its likelihood of occurrence.

Table 2.1: Typical Significance Matrix

Receptor Sensitivity	Magnitude of Impact			
	High	**Medium**	**Low**	**Negligible**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Minor	Negligible
Low	Minor	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

2.4.6. As the PEIR is preliminary in nature, each of the environmental topics provide an overview narrative of the potential sensitivity and magnitude in order to help stakeholders understand the potential effects of the Proposed Development. This is only a guide at this stage and the individual environmental topic chapters provide further information on the methodology for assigning of levels of sensitivity and magnitude of impact within an appendix for each the chapters within this PEIR.

2.5. EIA Stages

2.5.1. The following section of the PEIR provides an overview of the EIA process to help stakeholders understand the role and purpose of the PEIR at this stage of the project. It is important to note that the steps set out below overlap with one another and that there is ongoing engagement with stakeholders throughout the entire process.

Current and Future Baseline Conditions

2.5.2. An important first step in the EIA process is to establish a baseline against which to assess the effects of the Proposed Development. Information relating to the existing environmental baseline has been and will continue to be collected through field and desktop study up until submission of the DCO Application. These baseline sources include, but are not limited to:

- Online/digital resources;
- Data searches, e.g., Local Biological Record Centres, Historic Environment Record, etc.;
- Baseline Site surveys; and
- Available environmental information submitted in support of other planning applications for development within in the vicinity of the Site.

2.5.3. Whilst the PEIR provides an overview, the ES will include, within each of the environmental topics, a detailed description of the current baseline and the future baseline. Each environmental chapter will include details of the methods of baseline data collection. The 'future baseline' scenario will describe the changes from the current baseline scenario as far as natural changes can be established, although it is noted without the Proposed Development that the Solar PV Site would likely continue to be intensively managed for agricultural purposes.

2.5.4. The potential effects arising as a result of the Proposed Development will be assessed against these two baselines and presented within the ES as follows:

- Construction Phase - Current and Future Baseline;
- Operational Phase - Future Baseline; and
- Decommissioning Phase - Future Baseline.

EIA Assessment Scenarios

2.5.5. The ES will present the assessment of effects of the following scenarios;

- Construction Phase (2026 - 2028); and
- Operational Phase.

2.5.6. The Applicant is not seeking a time limited consent. The operational life of the Proposed Development will not be specified within the consent. Therefore, the ES as a worst case, will assess the permanent effects of the operational phase. Recognising that the electrical infrastructure associated with Solar Farms has an operational lifespan of typically 40 years, the ES will also present an assessment of the effects arising from a decommissioning phase, should the Applicant choose to decommission the Proposed Development. The decommissioning assessment will be based on an assumption that decommissioning would take place after 40 years although it is noted that decommissioning could take place prior to or after this timeframe subject to how the technology is performing at that time:

- Decommissioning Phase (2069 - 2070).

Identifying the Baseline Environment

2.5.7. The first stage in the design and EIA process is to gather baseline information. Environmental surveys of the Site and study areas were carried out during 2021 and 2022, some of which are ongoing, in order to establish a clear baseline against which the effects of the Proposed Development can be assessed. Further details of the baseline environment are provided at Chapter 3 (Description of the Site and Natural Evolution of the Baseline) and within the individual environmental chapters of this PEIR. Full details of the baseline environment will be presented in due course within the ES.

Predicting Environmental Impacts

2.5.8. The gathering of baseline information and progression of the initial design concept, allows the environmental team to undertake a preliminary assessment in order to predict potential environmental impacts. The results of the preliminary environmental assessments are presented within this PEIR. Following the publication of the PEIR as part of the Stage 2 Consultation, the next stage of the EIA process is to undertake further assessment work/modelling, informed by the Stage 2 Consultation feedback, further baseline survey information and the refinement of the design in order to present the potential impacts that might arise as a result of the Proposed Development within the ES. The assessment within the ES will describe the impacts (changes to the environment, compared with the baseline environment) attributable to the construction, operation and decommissioning phases of the Proposed Development, which may be adverse or beneficial, direct or indirect, temporary (short-term to long-term and irreversible) or permanent.

2.5.9. The methods of forecasting impacts vary by topic. For example, the assessment of air quality and noise relies upon traffic modelling.

2.5.10. Full details of the assessment methodology for each of the environmental chapters will be presented within the ES.

Assigning the Level of Significance

2.5.11. The approach to assessing and assigning significance to an environmental effect is derived from a variety of sources including, legislative requirements, topic-specific guidance, standards and codes of practice, the EIA Regulations, advice from statutory consultees and other stakeholders and the expert judgement of the team undertaking the EIA.

2.5.12. The following three stage approach will be used for determining significance for all environmental chapters within the ES:

1) Assigning an environmental value to (or sensitivity of) a resource or receptor:

2) Assigning a level of impact; and

3) Assigning a level of significance.

2.5.13. Owing to the different approaches and the terminology used to assign value, impact and the level of significance with best practice guidance will be set out in detail within the individual environmental chapters of the ES.

Mitigation and Residual Effects

2.5.14. At this stage in the project, the Proposed Development has already been through two stages of design development (refer to section 4.2 for further details). These review stages resulted in the identification of mitigation measures that have been embedded into the design and layout of the Proposed Development, referred to as embedded mitigation (or primary mitigation).

2.5.15. In addition to these embedded mitigation measures, the preliminary assessments presented within this PEIR have identified the need for further potential mitigation measures to avoid, prevent or reduce and, if possible, offset likely significant adverse effects, which, following feedback from stakeholders, will be considered in detail within the next stage of the EIA process.

2.5.16. These mitigation measures are being developed as part of an iterative process and therefore will be developed throughout the EIA process in response to the findings of the initial assessments and stakeholder feedback.

2.5.17. Where this initial assessment of potential effects identified the need for mitigation measures, these are discussed with the design team and incorporated into the development proposals, where appropriate. The process of iterative design, assessment and consultation is set out below, adapted from IEMA's 'Guide to Shaping Quality Development' (IEMA, 2015) (see Plate 1 below). As shown on Plate 1 below, we are part way through the design, assessment and consultation process and the PEIR provides a snapshot of where we are in the process, to help inform engagement and feedback from stakeholders about the Proposed Development.

2.5.18. Environmental effects remaining after the mitigation measures have been incorporated into the Proposed Development and/or control documents, as agreed with the project team and stakeholders (where necessary), are termed residual effects and these will be fully described in the ES along with how they are proposed to be secured within the DCO Application.

2.5.19. Where any significant residual effects remain the EIA Regulations require "*the monitoring of any significant adverse effects on the environment of the proposed development*". The ES will specify which effects, if any, will require monitoring.

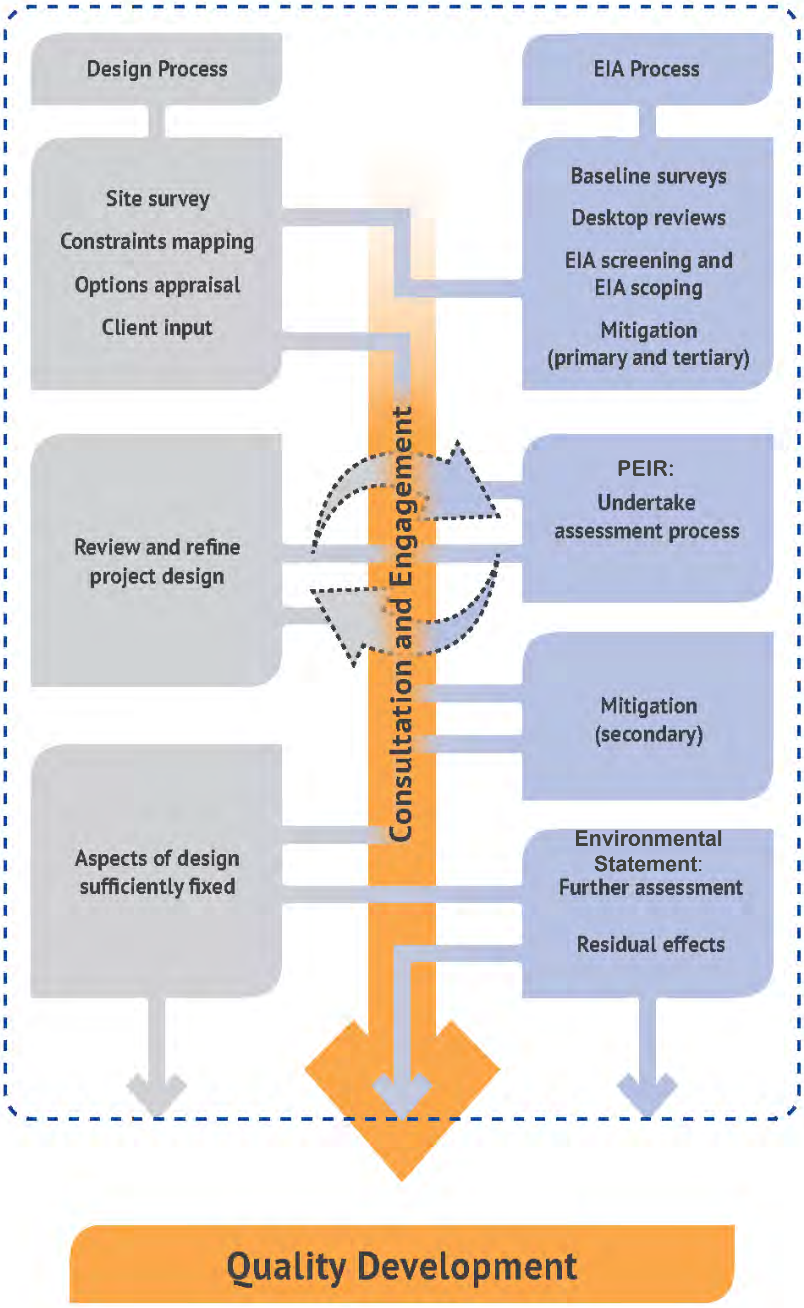

Plate 1: Interaction of the design and EIA processes (IEMA, 2015).

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Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 3: Description of the Site and Natural Evolution of the Baseline

May 2022

3.0 Description of the Site and Natural Evolution of the Baseline

3.1. Site Location

3.1.1. The purpose of this section of the PEIR is to provide an overview of the Site and surrounding area. Further detailed information relating to each of the environmental topics is provided in the relevant technical chapters and supporting figures and appendices.

3.1.2. The Site, as shown on Figure 1.1, comprises of three different areas, which are broadly defined as follows:

- The Solar PV Site - Areas within the Site that are being considered for solar development, the primary onsite substation and associated infrastructure.
- Mitigation and Enhancement Areas;
- Potential Highway Works Site - areas beyond the Solar PV Site which are being considered for cable route connections and temporary/permanent improvements to existing highways to facilitate the construction and decommissioning of the Proposed Development.
- Grid Connection Corridor – Area within the Site that is being considered for the Grid Connection Cable between the Primary Onsite Substation and the National Grid Ryhall Substation and the new connection at National Grid Ryhall Substation.

3.1.3. The extents of the Solar PV Site, Mitigation and Enhancement Areas, Potential Highway Works Site and the Grid Connection Corridor are shown on Figure 3.1.

3.1.4. The Site equates to approximately 906ha. The Solar PV Site equates to approximately 463ha.

3.1.5. Approximately 657ha of the Site falls within RCC's administrative boundary and the remaining 249ha of the Site falls within SKDC's administrative boundary.

3.1.6. The following paragraphs provide a general description of the Solar PV Site and Mitigation and Enhancement Areas. The Grid Connection Corridor consists of a single field containing the National Grid Ryhall Substation, access track and recently planted woodland. The field (Filed 17) is bounded by a hedgerow on all sides. The Potential Highway Works Site consists of the adopted highway extents and associated verge. Further detail will be provided within the ES once the extents of Potential Highway Works Site have been finalised.

3.1.7. The Grantham - Peterborough (East Coast Main Line) railway line dissects the Solar PV Site on a general north-west to south-east alignment. The Solar PV Site is located to the immediate south, east and west of Essendine and approximately 700m north-east of Ryhall. The north eastern most edge of Stamford is located approximately 1.4km south-west of the Solar PV Site at its nearest point. The centre of Peterborough is located approximately 16km south-east of the Solar PV Site.

3.1.8. The Solar PV Site is located at OS grid reference TF052115 (approximate centre of the Solar PV Site). The maximum extent of land anticipated to be included within the DCO Application is shown on Figure 3.1 and the Proposed Development will be located within the Site. It should be noted that this represents the current maximum extent of land being considered for either temporary or permanent use to construct, operate and maintain and decommission the Proposed Development. It is important to note that these extents may be subject to change in response to the EIA and consultation process.

3.1.9. The Solar PV Site comprises 37 agricultural fields and blocks of non-ancient woodland. Hedges, trees and woodland form the boundaries to the fields within the Solar PV Site. There is a potential requirement for highways works between the Strategic Highway Network (SRN) and the Solar PV Site to facilitate construction traffic access.

3.1.10. The Solar PV Site and Mitigation and Enhancement Areas are, for the purposes of the EIA process, divided into a series of numbered fields. The plan showing the field number system is provided at Figure 3.2.

3.1.11. A summary of the baseline environment is provided below with further detail provided within each of the individual environmental topic chapters.

3.2. Landform and Topography

3.2.1. The Site's topography ranges between 16 - 67m AOD the lowest elevation running along the route of the East Coast Mainline railway. The highest elevation is present in the north-western extent of the Solar PV Site.

3.3. Access and Recreation

3.3.1. The Solar PV Site is currently accessible from a number of existing field entry points capable of accommodating large agricultural machinery.

3.3.2. In terms of the SRN, the A1, which connects Grantham and Stamford, is located approximately 5.5km west of the Solar PV Site. The A15, which connects Bourne and Peterborough, is located approximately 6.5km east of the centre of the Solar PV Site. The A1175 is located approximately 4.5km south of the centre of the Solar PV Site, which provides a vehicular link between Stamford and Market Deeping and a link between Stamford and Oakham along the A606. The A6121, which connects Ryhall, Essendine and Carlby, separates the north-western extent of the Solar PV Site from the remainder, routing on a general north-east to south-west alignment. The A6121 provides connection to the A1 via Stamford to the south-west of the Solar PV Site and to the A15 via Bourne to the north-east of the Solar PV Site. The B1176 segments the north-westernmost extent of the Solar PV Site and is routed on a general north-south direction between Little Bytham to the north and Ryhall to the south. The B1176 connects to the A6121 at Ryhall.

3.3.3. There are six Public Rights of Way (PRoW) which cross the Solar PV Site and Mitigation and Enhancement Areas which are described in Table 3.1.

Table 3.1: PRoW within the Site

PRoW	Description
Footpath BrAW/7/1	The footpath routes through the easternmost extent of the Solar PV Site in a general north-east to south-west alignment
Footpath BrAW/3/1	The footpath crosses into the north-eastern extent on the Mitigation and Enhancement Areas in the vicinity of Grange Farm
Footpath BrAW/9/1	The footpath routes parallel to the north of PRoW footpath BrAW/3/1 crosses the Mitigation and Enhancement Area east-west into the Open Access Land of Braceborough Wood, which is located immediately adjacent to the north-eastern boundary of the Solar PV Site
Footpath Uffi/5/1	The footpath follows the south-western boundary of the Solar PV Site in an east-west direction
Bridleway BrAW/1/1	The bridleway crosses the eastern extent of the Solar PV Site north-south, between the local

PRoW	Description
	road to the north and the railway line to the south
Bridleway E169/1	The bridleway routes through the north-western extent of the Solar PV Site between the A6121 and B1176 in a general north-west to south-east alignment.

3.3.4. The Macmillan Way recreational route follows the south-western boundary before crossing the Solar PV Site and continues along the northern boundary of the south-western extent of the Solar PV Site.

3.4. Water Resources

3.4.1. The West Glen River (Environment Agency Waterbody ID: GB105031055510) runs through the Solar PV Site and Mitigation and Enhancement Areas on a general north-west to south-east alignment. A network of drains, ditches and streams, which follow field boundaries, are also present across the Solar PV Site and Mitigation and Enhancement Areas. A pond is located in the central-eastern area of the Solar PV Site (Field 31).

3.4.2. The Solar PV Site and Mitigation and Enhancement Areas are predominantly located in Flood Zone 1, which is an area classed as having a low risk from fluvial and tidal flooding (less than 1 in 1,000 annual probability, as indicated by the Environment Agency Flood Map for Planning). Smaller areas of Flood Zone 2 (medium risk) and Flood Zone 3 (high risk) are present along the alignment of the West Glen River. The Solar PV Site and Mitigation and Enhancement Areas are predominantly located within an area of very low risk from surface water flooding. There are areas of low to high surface water flood risk associated with the West Glen River and its tributaries.

3.4.3. The West Glen River has a River Basin Management Plan (RBMP) ecological classification of 'Moderate' and an overall Water Framework WFD classification of Poor.

3.5. Agricultural Land

3.5.1. The Provisional ALC mapping published by Natural England indicates that the Solar PV Site and Mitigation and Enhancement Areas comprise predominantly Grade 3 agricultural land, with an area of Grade 2 agricultural land located in the southern extent of the Solar PV Site.

3.5.2. Further information can be found in Chapter 13 of this report regarding the agricultural land classification survey that has been undertaken as part of the EIA process.

3.6. Ecology and Biodiversity

3.6.1. The Solar PV Site and Mitigation and Enhancement Areas comprise predominantly arable agricultural land, a network of hedgerows, drains and ditches and blocks of woodland. Areas of improved grassland, species poor semi-improved grassland, semi-improved neutral grassland, tall ruderal vegetation, and scrub are also present. Woodland within the Mitigation and Enhancement Areas consists of plantation and semi-natural broadleaved woodland. Ancient woodland is also present offsite, adjacent to the to the northern, southern and north-western Site boundaries.

Statutory Designated Sites

3.6.2. There are eight statutory designated sites within 10km of the Site boundary, including: Ryhall Pasture and Little Warren Verges SSSI, Newell Wood SSSI, the Rutland Water SPA and Ramsar site.

Rutland Water SPA

3.6.3. Rutland Water SPA, located approximately 8.65km south-west of the Solar PV Site, is designated for supporting the following non-breeding waterbird assemblages as qualifying features:

- Gadwall, *Anas strepera*; and
- Northern shoveler, *Anas clypeata*.

Rutland Water Ramsar Site

3.6.4. Rutland Water Ramsar site is designated for comprising a large, artificial freshwater reservoir fringed by a mosaic of wetland habitats that display a succession from open water communities to semi-natural mature woodland. The Ramsar site is a regionally important area for breeding and passage birds. Wintering waterbirds regularly exceed 20,000 individuals and include internationally important numbers of ducks and nationally important numbers of several Anatidae (ducks, geese, swans).

Ryhall Pasture and Little Warren Verges SSSI

3.6.5. The Ryhall Pasture and Little Warren Verges SSSI is located adjacent to the north-western boundary of the Solar PV Site. The SSSI is designated for supporting semi-natural limestone grassland and species-rich roadside verges comprising rich calcareous flora, and adjacent hedges which are rich in shrub species, providing habitat for a range of insect species characteristic of grassland and woodland edge.

Newell Wood SSSI

3.6.6. Newell Wood SSSI, which is located approximately 340m north-west of the Solar PV Site. Newell Wood SSSI is designated for being one of the best remaining examples of acid lowland woodland in Leicestershire and is representative of semi-natural woodland developed on light soil in Central and Eastern England.

Non-statutory Sites

3.6.7. A total of 98 non-statutory LWS are present within 2km of the Site boundary. The majority of these are designated for habitats (predominantly hedgerows, grassland and woodland) with many also featuring locally or nationally scarce.

3.6.8. Two LWS (the Carlby/Essendine Verge LWS and Essendine Dismantled Railway Embankment LWS) are located within the Mitigation and Enhancement Area, with both LWSs featuring priority habitats (calcareous grassland and a stream) and nationally scarce species. An additional 25 sites are directly adjacent to the Site boundary or within 10m (generally separated by a minor road). Most of these LWSs are protected hedgerows of lengths of road verge.

3.7. Cultural Heritage

3.7.1. The Site is not subject to any designated heritage assets. There is one Scheduled Monument within proximity of the Solar PV Site, Essendine Castle, along with the Grade II* Listed Building Church of St Mary, which are located approximately 300m west the Solar PV Site boundary. A total of approximately forty designated heritage assets are located within a 1km study area around the solar PV Site and Mitigation and Enhancement Areas. Further details on these assets can be found in Chapter 8 of this PEIR.

3.8. Air Quality

3.8.1. The Site is not located within an AQMA. The nearest AQMA, declared for one-hour and annual mean concentrations of Nitrogen Dioxide (NO_2) by SKDC, is located approximately 23km north-west of the Site in Grantham.

3.9. Ground Conditions

3.9.1. British Geological Survey (BGS) mapping indicates that the Solar PV Site is underlain by sedimentary rocks of the Inferior Oolite Group to the north-west, overlain by the Great Oolite Group in the centre, which is overlain by Ancholme Group to the south-west.

3.9.2. BGS superficial data does not record superficial deposits across a majority of the Solar PV Site; however, where superficial deposits are present, they comprise areas of Alluvium - clay, silt, sand and gravel, and areas of river terrace deposits – sand and gravel. Furthermore, in the east and southern extent of the Solar PV Site, there are areas of head – clay, silt, sand and gravel, and glaciofluvial deposits of mid Pleistocene sand and gravel.

Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 4: Alternatives and Design Development

May 2022

4.0 Alternatives and Design Development

4.1. Introduction

4.1.1. This chapter of the PEIR briefly outlines the alternatives considered in relation to the Proposed Development, at this point in time. A full description of the alternatives will be provided in the Environmental Statement. Regulation 14(2)(d) of the EIA Regulations requires "*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 option chosen, taking into account the effects of the development on the environment"* to be presented in the Environmental Statement.

4.1.2. Further to the requirements of the EIA Regulations, section 4.4 of the Overarching National Policy Statement (NPS) for Energy EN-1, published by the Department of Energy and Climate Change in 2011, states that:

"*Applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility*" (Paragraph 4.4.2).

4.1.3. Paragraph 4.2.13 of the Draft NPS EN-1, published by the BEIS in 2021, sets out that given the level of urgency of need for new energy infrastructure, the Secretary of State should, subject to any legal requirements which indicate otherwise, be guided by the nine principles, provided below, when deciding what weight should be given to alternatives:

- the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner;
- only alternatives that can meet the objectives of the proposed development need be considered;
- the Secretary of State should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security, climate change, and other environmental benefits) in the same timescale as the proposed development;
- the Secretary of State should not refuse an application for development on one site simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site, and it should have regard as appropriate to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals;
- alternatives not among the main alternatives studied by the applicant (as reflected in the ES) should only be considered to the extent that the Secretary of State thinks they are both important and relevant to the decision;
- as the Secretary of State must assess an application in accordance with the relevant NPS (subject to the exceptions set out in the Planning Act 2008), if the Secretary of State concludes that a decision to grant consent to a hypothetical alternative proposal would not be in accordance with the policies set out in the relevant NPS, the existence of that alternative is unlikely to be important and relevant to the Secretary of State's decision
- alternative proposals which mean the necessary development could not proceed, for example because the alternative proposals are not commercially viable or alternative proposals for sites would not be

physically suitable, can be excluded on the grounds that they are not important and relevant to the Secretary of State's decision

- alternative proposals which are vague or inchoate can be excluded on the grounds that they are not important and relevant to the Secretary of State's decision; and
- it is intended that potential alternatives to a proposed development should, wherever possible, be identified before an application is made to the Secretary of State (so as to allow appropriate consultation and the development of a suitable evidence base in relation to any alternatives which are particularly relevant). Therefore, where an alternative is first put forward by a third party after an application has been made, the Secretary of State may place the onus on the person proposing the alternative to provide the evidence for its suitability as such and the Secretary of State should not necessarily expect the applicant to have assessed it.

4.1.4. Considering the policy and legal requirements as well as the iterative approach to the design to date and feedback from the informal consultation undertaken in November 2021, the following alternatives have been considered for the Proposed Development and are discussed in this chapter:

- Alternative sites, size and scale;
- Alternative technologies; and
- Alternative layouts.

4.1.5. The consideration of 'no development' as an alternative to the Proposed Development has not been considered as a reasonable alternative as it would not deliver the proposed renewable electricity generation capacity which is required in order to meet the UK's net zero targets.

4.2. Need for the Project

4.2.1. There is a growing body of UK energy and climate change international commitments, law, policy and guidance which highlights an urgent need for new energy generation infrastructure, particularly from renewable sources such as solar. Alongside this drive for new energy generation the UK Government has committed to achieving net zero greenhouse gas emissions by 2050 and decarbonisation of the energy sector by 2035.

4.2.2. 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.

4.2.3. 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 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.

4.2.4. 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 decarbonising 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, and with a significantly lower carbon intensity. The decarbonisation of UK electricity generation is therefore vitally important to meet the UK's legal obligations on carbon emissions and ensure sustainable energy resilience.

4.2.5. 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 UK demand, but existing nuclear stations began to close in 2021. Only one existing plant is scheduled to remain operational beyond 2028. One new nuclear project is scheduled to be commissioned in the late 2020s, any others will not commission 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 Utilisation 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”.

4.2.6. 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 shield consumers from volatile international energy markets. But wind on its own is not sufficient. The development of large-scale solar in the UK (National Grid estimates up to 39.7GW by 2030 rising to 88.6GW by 2050) will provide an essential diversity to the UK’s low-carbon generation portfolio, working with other technologies to deliver security of supply and value to UK consumers. The Energy Security Strategy (April 2022) has now set an ambition of 70GW of solar by 2035 (an increase of 56GW from the current provision). Solar generation is therefore 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.

4.2.7. 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 international supply markets, and provides the potential to deliver biodiversity net gains through its development.

4.2.8. It is therefore against the context of a clear and urgent national need for this type of infrastructure that the assessment of alternatives is set.

4.3. Alternatives Considered

Alternative Sites

4.3.1. Windel Energy considered several important factors before arriving at the preferred site. As solar schemes are not referred to directly in the current suite of NPS, Windel Energy has considered and referenced the site selection criteria referred to in draft NPS EN-3. This is considered a reasonable approach to take because the draft NPSs have progressed to a reasonably advanced stage, including consideration by the House of Commons BEIS Committee, who endorsed the draft and proposed a series of changes to deliver the “step change” needed to deliver the required scale of new NSIPS at a sufficiently rapid pace to deliver the Government’s net zero aims. The factors are also considered to be the relevant ones when selecting a site for large scale solar.

4.3.2. The starting point in the consideration of alternatives, as noted earlier, is the clean and urgent need for renewable energy projects to deliver the Government’s legally binding commitment to net zero, which cannot be reached with the delivery of small sites alone – projects are needed to deliver energy at scale. On this basis, the emphasis should be on maximising the use of available capacity at grid connections where they occur. Lincolnshire is a particularly suitable area for large scale solar projects for several reasons including:

- The existence of large areas of undeveloped land and a generally sparse settlement pattern, meaning that there is the opportunity to identify sites of sufficient scale to deliver meaningful contributions towards meeting net zero.
- A generally gently undulating topography, rather than land that is too steep or too flat.
- There are grid connections with capacity to connect into the National Grid. This is more likely in less populated areas with lower demand from business and homes.
- Agricultural Land Classification (ALC) varies depending on precise location, but there is a good supply of non best and most versatile land and where it is best and most versatile land it is generally Grade 2, rather than large areas of Grade 1 land.

4.3.3. This is not to say that large-scale solar sites will only be suitable in Lincolnshire – available capacity should be maximised wherever possible, however, Lincolnshire's particularly topography and settlement pattern make it suitable for solar and it is perhaps for this reason that a number of large-scale solar.

Grid connection and capacity

4.3.4. Having first focussed on Lincolnshire, the principal driver for the site location was availability of a suitable grid connection, with sufficient capacity to enable the power generated from the solar farm to feed back into the grid. Windel Energy considered the availability of grid connections, in discussions with National Grid and using information on the TEC Register, and identified that the National Grid Ryhall Substation had sufficient available capacity to enable the delivery and connection of a solar farm of at least 350MW. Having this level of capacity without requiring an upgrade to the substation is relatively unusual – all substations are built in three phases, but in this case only two are currently being used (to power the East Coast Mainline), leaving the third phase available to enable the connection of clean renewable energy generation schemes. Given the urgent need identified above, this available capacity should be prioritised. Solar is considered to represent the best use of this available capacity, given the suitability of the landscape for solar and the environmental and planning considerations discussed in the following sections.

4.3.5. Utilising existing connections should also be preferred to building new connections, both for cost, timely delivery and environmental reasons.

4.3.6. Other substations in the region do not have the same level of spare capacity and require substantial upgrade to allow large scale renewables to deliver clean power to the grid (see below). Grid connections with available capacity are relatively limited and so, in the context of the urgent national need for renewable energy (and specifically solar) it is important to make the best use of this capacity where it occurs. To put this in context, publicly available information from National Grid shows very limited capacity within the wider region. There are ten potentially available connection points with the capacity to deliver large scale solar within 80km of the National Grid Ryhall Substation. The closest potentially available connection point to the National Grid Ryhall Substation is Spalding North, approximately 25km from the Site, and the next at Bicker Fen, approximately 31km from the Site. The next closest are all over 50km from the Site. These are not sufficiently close to the Site to be considered reasonable alternatives, however, given the urgent need for renewable energy, all of this capacity should and will need to be utilised. National Grid Electricity

Transmission's (NGET's) estimated cost of the Spalding North connection is £81.8m-£115.4m and Bicker Fen £99.8m-141.2m. No details are given on the breakdown on these costs, but given the significant costs involved are likely to be attributable to significant upgrade works to connect to the substation. The fact that the National Grid Ryhall Substation already has capacity without requiring significant upgrades means that best use should be made of this existing infrastructure, before developing new connections.

4.3.7. Large scale solar farms over 50MW are required to connect directly into the transmission network, rather than the distribution network. However, a review of the distribution network also shows a significant lack of available capacity for larger projects. Information from Western Power Distribution shows only 13 grid connection points on the distribution network in the East Midlands Region where there is the potential for large scale generation to connect (over 50MVA). The closest of these is Nottingham South 33kV substation, approximately 55km from National Grid Ryhall Substation, which has a current demand headroom of 127MVA. The other 12 all have current demand headroom of less than 95MWA. Seven of these 12 available connections taken together would be required to deliver the same capacity as Mallard Pass Solar Farm.

Land ownership

4.3.8. Following the identification of this capacity, Windel Energy started initial discussions with landowners to identify a suitable area of land, using local knowledge and an understanding of potentially willing landowners, for a solar farm capable of providing 350MW export capacity (DC) to the grid, reflecting the capacity agreement with National Grid.

4.3.9. The initial discussions with landowners focussed on identifying sufficient land to accommodate a 350MW solar farm, with sufficient additional land for mitigation and enhancement, as close as possible to the National Grid Ryhall Substation (see grid connection considerations). Windel Energy did not seek to actively identify a single site of a particular size but were led by landowner discussions to identify potentially available land, its suitability for solar and whether it was likely to have effects that were, or could be made to be, acceptable. The ability to reach voluntary agreement with landowners was a key requirement and therefore single, contiguous sites with as few landowners as possible were prioritised. The Site has a relatively small number of individual landowners, all of whom were agreeable in principle to leasing their land for solar. Other areas around, and further from, the substation were discounted due to reasons such as multiple land ownerships, unwilling landowners or smaller, irregular field boundaries. NPS EN-1 at paragraph 4.4.3 states that the decision maker: *"…should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as the proposed development"*. Windel Energy did not consider delivering a smaller scheme with less generation capacity on a smaller area, as a smaller scheme would not deliver the same capacity or energy security and climate change benefit as the Proposed Development, and as such would not represent a reasonable alternative.

4.3.10. In considering whether to commence discussions with landowners further from the National Grid Ryhall Substation, Windel Energy also considered the length of grid connection required to connect into the substation. Assuming planning and environmental effects could be mitigated to an acceptable level, as short a connection possible was preferred on the basis that longer grid connections effect the financial viability of the scheme, but also can have additional impacts in terms of land take, landowner agreements and environmental impact of the connection, which for long distances may include overhead lines.

Site topography

4.3.11. Flat or gently south facing slopes are most suitable and beneficial for solar and therefore this influenced the location of the site in proximity to the substation. The general topography of the area immediately surrounding the substation is gently undulating and therefore this makes it particularly suitable for solar.

Proximity of the Solar PV Site to dwellings

4.3.12. The area surrounding the National Grid Ryhall Substation is characterised by dispersed small settlements, with the larger towns of Stamford to the south west, and Market Deeping to the south east. The City of Peterborough lies further to the south east. The site was chosen as although it is located in relatively close proximity to Essendine, there are opportunities to significantly reduce its impact through a combination of setbacks, natural screening through topography and existing and proposed landscape improvements.

4.3.13. There are also relatively limited individual dwellings directly affected by the Proposed Development and this has been reduced further by the changes proposed in this Stage Two consultation.

Environmental considerations

4.3.14. Windel Energy also had regard to several important environmental considerations when determining the most appropriate location for the site within the broad vicinity of the National Grid Ryhall Substation. The key ones are described below.

4.3.15. The area around the National Grid Ryhall Substation is not subject to any protected landscape or spatial designations such as Areas of Outstanding Natural Beauty, National Parks or Green Belts. Whilst it is a countryside location, it is recognised that schemes of this type and scale will often need to be located in a rural location, provided that the planning and environmental effects are acceptable.

4.3.16. Land further south was considered in terms of its suitability for solar, but this significantly increased the potential for likely significant effects on Burghley House, a Grade 1 listed building, located to the south-east of Stamford, as well as increasing the number of residential properties likely to be affected by also being in close to proximity to Ryhall and Belmesthorpe. Proximity to heritage assets generally was also a consideration, with the potential for impacts on Conservation Areas and a number of listed buildings in Greatford and Braceborough likely to be significantly increased if the site was to move further east, and the same in Ryhall if the site were to move further to the south west. The Shillingthorpe Park Scheduled Ancient Monument (SAM) also represented a constraint to the east.

4.3.17. The area further west of Essendine is located in close proximity to a number of SSSI (East Wood, Great Casterton, Newell Wood, Clipsham Old Quarry and Pickworth Great Wood). In addition, Rutland Water, a Ramsar, Special Protection Area (SPA) and Special Area of Conservation (SAC) site is located approximately 8.6 km south west of the Solar PV Site. The closer that the site is located to the SPA, the more likely it is for there to be potential effects on the integrity of the European site.

4.3.18. The interaction with Public Rights of Way (PRoW) was also considered, with the Site having relatively fewer PRoW crossing the Site, compared to areas further west.

Agricultural Land

4.3.19. Whilst draft NPS EN-3 indicates that Agricultural Land Classification (ALC) should not be a "*predominating factor in determining the suitability of the site location*" (paragraph 2.48.13), ALC was an important factor for Windel Energy when selecting the Site.

4.3.20. The Site was selected on the basis that it was predominantly Grade 3, offering the potential for Grade 3b land subject to further survey, with small pockets of Grade 2. This was also supplemented by initial conversations with the landowners over the quality and viability of the Site for agriculture. Following further analysis, some additional Grade 2 land was identified and as noted below, where this was in single fields, this was removed from the fields proposed for PV Arrays. The regional level ALC maps show that the agricultural land within relatively close proximity to the grid connection is either Grade 2 or 3, with higher quality land (Grade 1) further east of Peterborough. There are very small pockets of Grade 4 land, coinciding with the SSSIs to the north of Pickworth, but none of sufficient size to deliver a solar farm and there would be the potential for significant adverse effects on the SSSIs. Further information on ALC is provided in Chapter 13 of this PEIR.

Accessibility

4.3.21. The Site is accessible by the rural road network, but in relatively close proximity to the Strategic Road Network (SRN) by virtue of the A1, a major dual carriageway, which is approximately 5.5km to the west of the Solar PV Site. This is an important factor when considering possible effects during construction and the ability of the road network to accommodate HGVs and potential Abnormal Indivisible Loads (AILs). The National Grid Ryhall Substation was granted planning permission in September 2013 (reference 2013/0291/FUL) and a Construction Traffic

Management Plan was submitted and approved which included a preferred route for construction traffic (via Ryhall Road and the A6121) and the provision of passing places in the highway verge on Uffington Lane due to its relatively narrow width (3m – 4.5m). The close proximity of the Solar PV Site to the SRN and the ability to use the improvements made at the time of the National Grid Ryhall substation construction, further support the use of the Solar PV Site for a solar project.

Previously developed land

4.3.22. NPS EN-3 states: "*As most renewable energy resources can only be developed where the resource exists and where economically feasible, the IPC should not use a sequential approach in the consideration of renewable energy projects (for example, by giving priority to the re-use of previously developed land for renewable technology developments).*" Draft NPS EN-3, as noted above, also explains that "land type should not be a predominating factor in determining the suitability of the site location".

4.3.23. Firstly, there is relatively little previously developed land located within a sufficient distance of the National Grid Ryhall Substation that an appropriate grid connection could be provided to. The previously developed land registers maintained by South Kesteven District Council and Rutland County Council show 22ha and 3.4ha respectively, which even together would be significantly below the area required to deliver a utility-scale solar farm.

4.3.24. There are some large previously developed sites within the wider area, although located some distance from the National Grid Ryhall Substation site, which are not listed on the register and so we consider these below, in terms of their ability to deliver the same infrastructure, with the same benefits and in the same timescale (as required by NPS policy) and are briefly discussed below.

Table 4.1 – Consideration of Alternative Sites

Site	Size (ha)	Comments	Reason for discounting
Woolfox Depot	486 ha in total, but majority is arable farmland and the only previously developed land remaining is the former runway	Initially put forward through the Local Plan process for Woolfox Garden Village. Proposed for 7500 new homes, new employment opportunities, new schools, sports and recreation facilities, walking, cycling and public transport opportunities and new parks and open spaces. Considered and discounted through the Local Plan process as an alternative housing site to St Georges Barracks. Rutland CC can currently only show a 3.5 year supply of housing and therefore there will be a presumption in favour of sustainable development whereby proposals whose benefits outweigh the impacts should be approved.	Not available. Landowners wish to develop mixed-use housing proposal. Previously developed element of land very small and so would not be favourable to the Site from this perspective. Land likely to be required to deliver housing and employment, given lack of planned supply through the Local Plan. Would require an 8.5km connection to the substation crossing agricultural land, woodland and in close proximity to SSSIs. Given landowner intentions and length of grid connection, would not be possible to secure land by agreement and deliver in the same timescale.
North Luffenham (St	300 ha	Identified by the Ministry of Defence to deliver jobs and housing.	Not available. Landowners wish to develop mixed-use housing proposal.

Site	Size (ha)	Comments	Reason for discounting
Georges Barracks)		Identified through the (now withdrawn) Rutland Local Plan to deliver circa 2,215 new homes, employment, schools, a local centre, park and ride, a new hotel and new country park. The Local Plan was primarily withdrawn after the Council voted to reject a Housing Infrastructure Grant that was needed to deliver the site. Rutland CC can currently only show a 3.5 year supply of housing and therefore there will be a presumption in favour of sustainable development whereby proposals whose benefits outweigh the impacts should be approved.	Land likely to be required to deliver housing and employment, given lack of planned supply through the Local Plan. Site is not of sufficient size to deliver the same infrastructure. Would require a 13.5km connection to substation crossing agricultural land, woodland and settlements and in close proximity to SSSIs and would require crossing of the A1. Given landowner intentions and length of grid connection, would not be possible to secure land by agreement and deliver in the same timescale.
Cottesmore	Airfield approximately 115 ha	Former RAF airfield and depot. Kendrew Barracks (to the south of the airfield) is currently in use by the Army, but the airfield itself is understood not to be in full active use since 2012.	Barracks is currently in use. Site is not of sufficient size to deliver the same infrastructure. The (withdrawn) Rutland Local Plan states that “the use of Kendrew Barracks is expected to change and expand

Site	Size (ha)	Comments	Reason for discounting
			during the plan period as it accommodates different military units." This suggests that the land could be retained to deliver potential future expansion of its established and operational military use. Would require a 13.8km connection to substation crossing agricultural land, woodland and settlements and require crossing of the A1. Given that there is no indication that the site is available and the length of grid connection, would not be possible to secure land by agreement (being operational Crown Land) and deliver in the same timescale.

Summary

4.3.25. In summary, the availability of significant capacity at the National Grid Ryhall Substation without the need for upgrading was the primary driver in identifying a site in this part of Lincolnshire. Given the urgent need for renewable energy to address the climate crisis, this available capacity should be utilised (and made the most of) where it occurs.

4.3.26. Following a review to identify which of the land in proximity to the National Grid Ryhall Substation may be appropriate for solar from a technical, environmental and community perspective, Windel Energy then commenced discussions with landowners to identify whether there was a willingness to enter into lease agreements. The Solar PV Site is considered to be preferable compared to possible alternative areas further away from the National Grid Ryhall Substation for a number of reasons including the lack of availability of suitable and available previously developed land, relative distance from protected ecological and heritage assets (including Rutland Water SPA) compared to areas further west and south and comparably favourable ALC with limited levels of Grade 3a and 2 land. There are also relatively few residential properties in immediate proximity to the Solar PV Site and the impact on those that are can be effectively mitigated through offsets and sensitive landscaping. The Solar PV Site is also well located in relation to the SRN, which will help to reduce the effects during construction.

Alternative Renewable Technologies

4.3.27. Alternative types of low-carbon forms of electricity generation for utilising the existing National Grid Ryhall Substation connection capacity were not considered by the Applicant. However, notwithstanding this, it is not considered that the Site would be suitable for other forms of renewable generation at the same scale of the Proposed Development. It is therefore considered that Solar Farm development is the best renewable generating solution for the Site.

Alternative Solar Technologies / Layouts

4.3.28. The parameters of the DCO Application will maintain a degree of flexibility to allow for the latest solar technology to be utilised at the time of construction. Notwithstanding this, technological design options have been considered and discounted. The main reasons for discounting the technological options are set out below:

Solar PV Configuration

4.3.29. East / West Solar PV Configuration – An East / West configuration (example shown in Plate 1) was discounted because, in comparison to the Fixed South Facing or Single Access Tracking, this configuration reduces the potential to deliver biodiversity gain and / or utilise the space between the panels for grazing. The level of light reaching the ground beneath the panels would be significantly reduced due to the density and compactness of the east / west configuration. An East / West configuration over the same area would generate an increased number of heavy goods vehicle (HGV) movements than Fixed South Facing or Single Access Tracking as the East / West configuration allows for a greater number of modules to be installed per unit area.

Plate 1 - Example of East West Configuration

Alternative Grid Connection Routes

4.3.30. No alternative grid connection corridors have been considered by the Applicant given the close proximity between the Primary Onsite Substation and National Grid Ryhall Substation. Any alternative route would unnecessarily increase the length of the grid connection cable and associated environmental impacts.

Alternative Layouts

4.3.31. The layout of the Proposed Development has evolved iteratively and will continue to evolve through the EIA and consultation process, taking into consideration the NPS, objectives of the Proposed Development, environmental effects, and feedback from stakeholders during the statutory consultation process.

4.3.32. To date the layout and extents of the solar arrays has undergone two design iterations which are described below.

Stage 1

Upon identification of the Site, the initial Solar PV Site boundary was identified based on the process outlined in 4.2.1 above. This area totalled approximately 880ha as shown on Figure 4.1. All available land within this boundary was then subject to an initial appraisal to identify suitability for solar PV development (i.e., to potentially accommodate solar PV arrays or enabling equipment as defined in section 5.2-5.15 below). The appraisal focused on the suitability of land parcels within the identified boundary for development, based on environmental, social and economic factors which are also reflected in the NPS. No designed layout was considered at this stage. However, minimum offsets to landscape and ecological features and designations, as described in table 5.13 below, were applied to inform the process. Following the initial appraisal, which included site visits and desktop analysis, identified areas within the solar PV Site considered not suitable for accommodating solar PV arrays were removed for the following reasons:

- Setting of Essendine – the extent of solar development was pulled back and away from the settlement boundary of Essendine to reduce potential landscape and visual impacts as well as impacts to the setting of Essendine Castle Scheduled Monument.
- Setting of Braceborough – The land to the east of the Site was removed because of the potential impacts on the landscape character and the proximity to the Braceborough conservation area.
- Braceborough Great Wood – the fields located to the north of Carlby Road due to their proximity to the ancient woodland and the existing PRoW that traverse through the centre of the fields.
- Burghley House – Two fields in the south-west of the Site were removed due to the potential theoretical visibility from Burghley House as the two fields are located on land that slopes towards the River Welland valley and Burghley House to the south.
- Little Warren Wood and Ryhall Pastures and Little Warren Verges SSSI – An opportunity was identified to improve connectivity

between Little Warren Wood and Ryhall Pastures and Little Warren Verges SSSI. The extent of solar infrastructure was set back from the northern boundary to reflect the offset to arable on the northern side of the ditch that runs through this part of the Site. This area will be used to improve green infrastructure connectivity with the SSSI, which is located outside of the Site.

- Primary onsite substation – the location of the Primary Onsite Substation was chosen due to its proximity to the existing National Grid Ryhall Substation, minimising the disruption of the export cable route. The location is also separated from Essendine by the East Coast Mainline, and other clusters of properties and public rights of way.
- Retention of existing green infrastructure features – an early design principle was to retain all existing woodland blocks, hedgerows and ditches within the Site so to reduce potential impacts on protected species and integrate the layout into the fabric of the existing landscape pattern and character.

4.3.33. Following removal of the areas described above, the remaining area for that could potentially accommodate solar PV arrays was approximately 570ha. The removed areas were retained in the Site as Mitigation and Enhancement Areas to potentially provide ecological mitigation and green infrastructure for example, areas for existing habitats, new planting, access and routes for Low Voltage Distribution Cables.

4.3.34. A Stage 1 Concept Masterplan was developed for the purpose of stage 1 (informal) consultation (See Figure 4.1)

Stage 2

4.3.35. Following informal consultation in November 2021, the Stage 1 masterplan has been reviewed in light of the comments received from stakeholders and further analysis of baseline information. The following changes have been made to the extents of the Solar PV Site:

- Grade 2 Agricultural Land – following the completion of the agricultural land classification survey, fields that were identified as consisting entirely of Grade 2 land have been removed from solar development.
- Residential Amenity – Following feedback from the Stage 1 consultation and further Site visits, areas of the Site have been removed due a combination of potential residential amenity impacts and landscape and visual impacts. The extent of removal was reviewed at each individual location, with a suitable set back reflecting existing or historic landscape boundaries or features.
- West Glen River – Areas for potential solar development have been removed along the West Glen River corridor in order to remove the majority of PV Arrays from the flood plain. This has also provided the opportunity to reduce any potential impacts on protected species using the river corridor and provide ecological habitat enhancement.
- Access Strategy – the access strategy has been consolidated so to use one point of access from the highway network per block of land given a total of 7 accesses subject to additional environmental work to take place before the DCO Application, rather than use 26 access points. This will minimise disruption on the existing road network during the construction phase as well as minimising potential direct impacts on Local Wildlife Sites (LWS) and SSSIs.

4.3.36. After the removal of the areas described above the proposed area for PV Arrays is approximately 463ha (See Figure 4.2). The removed areas were retained in the Site as Mitigation and Enhancement Areas to potentially provide ecological mitigation, green infrastructure opportunities, access and routes for Low Voltage Distribution Cables.

4.3.37. Following the Statutory Consultation, the project team will review feedback from all the stakeholders and feed this into the design review process prior to fixing the design parameters for the purposes of the preparation of the Environmental Statement and DCO Application.

Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 5: Project Description

May 2022

5.0 Project Description

5.1. Introduction

5.1.1. The chapter provides a description of the Proposed Development. The physical characteristics of the Proposed Development are described alongside the proposed construction, operation and decommissioning activities that have informed each of the technical assessments included in Chapters 6 to 18.

5.1.2. The principal components of the Proposed Development comprise the following:

- PV modules;
- Mounting Structures;
- Inverters;
- Transformers;
- Switchgear;
- Primary Onsite Substation and Ancillary Buildings;
- Low Voltage Distribution Cables;
- Grid Connection Cables;
- Fencing, security and ancillary infrastructure;
- Access tracks; and
- Green infrastructure (GI).

5.1.3. The illustrative layouts, that shows the areas that are being considered for PV Arrays, the primary onsite substation and areas for mitigation and enhancement, is provided at Figure 5.1(a) and (b).

5.2. Project Parameters

5.2.1. The development of the design of the Proposed Development is an iterative process, based on preliminary environmental assessments and consultation with statutory and non-statutory consultees.

5.2.2. It is important to note that the exact design details of the Proposed Development cannot be confirmed until the tendering process for the design and has been completed and the detailed design details have been approved by the local planning authorities in advance of the Proposed Development commencing (or phase thereof). For example, the enclosure or building sizes may vary depending on the contractor selected and their specific configuration and selection of plant. In order to maintain flexibility in the design and layout at this stage in the process, the Proposed Development will adopt the Rochdale Envelope approach, as described in the PINS Advice Note 9, published in 2018. This involves specifying parameter ranges, including details of the maximum, and where relevant the minimum, size (footprint, width and height relative to above ordnance datum (AOD)), technology and locations of the different elements of the Proposed Development. The use of the Rochdale Envelope approach is therefore being adopted to present a likely worst-case assessment of potential environmental effects of the parameters of the Proposed Development that cannot yet be fixed. Where necessary, design work will continue to further refine the proposed parameters prior to the submission of the DCO Application.

5.2.3. The following sections provide a description of the different elements of the Proposed Development along with the indicative details of the design parameters that have been assessed within this PEIR. The parameters are indicative at this stage in process as they may change in response to stakeholder feedback and ongoing design and environmental assessments. Each environmental topic has assessed the design considered to be the likely worst-case scenario for that discipline to determine the potential for significant effects and identify suitable mitigation measures.

5.3. PV Arrays

5.3.1. The Proposed Development would consist of PV Modules placed on Mounting Structures arranged in rows (known as PV Tables). The PV Array is a distinct group of PV Tables.

5.3.2. PV Modules convert sunlight into electrical current (as Direct Current (DC)).

5.3.3. The DC generating capacity of each PV Module will depend on advances in technological capabilities at the time of construction. The PV Modules will be fixed to a Mounting Structure and known as a PV Table. A group of PV Modules that connected to one another are known as 'PV Strings'.

5.3.4. There are currently two options for the Mounting Structures which are being considered and assessed and are described below:

- Fixed South Facing (FSF) Arrays; and
- Single Axis Tracker (SAT) Arrays.

Fixed South Facing Arrays

5.3.5. Indicative dimensions of modules will measure 2400mm x 1350mm x 35mm. Individual panels consist of a series of bifacial, mono-crystalline cells which make up an individual PV Module. The Mounting Structures will be orientated east west and would be installed between18 and 25 degrees to the horizontal facing south to optimise daylight absorption.

Plate 1: Fixed South Facing Arrays

Single Axis Tracker Arrays

5.3.6. Indicative dimensions of single axis tracking modules will measure 2400mm x 1350mm x 35mm. Individual panels consist of a series of bifacial, mono -crystalline cells which make up and individual panel. The Mounting Structures will be orientated north / south and would operate between 60 degrees from the horizontal (facing east in the morning) moving toward 0 degrees (horizontal) at midday, and up to 60 degrees from the horizontal (facing west in the evening). The PV Modules would track from east to west throughout the day and would return to their resting position 60 degrees (facing east) over night. The limit of rotation will be determined by the SAT PV Module configuration to ensure compliance with the height parameters.

Module Height and Separation

5.3.7. The exact configuration of the PV Arrays has not yet been defined and the DCO Application will seek to allow for flexibility that allows for different configurations of PV Modules. Initial early design work has been undertaken to establish the maximum height parameters for the

PV Array. The Single Axis Trackers (SATs) would be up to 3.2m in height when facing 60 degrees east or west. The Fixed South Facing (FSF) Solar Array would be up to 3.3m in height, allowing for 3 portrait PV Modules. At the lower edge, both the SAT and FSF Solar Array would be approximately 0.8m from the ground. The final elevations of the PV Modules will be influenced by various design factors such as local topography, flood risk, selection of PV Module type and configuration. The gap between the rows of PV Tables will vary to minimise effects of overshadowing and to ensure optimal efficiency. The indicative elevations for Fixed South Facing and Single Axis Trackers are shown on Figure 5.2.

5.3.8. The total number and arrangement of PV Modules will depend on the iterative layout design process and available technology at the time of construction.

Mounting Structures

5.3.9. The frames upon which the PV Modules will be mounted will be pile driven or screw mounted into the ground to a maximum depth of 2.5m, subject to ground conditions. The option to install concrete blocks known as "shoes" may also be considered, avoiding the need for driven and screw anchored installation, therefore minimising ground disturbance. The Mounting Structure would likely be made of either anodised aluminium alloy or galvanised steel and would have a rough matt finish.

5.3.10. Table 5.1 and Table 5.2 provide the indicative parameters of the PV Modules and Mounting Structure, respectively.

Table 5.1: Solar PV Module and PV Module Mounting Structures Parameters

<table>
<tr><th colspan="3">Solar PV Module</th></tr>
<tr><td rowspan="2">Indicative Module Dimensions</td><td>Width (mm)</td><td>1350 SAT / FSF</td></tr>
<tr><td>Length (mm)</td><td>2400 SAT / FSF</td></tr>
<tr><td>Indicative Module Type</td><td colspan="2">Bifacial, mono-crystalline</td></tr>
<tr><td>Indicative Module Colour</td><td colspan="2">The PV Modules are likely to be either black or dark blue. This will be fixed during detailed design and will be selected to ensure that they fit with the landscape.</td></tr>
<tr><td>Indicative Frame Material</td><td colspan="2">Anodized aluminium alloy</td></tr>
<tr><th colspan="3">PV Module Mounting Structure</th></tr>
<tr><td>Minimum Height of Lowest Modules (agl)</td><td colspan="2">• FSF: max. 800mm
• SAT: max. 800mm</td></tr>
<tr><td>Maximum Height of Highest Modules (agl)</td><td colspan="2">• FSF: max. 3300mm
• SAT: max. 3200mm</td></tr>
<tr><td>Indicative Slope of PV modules from the horizontal</td><td colspan="2">• FSF: Between 18 – 25 degrees facing south;
• FSF: Modelling assumption is 20 degrees
• SAT: between 60 degrees (facing east in morning) and 60 degrees (facing west in evening)
• SAT: Rotational Axis Height – 2m.</td></tr>
<tr><td>Mounting Structure Material</td><td colspan="2">Anodised aluminium alloy or galvanised steel with rough matt finish</td></tr>
</table>

Solar PV Module	
Foundation Type	Pile driven, screw mounted or concrete shoes
Typical number of foundations	30 piles per full table and 15 piles per half table
Maximum Depth of Piles	2.5m

5.4. Inverters

5.4.1. Inverters are required to convert the DC electricity collected by the PV Modules into alternating current (AC) which allows the electricity generated to be exported to the National Grid. Inverters are sized to deal with the level of voltage and intensity, which is output from the strings of PV Modules.

5.4.2. There are two options for inverters:

- String Inverters; or
- Central Container Inverters.

String Inverters

5.4.3. String Inverters are small enough to be mounted to the Mounting Structures underneath the PV Modules. String Inverters are typically 700mm in length by 365mm in depth by 1,035mm in width. A String Inverter is required for every PV String.

5.4.4. Table 5.3 provides the indicative parameters for the string inverters.

Table 5.3: String Inverter Parameters

String Inverter - (these convert the direct current electricity collected by the PV modules into alternating current)		
Max. Number of String Inverters	1,474	
Maximum String Inverter Dimensions	Length	700mm
	Width	1035mm
	Depth	365mm
Mounting	Plate mounted to Mounting Structures	
Indicative colour	White/light grey	

Central Container Inverters

5.4.5. Central container inverters will typically be housed within a container measuring approximately 6m x 2.5m and 3.2m in height. The containers are typically externally finished in keeping with the prevailing surrounding environment, often utilising a green painted finish. The containers would typically be mounted on adjustable legs on an area of hardstanding. Alternative smaller cabinet inverters may also be considered.

5.4.6. Table 5.4 provides the indicative parameters for central container inverters.

Table 5.4: Central Container Inverter Parameters

Central Container Inverter (including transformer and switch gear)	
Maximum number of central container inverters	84
Type of central inverter	A pre-assembled container that houses Inverter, transformer

Central Container Inverter (including transformer and switch gear)		
	and switch gear to form a single contained unit.	
Type	Housed in containers or cabinents.	
Maximum Inverter dimensions	Length (m)	6
	Width (m) (agl)	2.5
	Height (m)	3.2
Indicative mounting / foundations	Mounted on 150mm legs on concrete pad surrounded by permeable hardstanding	
Indicative Colour	In keeping with prevailing surrounding environment, painted dark green / light grey	

5.4.7. A plan showing the illustrative elevations of the central container inverters is provided at Figure 5.3.

5.5. Transformers

5.5.1. Transformers are required to step up the voltage of the electricity generated by the PV Modules before it reaches the Primary Onsite Substation. If String Inverters are used, separate String Transformers are required which are typically housed indoors within a container and will be distributed throughout the Solar PV Site. Where Central Container Inverters are used the transformer is typically housed within same container as the Central Container Inverter or within a cabinet.

5.5.2. The dimensions of the String Transformers will typically be 6.5m x 2.5m and 3m in height. Transformer cabins are typically externally finished in keeping with the prevailing surrounding environment, often utilising a green painted finish. The configuration of equipment will depend on the iterative design process and influenced by technical and environmental factors.

5.5.3. Table 5.5 provides the indicative parameters for the transformers.

Table 5.5: String Transformer Parameters

String Transformer (these control the voltage of the electricity generated before it reaches the primary substation)		
Maximum Number of Transformers	66	
Type of transformer	Pre-assembled standalone unit	
Maximum Transformer Dimensions	Length (m)	6.5m
	Width (m)	2.5m
	Height (m) (agl)	3m
Indicative mounting / foundations	Mounted on concrete pad or concreate columns surrounded by permeable hardstanding	
Indicative colour	In keeping with prevailing surrounding environment, painted green	

5.5.4. A plan showing the illustrative elevations of the string transformers is provided at Figure 5.4.

5.6. Switchgears

5.6.1. Switchgears are the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used both to de-energise equipment to allow work to be done and to clear faults downstream.

5.6.2. Switchgears are typically housed indoors within the same container as the String Transformer or the Central Container Transformer with a typical footprint of 6.5m x 2.5m and 3.2m in height.

5.6.3. The configuration of equipment will depend on the iterative design process as influenced by technical and environmental factors.

Plate 3: Example of Electrical Infrastructure Containers located within a solar array

5.6.4. Table 5.6 provides the indicative parameters for the switchgear containers.

Table 5.6: Switchgear Parameters

Switchgear - (this is a combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment)	
Maximum number of switchgear	81
Type	The switchgear may be an individual standalone unit within its own enclosure or may be pre-assembled with string transformers or central container inverters.

Switchgear - (this is a combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment)		
Type/configuration	Housed indoors within a container	
Maximum dimensions of switchgear	Length (m)	6.5
	Width (m)	2.5
	Height (m) (agl)	3.2
Indicative mounting / Mounting	Mounted on concrete pad or concrete columns surrounded by permeable hardstanding	
Indicative Colour	In keeping with prevailing surrounding environment, painted light grey / dark green	

5.6.5. A plan showing the illustrative elevations of the containers housing the switchgear is provided at Figure 5.4.

5.7. Primary Onsite Substation and Ancillary Buildings

5.7.1. There will be a single Primary Onsite Substation (400/33KV) located near the National Grid Ryhall Substation. The Primary Onsite Substation will comprise electrical infrastructure such as the transformers, switchgear and metering equipment required to facilitate the export of electricity from the Proposed Development to the National Grid. The Primary Onsite Substation is also expected to include Ancillary Buildings which will include office space and welfare facilities as well as operational monitoring and maintenance equipment. The indicative size of the primary substation compound is 100m x 200m, with a maximum height of buildings being 12.5m that allows for the Primary Onsite Substation and associated electrical control buildings & workshop buildings and Site office, storage and welfare building.

5.7.2. At this stage in the project, whilst the foul water strategy is yet to be finalised it is not anticipated that a connection to the public sewer network would be required.

5.7.3. Table 5.7 provides the indicative parameters for the substation and control building.

Table 5.7: Substation and Control Building Parameters

Primary Substation Compound				
Item	**Quantity**	**Length**	**Width**	**Height**
Primary substation compound	1	100m	200m	N/A
400/30kV transformer	1	14m	3.5m	6m
33kV Electrical compound control buildings	2	60	30	12.5
Harmonic Filter	3	30m	30m	12.5
Auxiliary Transformer	2	3m	4m	3m
Permanent plant storage buildings	1	10	10	2.5
Back-up power	1	15m	12.5m	12.5m
Welfare/Site Office	1	30m	20m	12.5m
Workshop/Store, Control Room/Permit Room and PRR/Battery/LVAC	1	30m	20m	12.5m

5.7.4. A plan showing the illustrative layout of the primary onsite substation is provided at Figure 5.5.

5.8. Onsite Cabling

5.8.1. Low Voltage Distribution Cabling between PV Modules and the String Inverters will typically be located above ground level (along a row of PV Tables), fixed to the Mounting Structure, and then trenched underground between the PV Tables and the Central Container Inverter or the String Inverters and String Transformer (subject to which technology is chosen). The dimensions of trenching will vary subject to the number of underground cables and the number of ducts they contain but will typically be up to 1m wide with a maximum depth of 1.3m and will be dependent on the method of installation and ground conditions. A plan showing the illustrative section of the cable trenches is provided at Figure 5.6.

5.8.2. Higher rated voltage cables (33kV) are required between the Central Container Invertors or String Transformers (subject to which technology is chosen) and the Primary Onsite Substation. It is anticipated that there will be one 33kV cable per five central invertors or string transformers (subject to which technology is chosen). The 33kV cables will be buried underground in a trench and have a minimum separation distance of 320mm between each cable. The routing of these cables has not yet been finalised, but it is anticipated that the 33kV cables will run alongside the internal access tracks to the access point onto the adopted highway. From that point the cables would either run within the adopted highway or would cross the adopted highway and run within the extents of the Solar PV Site or Mitigation and Enhancement Areas back to the Primary Onsite Substation. The indicative locations of the crossing points over the adopted highway are shown on Figure 5.7.

5.8.3. Cables will cross the existing below ground utility infrastructure at 90 degrees (perpendicular) to the alignment of the utility infrastructure. The cable crossings will be at least 600mm above or below the existing below ground utility infrastructure. Subject to ongoing engagement with utility providers there may be a requirement for horizontal directional drilling within the Solar PV Site to cross beneath existing below ground utility infrastructure.

5.8.4. Data cables will be required throughout the Solar PV Site to allow for the monitoring during operation, such as the collection of data on solar irradiance from pyranometers. The data cables would typically be installed within the same trench as the electrical cables.

5.8.5. The existing above ground powerlines across the Solar PV Site are not proposed to be altered by the Proposed Development. The offsets to these easements are to be discussed with the Statutory Undertakers as part of the ongoing design process.

5.8.6. Onsite cabling will be required to connect the Central Container Inverters or String Transformers (subject to which technology is chosen) located to the east of the East Coast Main Line to the Primary Onsite Substation which is located to the west of the East Coast Main Line. Three cable routes / methods are being considered, the location of which are shown on Figure 5.8:

- Option 1 - cables would be run through the existing brick culverts underneath the East-Coast mainline;
- Option 2 - Horizontal directional drilling (HDD) underneath the East Coast mainline; or
- Option 3 - cables to be routed within the adopted highway along the A6121 and Uffington Lane.

5.8.7. Table 5.8 provides the indicative parameters of the onsite cabling.

Table 5.8: Onsite Cabling Parameters

Onsite Cabling		
Low Voltage Distribution Cabling	Type	Low Voltage Distribution Cabling between PV Modules and the String Inverters will typically be located above ground level (along the PV Tables), fixed to the

Onsite Cabling			
		Mounting Structure, and then underground (between the PV Tables and the Central Container Inverter or between the String Inverters and the String Transformer). Higher rated voltage cables (around 33kV) are required between the String Transformers or Central Container Inverter and the Primary Onsite Substation.	
	Indicative cable trench dimensions	Depth	Max. depth 1.3m
		Width	Up to 1m
	Cable connection options	Option 1	Cables would be run through the existing brick culverts underneath the East Coast Mainline Railway
		Option 2	HDD underneath the East Coast Mainline Railway 500mm bore per 50MW AC generation, consisting of 3 x 200mm + 1 x 110mm. Maximum 5 bores distanced 5m centre to centre Maximum Depth – 12m Approximate length – 150m

Onsite Cabling			
		Option 3	Cables to be routed within the adopted highway along the A6121 and Uffington Lane

5.9. Electricity Export and Point of Connection to the National Electricity Transmission System

5.9.1. The electricity generated by the Proposed Development is expected to be exported via a 400kV connection between the Primary Onsite Substation and the National Grid Ryhall Substation at Uffington Lane which is a National Grid Electricity Transmission (NGET) substation. The grid connection cables to the National Grid Ryhall Substation will comprise three 400kV cables buried within a trench, up to 2m in depth. The three cables will have a minimum separation distance of 4,200mm. The depth and separation of the cables will be designed to meet electromagnetic frequency (EMF) requirements. The Grid Connection Route is expected to cross under Uffington Lane and run alongside the existing access track to the National Grid Ryhall Substation as shown on Figure 5.7.

5.9.2. The Grid Connection Route expected to be less than 350m from the Primary Onsite Substation to the National Grid Ryhall Substation.

5.10. Fencing, Security & Ancillary Infrastructure

5.10.1. A fence will enclose the operational area of the Proposed Development. The fence is likely to be a 'deer fence' (wooden or metal) and approximately 2m in height. Pole mounted internal facing closed circuit television (CCTV) systems installed at a height of up to 3.5m are also likely to be deployed around the perimeter of the operational areas. Access gates will be of similar construction and height as the perimeter fencing. Clearances above ground, or the inclusion of mammal gates will be included permit the passage of wildlife.

5.10.2. CCTV cameras would use night-vision technology with a 50m range, which would be monitored remotely and avoid the need for night-time lighting. No areas of the PV Arrays are proposed to be continuously lit. For security requirements, operational lighting would include Passive Infra-red Detector (PID) systems which would be installed around the perimeter of the Proposed Development.

5.10.3. The lighting of the Primary Onsite Substation would be in accordance with Health and Safety requirements, particularly around any emergency exits where there would be lighting, similar to street lighting that operates from dusk. Otherwise, lighting sensors for security purposes will be implemented around the Primary Onsite Substation.

5.10.4. The lighting design would seek to limit any impact on sensitive receptors.

5.10.5. Lightening protection masts will be up to 6m.

Plate 4: Example of security fencing and monitoring cameras

5.10.6. The indicative parameters for fencing and security CCTV are provided in Table 5.9 and 5.10, respectively.

Table 5.9: Parameters for Fencing

Fencing Parameters	
Fence Type	Deer fence (wooden or metal pole with wire mesh fence)
Fence Post Height	2.1m
Indicative depth of fence pole (bgl)	600mm
Mammal gates	Included

Table 5.10: CCTV Parameters

CCTV Parameters	
Indicative Number of CCTV Cameras	1,320

CCTV Parameters	
Type	Night-vision technology with 50m range
Support Column	Wooden Pole
Camera Height	Up to 3.5m
Indicative depth of CCTV pole (bgl)	1m
Camera Position	Pole mounted internal facing
CCTV /Lighting	Passive Infra-red Detector (PID) installed on perimeter. Lighting sensors implemented around primary onsite substation.

5.10.7. A plan showing the illustrative elevation of the fencing and access gates is provided at Figure 5.9.

5.11. Site Access

5.11.1. The primary point of access to the Proposed Development during the operational period is expected to be from Uffington Road, opposite the existing access to the National Grid Ryhall Substation, with vehicles approaching from the A6121 Stamford Road to the north. This point of access would provide access to the Primary Onsite Substation and Ancillary Buildings.

5.11.2. Six potential secondary points of access to the Solar Arrays have been identified in order to access the Solar PV Site, the details of which will be confirmed once the general arrangement and layout of the Proposed Development is further developed, although it is anticipated that access points would be located along Carlby Road, B1176 and/or minor roads between the B1176 and Pickworth. These secondary access points, along with a network of internal tracks, will provide operational access to the Solar Arrays and associated infrastructure for the purposes of management and maintenance.

5.11.3. The primary and secondary points of access will be taken from existing agricultural tracks and field entrances. A plan showing the preliminary locations of the primary and secondary access points is provided at Figure 5.10.

5.12. Access Tracks

5.12.1. It is anticipated that onsite access tracks will follow the alignment of the existing agricultural tracks, where possible, limiting the requirement for new drainage ditch crossings, disturbance to soils and habitat removal required access and circulate the Solar PV Site. New internal access tracks will be up to 3.5m wide, passing bays will be provided along the internal access tracks. The primary point of access into the Primary Onsite Substation will be 10.2m wide to facilitate two-way HGV traffic. The secondary points of access from the adopted highway will be up to 6.5m wide. The internal access tracks will likely be constructed of compacted stone with excavation kept to a minimum.

5.12.2. Where drainage is required, a ditch or a swale, with check dams, may be located downhill of the internal access track to control any potential for surface water run-off.

5.12.3. Table 5.11 provides the indicative parameters for permanent internal access tracks.

Table 5.11: Permanent Internal Access Track Parameters

Permanent Internal Access Road	
Maximum internal width	3.5m
Maximum width for secondary access to public highway	6.5m

Permanent Internal Access Road	
Maximum width for primary access to public highway	10.2m
Material	Compacted stone
Indicative fall	2 degree fall from centre line
Drainage	Ditch or swale where required

5.12.4. A plan showing the illustrative section of the internal access tracks is provided at Figure 5.11.

5.13. Green Infrastructure

5.13.1. The existing hedgerows, woodland, ditches, ponds and field margins will be retained within the layout of the PV Arrays, with the exception of small breaks and/or crossings required for new access tracks, security fencing and cable routes. Any breaks or crossing will be designed to use existing agricultural gateways/tracks between the fields and the width of any new breaks will be kept to a minimum.

5.13.2. The minimum offsets/buffers from the solar arrays or security, as set out in Table 5.13, will be incorporated within the design of the Proposed Development, with the exception of where access tracks, security fencing and/or cable routes are required to cross an existing feature. These offsets/buffers have been established based on best practice and guidance and will be used to deliver additional planting of diverse habitats to either increase habitat connectivity and structural diversity through combinations of hedgerow, scrub, grass / wildflower planting. The buffers/offsets are a minimum and for example may be increased to deliver further mitigation or enhancements and/or respond to root protection areas where required.

Table 5.13: Minimum Offsets to Landscape and Ecological Features and Designations

Landscape / Ecological Feature & Designations	Minimum Offset to Solar Infrastructure*
Ancient Woodland & Woodland	15m
Veteran Trees	15 times the width of the stem diameter
Site boundary hedgerows	10m
Internal hedgerows	10m
Main river	10m
Ditches	6m
Local Wildlife Site	15m
Site of Special Scientific Interest	15m
Public Rights of Way	15m
Ponds not with great crested newt (GCN)	10m
Main badger setts	30m
* with the exception of where access tracks, security fencing and/or cable routes are required to cross an existing feature; however, these will be kept to a minimum.	

5.13.3. The existing Public Rights of Way (ProW) that cross the Solar PV Site and Ecological Mitigation an Enhancement Areas will be retained and incorporated within multifunctional green corridors. Subject to the construction phasing and methodology there may be a requirement to temporarily divert or close a PRoW for a period during the construction phase.

5.13.4. The Mitigation and Enhancement Areas as identified on Figure 5.1 will also provide areas for green infrastructure, including the creation of wildflower grassland adjacent to the West Glen River and the small valley in the north-west of the Site. The majority of the fields within the Mitigation and Enhancement Areas will continue to be farmed under arable rotation with additional measures to support skylarks. The Green Infrastructure Strategy within Mitigation and Enhancement Areas along with Solar PV Site will be used to deliver a minimum 10% net gain in biodiversity.

5.14. Construction

Construction Programme

5.14.1. The construction phase is anticipated to take 24 months and subject to being granted consent the earliest construction is anticipated to start is Summer 2026. The final programme will be dependent on the final layout design and potential environmental constraints on the timing of construction activities. The ES will provide further details of the construction activities, their anticipated duration and indicative programme of each phase of construction works.

Construction Activities

5.14.2. The indicative construction activities likely to be required as provided below (not necessarily in order):

- Site preparation:
  - Delivery of construction materials, plant and equipment (see Plate 5)
  - The establishment of site fencing (see Plate 6)
  - The establishment of the primary and secondary temporary construction compound(s) (see Plate 7)

- The upgrade of existing tracks and construction of new tracks required (see Plate 8)
- The upgrade or construction of crossing points (bridges/culverts) over drainage ditches and below ground utility infrastructure
- Marking out location of the infrastructure (see Plate 9a)

- Solar Farm construction:
  - Delivery of Proposed Development components
  - Erection of Mounting Structures (see Plates 9a-d)
  - Mounting of PV Modules (see Plate 10)
  - Installation of Low Voltage Distribution Cables
  - Installation of String Transformer and / or Central Container Inverters
  - Construction of Primary Onsite Substation
  - Construction of onsite electrical infrastructure to facilitate the export of generated electricity.
- Testing and commissioning
- Reinstatement and habitat creation

Plate 5: Delivery of construction materials, plant and equipment to Site

Plate 6: Establishment of Site fencing

Plate 7: Establishment of the temporary construction compound(s)

Plate 8: Establishment of internal access tracks and crossing of underground utilities

Plate 9a: Marking out location of the infrastructure and installation of PV module mounting structures (1 of 4)

Plate 9b: Installation of PV module mounting structures (2 of 4)

Plate 9c: Installation of PV module mounting structures (3 of 4)

Plate 9d: Installation of PV module mounting structures (4 of 4)

Plate 10: Mounting of PV modules

Construction Access

5.14.3. The construction access strategy is still being discussed with the relevant highway authorities. Three initial options have been considered for construction traffic (HGVs) to access the Solar PV Site from the Strategic Road Network:

- Route 1 proposes to access the Solar PV Site from the A1, which forms part of the SRN via the B1081 Old Great North Road, Ryhall Road, and the A6121 Essendine Road.
- Route 2 proposes to access the Solar PV Site from the junction of the A47 with the A15 at Peterborough, which forms part of the SRN via the A15, the A1175 Main Road, Uffington Road, the A6121 Ryhall Road, and the A6121 Essendine Road.
- Route 3 proposes to access the Solar PV Site from a similar route to that identified for Route 2 from the junction of the A47 with the A15 via the A15, Raymond Mays Way (south of Bourne), West Road, and the A6121 Stamford Road.

5.14.4. Whilst the above proposed routes have been considered and discussed with National Highways and the local highway authorities, RCC and LCC, the details of the construction traffic management plan will be developed further once additional information is available on the bespoke development requirements. Whilst it is yet to be finalised the emerging preference is for HGVs to access the Solar PV Site from the SRN via Route 1 and then exit the Solar PV Site to the SRN via Route 3. This approach reduces the amount of HGV traffic along any given Route and avoids the need for localised highway improvements, especially along Route 1, where the verges are designated as a SSSI. Where required, the details of any localised highway improvements will be detailed within the ES and agreed with the relevant local highway authorities.

5.14.5. It is expected that a large transformer (in excess of 100 tonnes) will be required, therefore an Abnormal Indivisible Load (AIL) assessment will be undertaken. At this stage in the process, Route 1 is the preferred entry and exit route for AIL and segments of this route have been included within the redline boundary extents as initial swept path analysis along this route has identified the potential need for temporary localised road widening, temporary adjustments to the highway arrangement and/or street furniture, or other highway improvements between the A1 and the Solar PV Site. Further swept path analysis needs to be undertaken as well as consultation with the Local Highways Authority to discuss and agree the approach to any temporary measures required. Any works and associated mitigation measures along this route will be clearly described and assessed within the ES.

5.14.6. The ES will provide the final estimations on the type of construction vehicles, the number of construction vehicles, and the numbers of staff required during the construction phase, broken down by each respective phase of construction to identify any peaks or periods where the cumulative impact of construction may be greater.

5.14.7. Whilst the final details are yet to be agreed, the method for predicting the potential traffic flows has been discussed with consultees and at this stage, the preliminary analysis anticipates that during the peak construction period, there could be 54 two-way HGV deliveries per day. As the design of the Proposed Development is refined the peak traffic flows will be reviewed and discussed with the relevant stakeholders. The ES will set out the further details regarding the peak construction traffic flows. In addition, there will be Light Goods Vehicle (LGV) movements associated with deliveries and car movements associated with construction worker arrivals and departures.

5.14.8. Typical construction vehicles will include excavators, ramming machines, cable layers, low loaders, crane and waste vehicles, trenchers, telehandlers, forklift trucks and tractors/trailers. The number of HGV and LGV movements will be confirmed in the ES.

5.14.9. Whilst the final details are yet to be agreed, it is anticipated that the construction phase will require an average of between 100 - 150 workers onsite with a maximum of up to 400 construction staff at the peak construction period.

5.14.10. Table 5.14 provides the indicative parameters for construction staff. Details of the anticipated abnormal indivisible loads (AILs) and construction equipment and parameters are provided in Table 5.15.

Table 5.14: Construction Staff Parameters

Construction Staff & Parking	
Number of construction staff	Average of 100 – 150. Peak of 400
Dedicated construction car park	Construction workforce car parking co-located with primary construction compound. Workers shuttled to temporary construction compounds
Construction Hours	7am until 7pm Monday to Saturday. Working days will be one 12-hour shift.

Table 5.15: AIL and Large Construction Equipment Indicative Parameters

AILs and construction equipment	
Details of large construction equipment and AIL's	80 tonne crane 400 tonne crane 1000 tonne crane STGO CAT 2 Low Loader (AIL)

AILs and construction equipment	
	STGO CAT 3 Low Loader (AIL)
Details of crane for unloading at secondary compounds.	80 tonne crane
Construction Vehicles	Excavators, cranes, ramming machines, telehandlers, cable layers, cable pullers, trenching machines, loaders, graders, compactors, forklifts, tractor/trailer.
Internal construction movements	Deliveries made to primary construction compound, unloaded and then transferred to secondary compounds.

Temporary Construction Compound

5.14.11. During the construction phase, a primary construction compound is expected to be located onsite with temporary secondary construction compound(s) provided at different locations throughout the Solar PV Site. The indicative locations of the primary and secondary construction compounds are shown on Figure 5.12, further details (including location, scale and duration) will be set out and described within the ES.

5.14.12. Table 5.16 provides the indicative parameters for the primary and secondary construction compounds.

Table 5.16: Primary and Secondary Construction Compound Parameters

Construction Compounds	
Primary Construction Compound	1 primary construction compound located to the east of Uffington Lane directly opposite Ryhall Substation

<table>
<tr><th colspan="4">Construction Compounds</th></tr>
<tr><td rowspan="4"></td><td rowspan="2">Indicative dimensions</td><td>Length (m)</td><td>200</td></tr>
<tr><td>Width (m)</td><td>200</td></tr>
<tr><td>Material</td><td colspan="2">Crushed stone</td></tr>
<tr><td>Drainage</td><td colspan="2">Infiltration or attenuated</td></tr>
<tr><td rowspan="4">Secondary compounds</td><td colspan="3">Up to 6 which would contain laydown area and staff welfare facilities</td></tr>
<tr><td rowspan="2">Indicative dimensions</td><td>Length (m)</td><td>100</td></tr>
<tr><td>Width (m)</td><td>100</td></tr>
<tr><td>Material</td><td colspan="2">Crushed stone</td></tr>
<tr><td>Delivery between primary and secondary compounds</td><td colspan="3">Materials would be delivered to the primary construction compound, unloaded and stored until required. Tractor and trailers (or alternative) would then distribute materials to secondary temporary compounds when required</td></tr>
</table>

5.15. Construction Reinstatement and Habitat Creation

5.15.1. A programme of landscape and habitat reinstatement and creation will commence during the construction phase. It is anticipated that areas under the PV Arrays and the landscape buffers will be planted with a combination of native grassland mix, wildflower mixes, scrub and hedgerows. Woodland blocks and belts will be planted in strategic locations to provide visual screening, ecological habitats in order to achieve a minimum 10% biodiversity net gain.

5.16. Construction Environmental Management

5.16.1. An Outline Construction Environmental Management Plan (oCEMP) will be submitted to support the DCO Application. The oCEMP will set out legislation, guidance, best practice guidance and the mitigation measures identified through the EIA process to be employed during construction phase, such as construction lighting avoiding ecological sensitive habitats. The oCEMP will form the framework for a detailed CEMP that will be agreed with the local planning authority prior to construction. A draft oCEMP has been prepared for statutory consultation and is included at Appendix 5.1.

5.17. Construction Traffic Management

5.17.1. An Outline Construction Traffic Management Plan (oCTMP) including details on construction logistics and construction worker travel will be submitted in support of the DCO Application that will include information to guide the delivery of material, plant, equipment and staff during the construction phase. A draft Outline Construction Traffic Management Plan (oCTMP) has been prepared for statutory consultation and is included as an appendix to Chapter 9 (Access and Highways) of the PEIR at Appendix 9.4.

5.18. Operation

5.18.1. The operational life of the Proposed Development is not proposed to be specified in the application and the Applicant is not seeking a time limited consent. At the stage of preparing this PEIR there is nothing to suggest that there is any environmental reason why such a limit would be appropriate in planning terms. During the operational phase of the Proposed Development, onsite activities would include routine servicing, maintenance and replacement of solar equipment as and when required, as well as management of vegetation. Any solar equipment that requires to be replaced during the operational period will be disposed of following the waste hierarchy, with materials being reused or recycled wherever possible. Any electrical waste will be disposed in accordance with the Waste from Electrical and Electronic Equipment (WEEE) regulations, minimising the environmental impact of the replacement of any elements of the Proposed Development.

5.18.2. The EIA will be carried out on the basis that the Proposed Development is permanent, to ensure a worst-case assessment of likely significant effects.

5.18.3. At this stage of the project, it is anticipated that there would typically be up to four permanent staff onsite during the operational phase of the Proposed Development, with additional staff attending when required for maintenance, replacement of solar equipment and cleaning, up to a total of 20 staff per day. The ES will confirm the likely operational traffic flows.

5.18.4. In the event of the need to replace any of the operational equipment of the Proposed Development, there may be a level of HGV activity required to replace equipment onsite. However, this will be on an ad-hoc, low frequency basis only.

5.18.5. The land underneath and around the PV Arrays could be managed through a combination of sheep grazing and/or hay/silage production in order to maintain the field vegetation during the operational phase of the Proposed Development.

5.18.6. The management of the landscape and ecological features will be undertaken in accordance with a detailed Landscape and Ecological Management Plan (LEMP) that will be secured via a requirement of the DCO. The framework of a draft outline Landscape and Ecological Management Plan (oLEMP) has been prepared and included at Appendix 5.2 of this PEIR. The content and detail of the oLEMP will be further developed and included with the Outline Operational Environmental Management Plan (oOEMP) to be submitted in support of the DCO Application.

5.18.7. Table 5.17 summaries the anticipated number of staff and associated vehicle type required for the operation of the Proposed Development.

Table 5.17: Staff numbers and type of vehicle

Operation	
Typical Number of Staff onsite	4 –with additional staff attending when required for maintenance and cleaning, up to a total of 20 staff per day.
Type of vehicle	LGV & HGV

5.19. Decommissioning

5.19.1. The Applicant is not seeking a time limited consent. The operational life of the Proposed Development will not be specified within the DCO Application. However, it is recognised that the electrical infrastructure will have an operational lifespan, after which it will need to be replaced or removed.

5.19.2. For the purposes of the assessing decommissioning with the EIA, it has been assumed that the Proposed Development has a 40-year operational life span. The assessment does not assume that the operational phase will be limited to 40 years as the solar infrastructure may continue to be operating successfully and safely beyond this period.

5.19.3. It is proposed that the Applicant will commit to decommissioning the Proposed Development when it ceases being operational; however, no time limit will be set for this.

5.19.4. It is anticipated that all the solar infrastructure including PV modules, mounting structures, cabling on or near the surface, inverters, transformers, switchgear, fencing and ancillary infrastructure would be removed and recycled or disposed of in accordance with good practice following the waste hierarchy, with materials being reused or recycled wherever possible. All waste will be disposed of in accordance with the legislation at the time of decommissioning.

5.19.5. The future of the substation and control building would be agreed with National Grid prior to commencement of decommissioning. Any requirement to leave the internal access tracks would be discussed and agreed with the landowners at the time of decommissioning. The Solar PV Site would be reinstated in accordance with a Decommissioning Environmental Management Plan (DEMP). The DEMP will be required to be in accordance with an outline Decommissioning Environmental Management Plan (oDEMP) which will be submitted with the DCO Application. The DEMP will be subject to the approval of the local planning authorities. It is likely that decommissioning would include the removal of any permissive paths and potential reversion of grassland underneath the PV Arrays. Any landscape structural planting, such as tree planting, hedgerows, scrub etc created to deliver biodiversity mitigation and enhancement associated with the Proposed Development that have potential to contain protected species would be left in-situ. A draft oDEMP, setting out the framework and principles, has been prepared and is included at Appendix 5.3 of this PEIR.

5.19.6. Decommissioning is anticipated to take approximately six to twelve months.

5.19.7. The effects of the decommissioning phase are often similar to, or of a lesser magnitude than the effects generated during the construction phase and will be considered in the relevant sections of the ES. However, there can be a high degree of uncertainty regarding decommissioning as engineering approaches and technologies evolve over the operational life of the Proposed Development, and assumptions will therefore be made, where appropriate.

5.20. Rochdale Envelope and Design Principles

5.20.1. As explained in Chapter 2 (Overview of the EIA Process), EIA is the iterative process in which the assessment of environmental impacts is undertaken in parallel with the design process of the Proposed Development. The design and layout of the Proposed Development will evolve in response to the identification of specific constraints and opportunities. The comments made in response to this PEIR will also influence the final design and layout of the Proposed Development.

5.20.2. In order to maintain flexibility in the design and layout, the Proposed Development will adopt the Rochdale Envelope approach by specifying parameter ranges which will be defined in the Project Description chapter of the ES and the draft DCO. The indicative parameters are presented in this chapter based on the current design and have informed the preliminary assessments presented in this PEIR. The final design parameters will be considered in detail by environmental chapter authors in the ES to ensure that the realistic worst-case of the Proposed Development are assessed for each potential receptor.

5.20.3. Whilst the detailed design won't be fixed within the DCO application, a series of Design Principles will be developed for the Proposed Development. The purpose of the Design Principles is to set a framework that can be used by the Local Planning Authority to control the detailed design of the Proposed Development beyond the written and spatial parameters. The Design Principles for the Proposed Development will align with the core purposes and ambitions of the 'Design Principles for National Infrastructure' which are Climate, People, Places and Value. The NIC defined the role of principles as:

"Principles should act as reminders to the delivery organisation, a steer in the right direction, and a means of restoring focus to the big picture…Design Principles should be a point of departure, setting out a common understanding [of] the issues to be addressed.” (Developing Design Principles for National Infrastructure (NIC, 2018)).

5.20.4. The project principles for the Proposed Development, which were set out in the Stage One Consultation material, have been refined to reflect the feedback during the Stage One consultation. The principles will be refined in response to the ongoing EIA and stakeholder engagement and will be secured through the DCO. Further information regarding the project principles can be found within the Main Consultation document which has been published alongside this PEIR.

Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 6: Landscape and Visual

May 2022

6.0 Landscape and Visual

6.1. Introduction

6.1.1. This chapter covers the approach to the assessment of the potential effects of the Proposed Development on the landscape and visual resources within and around the Solar PV Site and Mitigation and Enhancement Areas (Figure 3.1). The Solar PV Site area and Mitigation and Enhancement Areas, as shown by the redline on Figures 6.1 to 6.7, represents the main development area and excludes areas of the Site required for Potential Highways Works Site as any works are anticipated to be minimal and will not lead to significant landscape or visual effects. This will be reconsidered within the ES when further information is available. It is therefore reasonable to focus on the Solar PV Site area together with the Mitigation and Enhancement Areas for the assessment of landscape and visual effects. The chapter describes potential effects on the receiving landscape character and on the public's views arising from the construction, operation and decommissioning phases of the Proposed Development. Related aspects concerning Residential Visual Amenity Assessment (RVAA) and Amenity and Recreation (A&R) are considered as separate topics outside of the Landscape and Visual Impact Assessment (LVIA) and are appended at Appendix 6.4 and Appendix 6.5, respectively.

6.2. What might be affected by the Proposed Development?

6.2.1. Potential landscape effects derived from the Proposed Development could include effects on the local landscape character where the character of agricultural fields would change to that of a Solar Farm. Potential visual effects derived from the Proposed Development could include effects on the visual resource experienced by people in and around the Solar PV Site and Mitigation and Enhancement Areas where views may change from open outlook across agricultural fields, to views across the Proposed Development, broken up by and contained within the existing field parcel, hedgerow and woodland block network that covers the Solar PV Site and Mitigation and Enhancement Areas and surroundings.

6.2.2. The Solar PV Site and Mitigation and Enhancement Areas occupy an agricultural landscape, of gently undulating terrain (see Figure 6.1) interspersed with scattered woodland and connecting tree belts / hedgerows. The land use is generally arable farmland, of a large-scale contained by a network of clipped hedgerows. The existing East Coast Mainline Railway, with its overhead gantries, is a distinctive feature visible in many of the wider views, and industrial elements including large buildings south of Essendine, and electricity pylons also contribute to more urbanising elements centrally and along a north-south axis through the Solar PV Site and Mitigation and Enhancement Areas. The East Coast Mainline railway (and West Glen River corridor) forms a distinctive linear feature north to south through the centre of the Solar PV Site and Mitigation and Enhancement Areas. Field parcels to the west of the East Coast Mainline railway tend to be more enclosed (opening up towards the north) whilst east, longer views are available from more elevated areas within the Solar PV Site and Mitigation and Enhancement Areas, with fewer woodland stands and boundary vegetation. However, the gently undulating terrain combined with woodland stands, vegetated field boundaries and roadsides act to provide a wooded backdrop to many views and, therefore, screening the Solar PV Site from further afield, limiting distant views from outside of the Solar PV Site.

Designated landscapes

6.2.3. The Solar PV Site does not lie within any national landscape designations. The nearest such designation is the Norfolk Coast Area of

Outstanding Natural Beauty (AONB) is located over 50km east of the Solar PV Site. Two local designations identified in the old 2001 Rutland Local Plan policy are located approximately 1km west of the Solar PV Site, including an ‘Area of Particularly Attractive Countryside’ (approximately 1.3km northwest towards The Grange), and an ‘Area of Local Landscape Value’ (approximately 850m west of the Solar PV Site, close to Ryhall) (see Figure 6.2). It is important to note that these designations are not retained in the adopted Local Development Framework planning policy. However, reference to these local designations is made within current evidence base documents including the 2012 Landscape Sensitivity and Capacity Studies (for Service Centres and Wind Turbines). These documents have been used to aid preliminary judgements and inform design development but are not assessed directly. It is also important to note that the nature of Solar Farm development is very different in character to wind energy developments which is the basis of assessment for one of these studies.

6.2.4. Three Registered Parks and Gardens (RPGs) are located within the Study Area (see Figure 6.2) including the:

- Grade II listed Greatford Hall, located approximately 1.3km east of the Solar PV Site;
- Grade II listed Uffington Park, which is located approximately 1.5km south of the Solar PV Site; and
- Grade II* listed Burghley House RPG, which is located approximately 2.5km south of the Solar PV Site.

6.2.5. In accordance with the methodology, RPGs are not assessed as part of the LVIA but are used to inform the consideration of the value of character areas in which they lie.

6.2.6. At a national landscape scale, the Solar PV Site and Mitigation and Enhancement Areas lies within The Kesteven Uplands National Character Area (NCA 75) (Natural England, 2014) (see Figure 6.3). This provides context to the wider character of the landscape and in accordance with the LVIA methodology use to provide context.

6.2.7. At a local landscape scale, the Solar PV Site and Mitigation and Enhancement Areas extend over two landscape character areas including the Rutland Plateaux D(ii) Clay Woodlands (as identified within the Landscape Character Assessment of Rutland (2003)); and the Kesteven Uplands (identified within the South Kesteven Landscape Character Assessment (2007)). The majority of the central and north-western parcels of land within the Solar PV Site and Mitigation and Enhancement Areas are located within the eastern perturbance of the Rutland Plateaux D(ii) Clay Woodlands, whilst the southern extent of the Solar PV Site (beyond the Belmesthorpe to Greatford local road), the eastern extent of the Solar PV Site and Mitigation and Enhancement Areas (south-east of Grange Farm) and a field parcel at the north-western extent of the Solar PV Site and Mitigation and Enhancement Areas (Barbers Hill) lie within the Kesteven Uplands (see Figure 6.4). Further landscape character areas present within 2km Study Area identified from the local landscape character assessments and addressed within the LVIA include those listed below; however, due to their location outside of Solar PV Site, and distance from, the Solar PV Site, and intervening landscape features limiting potential intervisibility informed by a ZTV and Site visit, potential landscape effects on the character of these areas are unlikely to be significant:

- Rutland Plateau - Gwash Valley (Diii) Landscape Character Assessment (LCA) (David Tyldesley and Associates, 2003), located approximately 600m south-west of the Solar PV Site;

- Welland Valley LCA (Peterborough City Council, 2007), located approximately 2.1km south of the Solar PV Site; and
- Nassaburgh Undulating Limestone LCA (Peterborough City Council, 2007), located approximately 2.4km south of the Solar PV Site.

Settlements

6.2.8. The settlement pattern includes nucleated built form of towns and villages within the landscape, and isolated farmsteads associated with large scale agricultural land. The nearest larger settlements to the Solar PV Site include: the village of Essendine, situated adjacent to the Solar PV Site; Ryhall, located approximately 500m in the west; and the larger conurbation of Stamford, located approximately 1.5km to the south-west of the Solar PV Site. Further smaller settlements in close proximity to the Solar PV Site include Belmesthorpe (located approximately 700m west), Uffington (located approximately 1.5km south), Greatford (located approximately 1.5km east), Braceborough (located approximately 1.1kmm north-east) and Carlby (located approximately 450m north).

Public Rights of Way

6.2.9. A network of Public Rights of Way (PRoW) traverse the landscape in and around the Solar PV Site and Mitigation and Enhancement Areas and often terminate at roads limiting connectivity (see Figure 6.5). The Macmillan Way long distance footpath traverses the Solar PV Site and Mitigation and Enhancement Areas connecting Stamford (located south-west of the Solar PV Site) with Pinchbeck in the north-east and beyond to Boston on the east coast. Along this route, the Macmillan Way skirts the northern edge of Fields 45, 46, 47 and 48 (as indicated in Figure 3.2) and continues north-east along a local road that connects Belmesthorpe with Greatford. Views into the Solar PV Site from along the Macmillan Way are limited by existing vegetation lining the roadsides and field boundaries along the length of this route. Other PRoW, including bridleways (BrAW/1/1 and E169/1) and footpaths (Uffi/5/1, BrAW/9/1, BrAW/7/1 and BrAW/3/1) that route through the Solar PV Site and Mitigation and Enhancement Areas, afford a mixture of short distance views over individual field compartments that are contained by field boundary vegetation and woodland blocks, and more extensive, longer distance views over larger field parcels from more elevated areas over the wider landscape. Additionally, a Byway Open to All Traffic (BOAT) aligning to the route of 'The Drift' runs roughly west to east along the southern edge of the Solar PV Site in the northwest, and comprises a rough dirt track at the westernmost extent of the Solar PV Site becoming hard surfaced eastwards of Fields 1 and 2 before connecting to footpath E168. Views are generally channelled along the length of this route with views into the Solar PV Site greatly limited to glimpsed short distance views over individual field compartments. These routes are considered in more detail as part of the A&R assessment (provided at Appendix 6.4).

6.3. How have we assessed the effects relating to this topic?

6.3.1. This section of the chapter describes the approach to the LVIA, including the extent of the study area, the location of viewpoints and key reference documents that will inform the assessment of potential landscape and visual effects.

6.3.2. The landscape assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to landscape and visual effects is described in Appendix 6.1.

6.3.3. A desktop assessment of potential landscape and visual receptors has been undertaken, supported by site visits (undertaken in October 2021, and February 2022) to understand the baseline conditions of the Solar PV Site and Mitigation and Enhancement Areas, its landscape character and visual context. Several viewpoints have been identified from within and around the Solar PV Site from publicly accessible locations to understand the nature of existing views towards and within the Solar PV Site to inform the assessment.

Legislation, Planning Policy and Guidance

6.3.4. There is no legislation relevant to the landscape and visual assessment for the Proposed Development.

6.3.5. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

6.3.6. The PEIR has and the full LVIA in the ES will include an assessment of the effects of the Proposed Development on landscape character. Consideration will also be given to the effects of the Proposed

Development on the physical fabric of the Solar PV Site and Mitigation and Enhancement Areas itself. Reference is made to the following relevant landscape character and sensitivity assessments:

- National Character Area Profile 75: The Kesteven Uplands, Natural England (2014);
- The Landscape Character Assessment of Rutland, David Tyldesley and Associates (2003);
- South Kesteven Landscape Character Assessment (2007);
- Landscape Sensitivity and Capacity Study Land Around Local Service Centres, RCC (2012), and its Addendum (2017);
- South Kesteven Landscape Sensitivity and Capacity Study (2011);
- Peterborough Landscape Strategy: Landscape Character Assessment for Peterborough City Council, The Landscape Partnership Ltd (2007); and
- Carlby Landscape Character Assessment, Allen Pyke Associates (2017)

6.3.7. Paragraphs 5.13-5.15 of GLVIA3 indicates that landscape character studies at the national or regional level are best used to "*set the scene*" and understand the landscape context. It indicates that local authority assessments provide more detail and that these should be used to form the basis of the assessment of effects on landscape character – with (appropriately justified) adaptation, refinement and interpretation where required. Therefore, the framework for the assessment of effects on landscape character are relevant local landscape character areas as identified within local landscape character assessments, informed by other sources listed above; relevant policy and guidance documents; and field observations.

6.3.8. Landscape related policy derived from relevant local plans have also been used to inform the Proposed Development and suitable design responses.

6.3.9. The approach to the assessment of landscape and visual effects considers both impacts to landscape and visual receptors drawing upon the established and best practice standards. These include:

- The Guidelines for Landscape and Visual Impact Assessment (3rd Edition) (GLVIA3), Landscape Institute and Institute of Environmental Management and Assessment (IEMA), 2013;
- An Approach to Landscape Character Assessment, Natural England, 2014: and
- Visual Representation of Development Proposals Technical Guidance Note 06/19, Landscape Institute, 2019.

6.3.10. Whilst not directly affecting the assessment of the design in landscape and visual terms, these guidance documents have been used to ensure the mitigation by design approach works in in a way that is functional, respective of, and fitting for the locality and identified landscape related objectives.

- Space for Wildlife, Leicester, Leicestershire and Rutland Biodiversity Action Plan 2016 – 2026; and
- Lincolnshire Biodiversity Action Plan 2011-2020 (3rd edition) Lincolnshire Biodiversity Partnership.

Viewpoints and Visual Receptors

6.3.11. A wide variety of visual receptors can reasonably be anticipated to be potentially affected by the Proposed Development. A Zone of Theoretical Visibility (ZTV) modelling (see Figure 6.6) and fieldwork have been used to determine which visual receptors are likely to be affected and merit detailed consideration in the assessment effects. In accordance with guidance (GLVIA3), representative, illustrative, and specific viewpoints may be identified to inform the assessment.

6.3.12. It is important to note that the ZTV represents a theoretical model of potential visibility of the Proposed Development and is based on a computer-generated surface model that does not account for localised features such as small woodland copses, hedgerows or individual trees; and / or small elements of built form. As a result, the extent of actual visibility on the ground will be less than suggested by the ZTV study.

6.3.13. . Within this PEIR, 14 Representative Views within and around the Solar PV Site have been identified and are shown as photopanels on Figure 6.8 (with viewpoint locations shown on Figure 6.6). In each case the existing view is summarised and the likely visibility of the Proposed Development within these views described. Further viewpoints including illustrative and/or specific views may be included within the LVIA of the ES and will be agreed with local authorities. Winter photography from these viewpoints was undertaken in February 2022 to aid assessment and inform design development from a worst-case visibility perspective (when deciduous species' are not in leaf).

6.3.14. Photomontages to demonstrate anticipated views resulting from the Proposed Development have been produced from selected viewpoints. These are undertaken for year 1 when the Proposed Development would be built but before proposed mitigation planting has matured, and at year 15, following establishment of proposed mitigation planting.

6.3.15. The photomontages illustrate the fixed, south facing central inverter development option as this represents the highest height of the PV Arrays (3.3m) and larger inverter type (as opposed to string inverters) therefore representing the maximum built parameters of the proposed PV array. The Single Axis Tracking PV Arrays would be lower in height and whilst of different orientation, would not result in any difference in terms of landscape and visual effects to that of the fixed south facing option.

Study Area

6.3.16. Based on the findings of field survey, preliminary ZTV modelling as set out in the Scoping Report, desk-based analysis, and previous experience of similar recent projects of this nature, a study area defined by a 2km radius from the Solar PV Site and Mitigation and Enhancement Areas boundary has been identified and is used for the purposes of the LVIA. The ZTV study indicates limited and fragmented potential visibility of the Proposed Development beyond 2km due to landscape topography in combination with intervening built form and/or vegetation, any landscape and visual effects beyond 2km are unlikely to be potentially significant. Based on this analysis, it is judged that a 2km study area would cover all potential significant landscape and visual effects arising from the Proposed Development and any associated construction and decommissioning works.

6.3.17. The study area includes the settlements of Essendine, Ryhall, Belmenthorpe, and fringes of Stamford, scattered properties as well as recreational routes, PRoW (footpaths, bridleways etc.) and local roads (see Figure 6.5).

Assumption and Limitations

6.3.18. For the Proposed Development the ZTV has been modelled on a worse-case scenario with PV Array heights at 3.5m as per the EIA Scoping Report and Primary Onsite Substation area at 13m. The maximum heights of the PV Arrays and Onsite Substation have been reduced from the parameters set out in the EIA Scoping Report and therefore it is considered that the ZTV represents a worst case for establishing the study area. The ZTV will be updated to reflect the parameters in the ES.

6.3.19. The change in precipitation levels as a result of climate change is not anticipated to have a material impact on existing or proposed vegetation. The rise in temperature has the potential to effect, the growth rates of vegetation and the species composition but it is considered that it wouldn't materially alter the provision of screening mitigation as a rise in temperature will be considered in the planting specification that will be set out within the LEMP, which will be secured via a DCO Requirement.

Overview of Assessment of Significance

6.3.20. The sensitivity of receptors, magnitude of impact and significance of effect is determined using both desktop review of published reports and guidance documentation in combination with Site visit assessment and professional judgements, supported by photography and photomontages following the established guidance detailed in GLVIA3. Further detail on the LVIA methodology is provided at Appendix 6.1.

6.3.21. In accordance with the LVIA methodology, significant landscape and visual effects are considered to be those of Major-Moderate significance and above.

6.4. What are the potential environmental effects?

6.4.1. This section describes the potential landscape and visual effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development.

6.4.2. Potential effects to landscape and visual receptors include physical changes the fabric and character of the Solar PV Site, visual intrusion of the construction activities and visual intrusion of the Proposed Development in views, including PV Arrays, Primary Onsite Substation, associated infrastructure such inverters, fencing and internal access tracks. Lightening would be limited to the Primary Onsite Substation.

6.4.3. Due to the location of landscape and visual receptors within or in close proximity to the Proposed Development, the following landscape and visual receptors have been considered.

Landscape Receptors:

- Rutland Landscape Character Areas (see Figure 6.4):
  - Rutland Plateau Clay Woodlands (Dii) (Medium Sensitivity); and
  - Rutland Plateau Gwash Valley (Diii) (Medium Sensitivity);
- South Kesteven Landscape Character Areas (see Figure 6.4):
  - Kesteven Uplands (Medium Sensitivity);
- Grade II* Burghley House RPG (located approximately 1.5km south of the Solar PV Site), (considered as part of landscape value) (High-Medium Sensitivity);
- Grade II Greatford Hall RPG (located approximately 600m east of the Solar PV Site), (considered as part of landscape value) (High-Medium Sensitivity);
- Grade II Uffington Park RPG, (located approximately 650m south of the Solar PV Site), (considered as part of landscape value) (High-Medium Sensitivity); and
- Rutland Local Plan 2001 designations: Area of Local Landscape Value (Ryhall), and Area of Particularly Attractive Countryside (Pickworth) (No longer official designations but used to inform the

judgement of value on landscape character, see Figure 6.2 for locations).

Visual Receptors:

6.4.4. Visual effects are assessed for groups of visual receptors within close proximity of each other and that are judged to experience similar visual effects arising from the Proposed Development. These are referred to as 'visual receptor groups' and include motorists on local roads, users of PRoW and local residents, workers or visitors to settlements. The following visual receptors have been considered:

- Local residents and visitors;
- Users of Macmillan Way Long Distance Footpath;
- Users of PRoW;
- Users of local roads;
- Users of the East Coast Mainline Railway; and
- Workers generally.

6.4.5. The ZTV illustrates that the visibility of the Proposed Development would be relatively limited across the study area, with substantially reduced visibility to the east as the landform descends towards Braceborough, Greatford, and Tallington, and south / south-west towards Stamford, primarily as a result of landform combined with intervening vegetation. Potential visibility of the Proposed Development extends north-westwards towards Pickworth; however, this visibility is likely fragmented due to the undulating landform and intervening vegetation, including woodland stands. Potential visibility of the Proposed Development is also likely fragmented from areas to the north of the Solar PV Site either side of the East Coast Mainline railway corridor, becoming slightly more visible north-east towards Witham on the Hill. In this area, scattered large woodland stands are characteristic of the landscape and serve to break up views of the Solar PV Site and screen views from areas beyond.

6.4.6. The anticipated main area of visibility, hereafter referred to as the 'Zone of Visual Influence' (ZVI), is described below and shown on Figure 6.7. Preliminary desk-study and Site visit fieldwork indicate that potential landscape character and visual effects would likely be limited to the Solar PV Site and Mitigation and Enhancement Areas and its local context up to approximately 500m north, south, and west. Areas at greater distances from the Solar PV Site and Mitigation and Enhancement Areas in these respective directions are unlikely to experience notable or perceptible change to their prevailing characteristics, owing to the limited intervisibility of the Proposed Development as a result of intervening vegetation, existing built development and landform. Taller elements of the primary substation may be glimpsed visible but would be small features within the view and not change the overall visual composition.

6.4.7. The following visual receptor groups have been identified within the extent of the 2km study area and are indicated on Figure 6.7:

- Receptor Group 1 – Areas within the Site boundary. Judged to be High-Medium Sensitivity.
- Receptor Group 2 – Essendine and immediate surroundings north. Judged to be High-Medium Sensitivity.
- Receptor Group 3 – Carlby and local area, extending from Essendine in the south to field boundaries conforming to a ridgeline in the landscape in the north, and from the East Coast Mainline Railway line in the west, up to and including the village of Carlby in the east and the A6121 Stamford Road. Judged to be High-Medium Sensitivity.

- Receptor Group 4 – Agricultural land adjacent to Site, north, extending from the A6121 Stamford Road in the west to Braceborough Little Wood in the east, and from the Site Boundary in the south, approximately 800m northwards to a ridgeline in the topography and field boundaries which also align to the alignment of a disused railway line in this area. Judged to be Medium Sensitivity.
- Receptor Group 5 – Braceborough, Greatford and agricultural land extending from the eastern boundary of the Site up to approximately 1km at Greatford (east), and from eastern edge of Braceborough Little Wood in the north to Shillinthorpe Park in the south skirting the eastern boundary of the Site. Judged to be High-Medium Sensitivity.
- Receptor Group 6 – including agricultural land and scattered farms adjacent to the east of the Site from the western edge of Banthorpe Wood in the northeast to Maidens' Farm in the south (and east of the railway line) and extending west over the railway line at Banthorpe Lodge in this small pocket of land. Judged to be High-Medium Sensitivity.
- Receptor Group 7 – Southern Fringes extending from the southern Site boundary up to approximately 500m to local roads, field edges and Uffington including scattered farms and agricultural fields. Judged to be High-Medium Sensitivity.
- Receptor Group 8 – Western Fringes extending approximately 500m from the western Site boundary towards Belmesthorpe and Ryhall towards the south, and over adjacent fields in the north towards the Turnpole and Newell Woods, located on generally east facing sloping terrain. Judged to be High-Medium Sensitivity.
- Receptor Group 9 - Belmesthorpe and Ryhall extending from approximately 500m to 1.5km west of the Site (beyond a ridgeline in

the landform) including residents, visitors, users of local roads and PRoW. Judged to be High-Medium Sensitivity.

- Receptor Group 10 – Northern Fringes extending approximately 500m from the northern Site boundary up to the ridgeline in the landform associated with Barber's Hill, from Little Warren and the Heath Woodlands in the west up to the alignment of the Great Eastern Railway Line in the east. Judged to be High-Medium Sensitivity.
- Receptor Group 11 – Northern Countryside including scattered farms and local roads along this undulating terrain set behind an intervening elevated landform at Barber's Hill up to approximately 2km at the study area boundary. Judged to be High-Medium Sensitivity.
- Receptor Group 12 – Western elevations including countryside on undulating terrain, scattered farms, local roads and PRoW from approximately 500m west of the Site up to 2km at the edge of the study area in this direction. Judged to be High-Medium Sensitivity.
- Receptor Group 13 – Southern settled study area including the larger conurbation of Stamford and settlement of Uffington, scattered farms, local roads and PRoW, from approximately 500m south to 2km at the study area boundary. Judged to be High-Medium Sensitivity.

6.4.8. It is judged that for those visual receptors located outside of the ZVI there would be little to no visibility of the Proposed Development, and that effects would be Negligible at most. Visual receptors within receptor groups located outside of the ZVI are not anticipated to be taken forward for detailed assessment and include:

- Receptor Group 5;
- Receptor Group 9;
- Receptor Group 11;

- Receptor Group 12; and
- Receptor Group 13.

Representative Viewpoints

6.4.9. Representative viewpoints are located on publicly accessible locations and generally where the greatest potential effects are anticipated to be experienced. The viewpoint locations represent a range of receptors, providing a 'sample' of the potential effects from the locality, with locations purposefully selected to illustrate the range of visual effects; or to specifically ensure the representation of a particularly sensitive receptor.

6.4.10. The location of the representative viewpoints are listed in Table 6.1 and shown on the ZTV and Viewpoint Location Plan (see Figure 6.6). In addition to the 14 representative viewpoints, further illustrative views may be identified in conjunction with local authorities during the assessment process to illustrate and describe particular points made within the assessment. These may include locations outside the study area to illustrate the nature of visibility, if necessary.

Table 6.1 - Representative Viewpoint Locations

Viewpoint Reference	Representative Receptors	Direction & Distance from Solar PV Site	Approx. Grid Reference (X,Y)
Viewpoint 1 Stamford/Carlby road junction	Receptor Group 4: Local residents (Carlby) and visitors. Users of local roads and local PRoW	Central North, 318m	505318 313536
Viewpoint 2 Essendine	Receptor Group 2: Local residents and visitors to	Central North, adjacent to Site	505036 E 312749 N

Viewpoint Reference	Representative Receptors	Direction & Distance from Solar PV Site	Approx. Grid Reference (X,Y)
	Essendine. Users of local roads and local PRoW		
Viewpoint 3 PRoW footpath Carl/1/1	Receptor Group 3: Local residents and visitors to Carlby. Users of local PRoW	Central North, 496m	504960 E 313598 N
Viewpoint 4 Carlby Road	Receptor Group 4: Local residents, visitors and users of local roads and local PRoW and accessible land at Braceborough Great Wood	North, adjacent to Site	506147 E 313124 N
Viewpoint 5 Carlby Road, east	Receptor Group 1: Visitors and users of local roads and local PRoW and accessible land at Braceborough Great Wood	North, Within the Site	506892 E 312997 N
Viewpoint 6 Bridleway BrAW/1/1	Receptor Group 1: Users of PRoW and railway	Central, 0m	506064 E 311193 N
Viewpoint 6A Railway overbridge Bridleway BrAW/1/1	Receptor Group 1: Users of PRoW and railway	Central, 3m	506042 E 311182 N

Viewpoint Reference	Representative Receptors	Direction & Distance from Solar PV Site	Approx. Grid Reference (X,Y)
Viewpoint 7 Belmesthorpe Grange, Footpath Uffi/5/1	Receptor Group 1: Local residents, visitors and users of local roads and local PRoW	Southwest, 0m	504607 E 309386 N
Viewpoint 7A Belmesthorpe Grange, Footpath Uffi/5/1	Receptor Group 1: Local residents, visitors and users of local PRoW	Southwest, 0m	504740 E 309333 N
Viewpoint 8 Essendine Road,	Receptor Group 7: Local residents and users of local roads	South, 0m	506321 E 309018 N
Viewpoint 9 Essendine Road,	Receptor Group 8: Local residents and users of local roads	West, 1m	504486 E 311651 N
Viewpoint 10 PRoW Footpath E/174 Belmesthorpe,	Receptor Group 9: Local residents and users of local PRoW	West, 620m	504375 E 310016 N
Viewpoint 11 Stamford Road, Essendine	Receptor Group 1: Local residents, visitors to Essendine and users of local roads	Central, 77m	504375 E 312289 N
Viewpoint 12 Local Road B1176 Bridleway E169	Receptor Group 1: Users of local roads and PRoW	West, 0m	503234 E 312640 N
Viewpoint 13	Receptor Group 1: Isolated residences,	West, 0m	501410 E 313078 N

Viewpoint Reference	Representative Receptors	Direction & Distance from Solar PV Site	Approx. Grid Reference (X,Y)
The Drift Byway Open to All Traffic E123	visitors and users of local roads and PRoW		
Viewpoint 14 Barberry Hill	Receptor Group 10: Isolated residences, visitors, and users of local roads	North, 0m	502751 E 314219 N

6.4.11. Panoramic baseline photographs from representative viewpoints are illustrated on annotated panels (see Figures 6.8.1 – 6.8.14). Additionally, five fully rendered photomontage visualisations have been produced from viewpoints 1, 2, 4, 8, and 11 to help demonstrate the nature of predicted views in year 1 following construction of the Proposed Development (but before mitigation planting has matured) and at year 15 once planting has established (see Figures 6.9.1 – 6.9.10).

6.4.12. The potential (positive and negative) impacts on landscape and visual factors from the Proposed Development are likely to include:

- Change in landscape character from open agricultural land to solar built form;
- Introduction of new built structures including fencing;
- Breaks in vegetation where new access routes may be required;
- Loss / interruption of existing views;
- Creation of new hedgerows and enhancement of Green Infrastructure (GI) as part of the Proposed Development;
- Enhancement of existing vegetation and habitats through new planting and management; and

- Potential night-time effects – lighting.

6.4.13. Key potential impacts during the construction phase might include the visual effect of construction traffic and equipment; other components typical of construction activities, including, stockpiles of materials, lighting, construction compounds; and gradual modification of landscape character as part of a phased programme of works. Effects during construction would be temporary and short-term and would be of notably lower magnitude than those on completion, although more likely to be perceived as adverse. Potential impacts during decommissioning would be similar to construction phase but lower in magnitude due to the retention and management of new and existing planting as part of the Proposed Development providing greater filtering/screening and containment to views once established during the operational phase of the Proposed Development.

6.4.14. It is considered effects to the landscape and visual resource would be at their greatest following completion of construction (year 1 photomontages) before mitigation planting is mature. As planting matures and provides additional screening, the impacts will gradually reduce. Effects to the landscape and visual resource for construction and decommissioning phases would be less than year 1 completion and are summarised in Table 6.2.

6.4.15. Additional planting is proposed as part of the Proposed Development within the Mitigation and Enhancement Area which are considered to be permanent.

Potential Impacts on Landscape Character

6.4.16. Potential impacts on landscape character could include change to the character of the landscape as a consequence of the Proposed

Development. The impact would depend on the extent and degree of change to the particular character area in question.

6.4.17. A comprehensive Green Infrastructure (GI) strategy has been developed to improve the quality and connectivity of habitats at a landscape level across the Solar PV Site and Mitigation and Enhancement Area as well as performing important screening and assimilatory functions to respond to and enhance the local landscape fabric (Refer to Figure 6.10 GI Strategy Plan). The design also strives to contribute to the improvement of the amenity value of the PRoW network via provision of new permissive routes that interconnect with existing PRoW along new and enhanced GI corridors (Figure 6.10 GI strategy plan). For the purposes of the LVIA the green infrastructure design shown on Figure 6.10 are considered as part of the Proposed Development within this assessment.

National Character Area (NCA) 75: Kesteven Uplands

6.4.18. The Solar PV Site is located entirely within National Character Area (NCA) 75: Kesteven Uplands, towards its southern extent (see Figure 6.3). NCA 75 is described as being a "*deeply rural landscape which has only a very small urban area*" and comprises "*gently rolling, mixed farming landscape dissected by the rivers …*" including the West Glen River which is an "*important feature*" and runs through the Site in a southerly direction. It also notes the "*more elevated arable areas … have exposed distant views of the West Glen river valley*" and the presence of the East Coast Mainline Railway that crosses this NCA and bisects the Solar PV Site. Key characteristics identified for NCA 75 include [inter alia] "*Significant areas of woodland … and parkland landscapes which, in combination with the topography, frame and contain views*".

6.4.19. Statements of Environmental Opportunity identified for NCA 75 include [inter alia]:

- *SEO2: Protect and significantly increase the extent, quality and connectivity of the unimproved and limestone grasslands throughout the NCA, to enhance biodiversity, ecological networks, water availability and quality, climate regulation and sense of place*.
- *SE03: Manage and expand the native woodlands throughout the Kesteven Uplands to reinforce the area's wooded character, benefit biodiversity, increase the potential for biomass, access and recreation, and help to regulate climate change and water quality*.
- *SEO 4: Protect, manage and promote the area's rich historic environment … while also improving access and interpretation to enhance people's understanding and enjoyment of the landscape*".

6.4.20. Specific Landscape opportunities identified for the NCA include to [inter alia]:

- *"Protect, manage and restore the areas species-rich grasslands, particularly limestone grassland.*
- *Maintain and restore hedgerows … including replanting where necessary, to maximise their contribution to landscape character and biodiversity networks. Restore and introduce hedgerow trees into key locations to reinforce field patterns.*
- *Conserve and manage the open character of the Kesteven Uplands protecting long distance views.*
- *Manage and expand broadleaf woodlands where possible, conserving the predominant tree species that include ash and oak and considering successional tree planting to conserve the tree canopy in existing woodland. Manage existing wet woodland, and extend and buffer where possible.*

- *Manage plantation woodlands to ensure their long term survival as landscape features, increasing the content of native broadleaved trees.*
- *Manage grassy verges to encourage greater species richness and to maintain them as a feature as former drovers' routes".*

6.4.21. The design of the Proposed Development responds directly to a number of the opportunities set out in the Statements of Environmental Opportunity identified for NCA 75. Potential effects on NCA 75 as a consequence of the Proposed Development would be high within the confines of the Solar PV Site as it changes from agricultural countryside to solar development but limited overall as the Solar PV Site forms a very small component of this large national character area. As described in paragraph 6.3.4, local authority assessments on landscape character provide more detail and should be used to form the basis of the assessment of effects on landscape character and will be used within the LVIA to assess effects on landscape character.

Potential Effects on the Rutland Plateau D(ii) Clay Woodlands LCA

6.4.22. The Clay Woodland LCA extends as a protuberance over the central and western parts of the Solar PV Site (see Figure 6.4). It is generally described as "*an extensive area of gently undulating, predominantly arable countryside*". Key characteristics pertinent to the area containing the Site include:

- *"medium to large scale mixed broadleaved and coniferous woodlands within large farming estates …These woodlands… are conspicuous features in most views within or into this area. Close to, they enclose views whilst providing an extensive backdrop in most distant views across well maintained farmland.*

- *Woodlands are less extensive around the Gwash Valley, where trees are in small copses and where close trimmed hedges alongside large arable fields give a more open feeling to the landscape. This is particularly so in the extreme eastern corner of the County, between Ryhall and Essendine, where the railway line and its tall gantries, high voltage power cables and pylons, and modern housing are intrusive.*
- *a transitional area between the settled estate woodlands to the north and west, and the more open, modern unsettled claylands to the east and south."*

6.4.23. Recommendations/objectives for the Clay Woodlands LCA and related reports include [inter alia:

- *"To conserve and enhance the large-scale, gently undulating, agricultural landscapes with substantial woodlands and avenues,*
- *to enhance the sustainable management of existing woodlands and*
- *to create new woodlands in the less wooded parts around the Gwash Valley, especially where they would create skyline features.*
- *To improve the edges of the settlements and integrate large structures and modern buildings into the landscape where necessary."*

6.4.24. In light of the above, the sensitivity of the Rutland Plateau (Dii) Clay Woodlands is considered to be Medium.

6.4.25. Very limited vegetation removal is proposed, with the Proposed Development incorporated within the existing field structure pattern. As such, a major feature of the existing landscape character in terms of existing woodland enclosing and acting as backdrop to views would remain. New structure planting including woodland copses, tree belts, and hedgerows would be provided as part of the Proposed Development creating greater connectivity and enhancement to existing GI features. For example David Tyldesley and Associates (2003) LCA of Rutland identifies the creation of new woodlands around the Gwash Valley within the Clay Woodland LCA as an objective, and the proposal includes the creation of new carr woodland and ecological corridor along the western flank of the West Glen River to the south of Essendine in this area. Taken together the existing generally well vegetated field boundaries and new planting in more exposed areas within and around the Solar PV Site and Mitigation and Enhancement Area will greatly reduce views into the Solar PV Site to glimpsed views through gateways and as such effects to landscape character outside of the Solar PV Site is likely to be of Minimal significance.

6.4.26. Within the Solar PV Site, the Proposed Development would lead to a change from agricultural fields in the countryside to built form of a solar farm set within the existing field and landscape structure. Effects are likely to be Large scale within the Solar PV Site over the duration of the operation of the Proposed Development and of Major-Moderate significance, albeit within the context of an improved GI network and landscape fabric resulting from retained structure planting (woodland, tree belts and hedgerows). The significance of effect to the character of the Clay Woodlands within the Solar PV Site is likely to remain unchanged after year 15 given the presence of the Proposed Development.

6.4.27. Outside of the Solar PV Site, effects on landscape character are likely to reduce quickly with distance from the Solar PV Site as it extends over a relatively small and localised area of the wider landscape character area, effects on the Rutland Plateau D(ii) Clay Woodlands character area, as a whole, are likely to be of Minimal significance and not significant. Effects would lessen over time as vegetation matures providing further screening and assimilating the Proposed Development in the landscape and the impact in LVIA terms would remain at the lowest level of Minimal significance.

Potential Effects on the Kesteven Uplands LCA

6.4.28. The Solar PV Site also extends into the Kesteven Uplands Landscape Character Area to the north, east and south, (as it wraps around the Clay Woodlands LCA within Rutland). This LCA shares its name "*and most of the same geographic area with the Natural England Character Area number 75*". Key characteristics are identified as [inter alia]:

- *"a relatively unified, simple, medium-scale agricultural landscape, with a high proportion of historic woodland …*
- *Undulating landform based around the valleys of the Rivers …*
- *High concentration of houses and parks, with areas of farmland under estate management.*
- *A dispersed, nucleated settlement pattern, mostly following the river valleys.*
- *Enclosed mostly by hedgerows, with hedgerow trees."*

6.4.29. It further describes the area as demonstrating a "*mostly harmonious rural landscape, with farmland, woodland and parkland with small stone-built villages"* and notes that "*Where the undulations are more pronounced, with small woodlands and fields, it is a relatively small-scale intimate landscape*."

6.4.30. Recommendations/objectives for the Kesteven Uplands LCA include [inter alia]:

- *"Protect and improve field boundary condition.*
- *Protect existing hedgerow trees.*
- *Plant new hedgerow trees.*

- *Maintain important grassland areas.*
- *Protect important and distinctive woodland cover.*
- *Protect historic parkland.*
- *Protect field trees, particularly in parkland and in large arable fields.*
- *Use of new planting to minimise the visual impact of major roads and industrial buildings.*
- *Pay special attention to sensitive spaces around the edge of historic towns such as Stamford and the villages.*
- *Maintain open areas that extend into the towns and villages."*

6.4.31. In light of the above, it is judged the sensitivity of the Kesteven Uplands LCA is Medium-Low.

6.4.32. As stated in paragraph 6.4.24 very limited vegetation removal is proposed, with the Proposed Development incorporated within the existing field structure pattern. New planting will be undertaken for increased screening and sensitive siting of the Proposed Development within the existing landscape fabric and wider GI network. Offsetting the PV Arrays within the Solar PV Site is also proposed to further reduce potential impacts on the surrounding landscape (refer to Figure 5.1).

6.4.33. Site visits have confirmed a well vegetated landscape fabric including a number of woodland copses, tree belts and connecting hedgerows enclosing fields, limit greatly longer distance views. Any effects on landscape character outside of the Solar PV Site are therefore likely to diminish rapidly. Within the Solar PV Site those field parcels proposed to contain PV Arrays and associated equipment would change from agricultural field in character to one of built solar development contained within the existing and enhanced field structure pattern. The scale of effects would be Large within these areas due to a fundamental change from farmland to built form. The Solar PV Site extends over a limited area of this large landscape character area, effects on the Kesteven Uplands character area as a whole are likely to be of Minimal significance and not significant.

6.4.34. Maturation of new planting after approximately year 15 would assist in assimilating the Proposed Development in the landscape context but would not change the change the significance of impact which would remain at the lowest assessment level of Minimal significance.

Potential Impacts to Visual Receptors

6.4.35. Potential impacts on visual receptors include a change from views over countryside to views over new solar farm development. Other receptor groups/features may experience little to no visual impact from the Proposed Development despite their close proximity due to containment by existing established boundary vegetation and relatively low-lying nature of the elements of the Proposed Development.

6.4.36. The effects focus on groups of visual receptors, incorporating effects on views from public spaces and streets within settlements (or around the houses in areas with isolated dwellings), and the routes and accessible landscape in the surrounding countryside. Residents and visitors within these communities are assessed to be of High-Medium sensitivity. Following desk based studies and Site visits, 13 visual receptor groups have been identified. Effects on private residential visual amenity are considered in a separate Residential Visual Amenity Assessment (Appendix 6.4).

6.4.37. Visual Receptor Group 1 – The Site. Receptors include users of PRoW traversing the Solar PV Site and residents flanking Stamford Road to the west of Essendine and are judged to be of High-Medium sensitivity.

6.4.38. Potential likely effects to this group include changes to views across fields from agricultural farmland to PV Arrays contained within the existing vegetated landscape and field structure. Receptors from publicly accessible areas in this group are limited to five PRoW that traverse the Solar PV Site including bridleways BrAW/1/1, and BrAW/7/1 within the east, bridleway E169 and E123 'The Drift' BOAT within the north-western extent of the Solar PV Site, and footpath Uffi/5/1 to the south, respectively (see Figure 6.5). Views from The Drift are likely to be highly restricted to glimpsed views of adjacent PV Arrays (Field 3) through gaps in the hedgerows (see Figure 6.8.13 Viewpoint 13) at an existing field access point, due to existing densely vegetated field and trackside boundaries. No effects are likely to be observed for users of BrAW/7/1 as this area is not proposed for PV Arrays and will remain as open field contained by existing woodland which screens views to the Solar PV Site. Views from bridleways BrAW/1/1, and E169 will change from open views across fields to views across solar arrays, albeit with new planting proposed flanking these routes (with 15m offsets) that will restrict close views of PV Arrays as it matures (refer to Figures 6.8.4, 6.8.6 and 6.8.12, from Viewpoints 4, 6 and 12, respectively, for illustrations). Assessment of amenity and recreational effects on users of these routes area addressed in Appendix 6.4. There will also be a change from open views across agricultural fields to PV Arrays from footpath Uffi/5/1 as it passes the southern edge of the Solar PV Site in the south-west at Field 45 (refer to Figure 3.2) (see Viewpoint 7a, Figure 6.8.7a). For residents along Stamford Road on the western approach to Essendine, due to the offset of the Solar PV Site, behind woodland to the north and west and within distant fields to the south and east, views are likely to be limited to distant views only as shown in Representative View 11 (Figure 6.8.11 and developed as photomontages in Figure 6.9.5). Given the change from views across agricultural fields, where possible, to views across built solar farm contained within fields, visual effects on this receptor group are likely to be of Major-Moderate significance and significant. Effects would remain of Major-Moderate post year 15 given this receptor groups includes the Solar PV Site.

6.4.39. Visual Receptor Group 2 – Essendine, adjacent north. Receptors include workers, users of the A6121Stamford/Bourne Road and public footpaths E170 and E171 that traverse this receptor group to the north of Essendine connecting to Carlby, and residents and visitors of Essesndine and are judged to be of High-Medium sensitivity.

6.4.40. Visual effects from publicly accessible locations within this group would likely be limited to middle and long distant views of the Proposed Development over and through tiers of existing vegetation due to the offsetting of built form behind existing landscape structures (e.g. the disused railway line to the east). Views are likely to be restricted to westerly and easterly views and new planting as part of the Proposed Development will act to further screen and deflect views as it matures. The undulating landscape north of Essendine descends to the West Glen River before ascending again to Carlby, restricting views from the lower river corridor countryside. Visual effects on this receptor group are likely to be Moderate significance at most and not significant.

6.4.41. Figures 6.9.2 and 6.9.5 illustrate photomontages from viewpoints 2 and 11 within this receptor group and indicate that by year 15 new and enhancement vegetation planting would have matured to provide a substantial screen to views although views in the south of the receptor group (viewpoint 11) would remain. The significance of impact to Receptor Group 2 as a whole would reduce to Slight significance.

6.4.42. Visual Receptor Group 3 – Carlby, adjacent north. Receptors include users of the A6121 Stamford Road north of Essendine, and High Street west of Carlby, public footpath E171 connecting south to Essendine and residents/visitors of Carlby. The East Coast Mainline Railway, partially on embankment in this location, forms the western boundary to the receptor group and are judged to be of High-Medium sensitivity.

6.4.43. Visual effects from publicly accessible locations within this group would likely be limited to middle and long distant views of the Proposed Development over and through tiers of existing vegetation due to the distance from the Solar PV Site. Views of the Proposed Development, where possible, are likely to be restricted to the southwestern fringes of Carlby and more elevated sections of footpath E171 in this area. Views of the Proposed Development are highly limited on lower sections of the footpath as it descends and crosses low-lying countryside south of Carlby (eg. Viewpoint 3, Figure 6.8.3). Views of the Proposed Development from the High Street are likely to be restricted to glimpsed views through field access points and gaps in established roadside vegetation along High Street looking south-west. Views of the Proposed Development southeast from the southern fringes of Carlby are likely to be greatly screened by intervening built form combined with topography and existing vegetation. Viewpoint 1 (taken from the junction of Stamford Road and Carlby Road) shows the views from just beyond the south easterly extent of this receptor group. Views over the Solar PV Site are possible from this location; however, the existing vegetation along the roadsides visible in the view is likely to screen views of the Proposed Development from the fringes of Carlby located behind the viewpoint to the northwest. The Carlby Landscape Character Assessment (2017) undertaken for the Carlby Neighbourhood Plan provides description of this area and is used to inform assessment and design. Visual effects on this receptor group are likely to be of Slight significance at most and not significant. Effects are likely to reduce further to Slight-Minimal significance on the maturation of new planting after approximately 15 years.

6.4.44. Visual Receptor Group 4 – adjacent, north. Receptors include users of Carlby road, and sections of Bridleway BrAW/9/1 connecting Carlby in the west to Braceborough in the east, and scattered farmsteads and are judged to be of High-Medium sensitivity.

6.4.45. The well vegetated disused railway line and woodland blocks within this receptor group, as well as a ridgeline plateau that forms the north of this receptor group act to break up and screen views southward over the Solar PV Site from within this area and beyond to the north. Within this area, particularly from its southerly extent adjacent to the Solar PV Site and Mitigation and Enhancement Area, open views of the Site are likely to be possible through and over thinly vegetated roadside boundaries. Viewpoint 1 (see Figures 6.6 and 6.8.1) (taken from the junction of Stamford Road and Carlby Road) shows the view from within the south of this receptor group. As described above, views over the Solar PV Site are possible from this location around and over existing screening vegetation and/or filtered through vegetation. The Solar PV Site is offset away from residential properties on Carlby Road and new planting will further reduce visibility of the PV Arrays as the planting matures. Visual effects on this receptor group are likely to be of Slight-Minimal significance at most and not significant.

6.4.46. As vegetation matures views of the PV Arrays will become less visible from within this area (Figure 6.9.1 and 6.9.3) given the boundary planting proposed both within the Solar PV Site and also Mitigation and Enhancement area. A Minimal significance is concluded.

6.4.47. Visual Receptor Group 6 – adjacent, east up to approximately 500m from the Solar PV Site. Receptors include users of the local road connecting Greatford (east) to Belmesthorpe (west), PRoW including a short section of the BrAW/1/1 as it passes along a track towards a ford across the West Glen River and East Coast Mainline Railway bridge, and scattered farms. The receptor group is judged to be of High-Medium sensitivity. The Macmillan Way Long Distance Footpath also runs along the local road in this area before connecting with and continuing northwards on bridleway BrAW/7/1. Effects on The Macmillan Way itself considered separately to the receptor group.

6.4.48. Due to the limited amount of publicly accessible land within this receptor group, visual effects are highly restricted to road users and the access track/bridleway BrAW/1/1. Existing roadside, trackside and field boundary vegetation is dense along these routes and any effects are likely to be highly restricted to glimpsed filtered views through intervening vegetation. Scattered residences are also present within this group including Banthorpe Lodge within a triangle of land between the Solar PV Site and the west of the East Coast Mainline Railway; however, the Solar PV Site is offset behind existing vegetation and field boundaries screening and filtering views and minimising potential visual effects incurred. Effects on receptors within this receptor group are therefore likely to be Minimal significance and not significant. Impacts would remain of Minimal significance post year 15.

6.4.49. Visual Receptor Group 7 – adjacent, south includes users of Essendine Road, and Greatford Road and Newstead Lane which delineate its southern and western extents respectively. Footpath Uffi/5/1 traverses the area from Uffington northward towards Belmesthorpe continuing along the southern edge of the Solar PV Site. Scattered residential properties are present within the landscape in this area and the northern fringes of Uffington abut the southern extent of the receptor group. The receptor group is judged to be of High-Medium sensitivity.

6.4.50. Built form of the Proposed Development will be set back from the southern protuberances of the Site in this location and also from nearby residential properties (see RVAA provided at Appendix 6.4). Visual effects are likely to be limited to glimpsed views through gaps in intervening and boundary vegetation from local roads. Due to the set back of the Solar PV Site in this area, views will also tend to be distant views and filtered by intervening built form and or vegetation. Viewpoint 8 shows the view from a field access point on Essendine Road (see Figures 6.6 and 6.8.8). Viewpoint 7 (see Figures 6.6 and 6.8.7) taken from along footpath Uffi/5/1/ shows the existing boundary vegetation at this location, which taken with the offset of the Solar PV Site from properties directly west provides a landscape buffer to these receptors. Overall, effects on receptors within this receptor group are therefore likely to be Slight significance at most and not significant.

6.4.51. As boundary vegetation matures, effects would reduce to Slight-Minimal for this receptor group with only occasional glimpses through existing vegetation likely to be possible.

6.4.52. Visual Receptor Group 8 – adjacent up to approximately 500m west of the Solar PV Site. This receptor group represents generally east facing valley slopes on the western fringes of the Solar PV Site. Receptors include users of local roads including Main Street (connecting Belmesthorpe with Greatford), Essendine Road (connecting Ryhall with Essendine), the B1176 (Ryhall towards Aunby), and PRoW including footpaths E168 and E159 and E123, The Drift BOAT, that traverses the landscape in this location. Representative Viewpoints 9 (at Essendine Road) and 13 (at The Drift) are located within or immediately adjacent to this receptor group and are shown on Figure 6.6 with the views displayed on Figures 6.8.9 and 6.8.13 respectively. Scattered farmstead and properties in the countryside are residential receptors in this receptor group. The receptor group is judged to be of High-Medium sensitivity.

6.4.53. Visual effects to this receptor group will largely comprise effects to areas of countryside that are not publicly accessible. Views for road users tend to be channelled along in the direction of the road, framed by existing roadside vegetation. Views of the Proposed Development are likely to be greatly restricted to close views through gaps in hedgerow vegetation, or slightly longer views over tiers of intervening vegetation. The existing National Grid Ryhall Substation is located adjacent to this area. Proposed built form in close proximity to this including the proposed Primary Onsite Substation, where visible, would be seen as part of an existing partly industrialised landscape with power lines converging on the existing National Grid Ryhall Substation and with the East Coast Mainline Railway line also potentially visible in the background to the east. Away from the National Grid Ryhall Substation to the north, views are likely to be restricted to more distant views north/east over and/or filtered through tiers of intervening vegetation. Overall effects on receptors within this receptor group are therefore likely to be of Slight significance and not significant.

6.4.54. As boundary vegetation matures, effects would reduce to Slight-Minimal for this receptor group with only occasional glimpses through existing vegetation likely to be possible.

6.4.55. Visual Receptor Group 10 - adjacent, north up to ridgeline associated with Barber's Hill. Receptors include local residents and users of local roads. This receptor group occupies south facing slopes of Barber's Hill which forms a general west-east ridgeline/plateaux at the approximate alignment of the northern edge of this group (see Figures 6.1, 6.6 and 6.7) with woodland at Little Warren and the East Coast Mainline Railway forming the western and eastern extents of this receptor group respectively. Receptors include users of local roads including the road connecting Carlby Mainstreet with Holywell in the northwest beyond Little Warren and the B1176 road toward Aunby and Careby, and scattered dwellings. The receptor group is judged to be of High-Medium sensitivity.

6.4.56. The Solar PV Site has been offset away from the northern boundary and elevated locations on Barber's Hill in order to minimise visual impacts in this location. Vegetation along the local roads in this location are also well established and dense and would act to greatly restrict views of the Solar PV Site to glimpsed views through access points and gaps in vegetation only. Viewpoint 14 taken from an existing field access point from the B1176 road shows the view into the Mitigation and Enhancement Area from this elevated position (see Figures 6.6 and 6.8.14) where proposed built form would be offset south from the elevated and more exposed northern extent of the field (see Figure 5.1). Overall, effects on receptors within this receptor group are therefore likely to be of Slight significance at most and not significant. Effects post 15 years would reduce to Slight-Minimal significance.

Potential Impacts on Landscape Designations

6.4.57. No designated landscapes such as AONBs or National Parks would be affected by the Proposed Development.

Potential Night-time Effects and Lighting

6.4.58. Proposed lighting is generally restricted to motion sensor lighting around the Primary Onsite Substation. However, manually operated lights may be attached to the substations and transformer and/or inverter cabinets in the event of an emergency maintenance visit being required in the hours of darkness.

6.4.59. The built form within Solar PV Site such as the Primary Onsite Substation and inverters have been purposely located away from residential edges such as Essendine, Carlby, Ryhall and Belmesthorpe to avoid any potential nigh-time effects to these receptors

6.4.60. It is anticipated that the Proposed Development would produce little to no additional ambient illumination at night during operation, with only motion sensor security lighting implemented as part of the Primary Onsite Substation compound. Lighting will be in accordance with the Institute of Lighting Professionals Guidance Note 1 for the reduction of obtrusive light to minimise light intrusion.

6.4.61. It is assessed that night-time effects would therefore be no greater than those effects experienced by visual receptors (as set out above) during the daytime.

Summary of Effects

6.4.62. Overall effects on landscape character, where present, are likely to be confined to the Solar PV Site and Mitigation and Enhancement Area and edges up to approximately 500m where visible. As such, effects to landscape character would be limited to the two local landscape character areas (Rutland Plateau D(ii) Clay Woodlands and Kestevan Uplands) covered by the Solar PV Site. Other landscape character areas within the 2km study area due to distance from the Solar PV Site are unlikely to experience any effects greater than Minimal significance which are not significant. Effects on landscape character would be greatest within the Solar PV Site where the Proposed Development would inevitably change the character from countryside fields with well vegetated wooded backdrops to solar arrays contained within existing landscape structure. Effects during construction are likely to be large but short-term, whilst operational effects are assessed as permanent and of Minimal significance but reduce over time as new planting matures that will act to further break up and screen the Proposed Development over time. Effects during decommissioning would be similar to construction effects but reduced in magnitude and scale due to the retention of the structure planting proposed as part of the Proposed Development that would be retained providing a permanent enhancement to landscape structure within the Solar PV Site and Mitigation and Enhancement Area.

6.4.63. Overall, visual effects arising from the Proposed Development, are likely to be confined to within 500m south, west and north of the Site, and as indicated by the ZVI (see Figure 6.7) and limited to receptor groups 1, 2, 3, 4, 7, 8, and 10 located within or in close proximity to the Solar PV Site. Visual effects would be greatest within the Solar PV Site (Major-Moderate) where the Proposed Development would inevitably change the views across agricultural fields to solar arrays, where present, contained within well vegetated boundaries, and woodland backdrops.

6.4.64. For other visual receptor groups beyond the Solar PV Site impacts range from Moderate significance reducing to Minimal, with all effects reducing over time as new planting matures and provides further visual screening.

6.4.65. Effects during the construction phase are likely to be large but will be short term, whilst operational effects would be permanent but would be limited given the relatively low heights of the Proposed Development and new planting that will act to further break up and screen the built form as it matures. Within the Solar PV Site large offsets to existing PRoW have been incorporated within the design including screening planting to create wide PRoW avenues through the Solar PV Site. Views from these routes would change from views over open fields (where currently open) to views along wide GI corridors that simultaneously function to improve the landscape fabric by introducing new and enhanced hedgerows and tree belts, connecting existing woodland blocks and GI features across the landscape. Effects during decommissioning would be similar to construction effects but reduced in magnitude and scale due to the retention of the structure planting as part of the Proposed Development that would be retained providing a permanent enhancement to landscape structure within the Solar PV Site area.

6.5. How would we mitigate the environmental effects?

6.5.1. The Solar PV Site lies between and extends over two landscape character areas: Rutland Plateau and the Kesteven Uplands, and management guidelines as well as identified opportunities for improvement have been used to inform the design of the Proposed Development, including substantial new planting to bolster and renew existing field boundaries, reinstatement of lost historic hedgerow boundaries and greater GI connectivity between remaining woodland copses and grassland habitats, as shown on Figure 6.10.

6.5.2. A number of measures have already been embedded into the design as described in Chapter 5 of this PEIR, which include retaining the existing landscape field structure, and incorporating strong and appropriate landscape buffers, to reduce potential landscape and visual impacts and minimise harm to existing features. Further planting has been proposed as illustrated on the GI Strategy Plan (Figure 6.10). The proposed landscape planting as shown on the GI plan has been considered within the assessment of potential effects described within this chapter. The GI Plan forms part of the draft oLEMP (Appendix 5.2). The draft oLEMP sets out the framework of the management regime that will be put in place during the operational phase of the Proposed Development to ensure that the landscape and ecological measures are managed appropriately to achieve the desired outcome. It is proposed that all planting associated with the Proposed Development will be retained for the duration of the Proposed Development. The oLEMP will be secured via a requirement through the DCO.

6.5.3. To mitigate potential impacts and provide protection for features of value during construction, a draft Outline Construction and Environmental Management Plan (oCEMP) (Appendix 5.1) has been produced which will protect existing trees and hedgerows during the construction period. The CEMP will be required to take into account measures contained within the LEMP approved pursuant to it and will include measures such as construction exclusion zones in relation to retained vegetation, ensuring a tidy and neat working area, covering stockpiles, hoardings in a suitable colour to aid their integration in the landscape and storing topsoil in accordance with best practice measures.

6.5.4. A draft Outline Decommissioning Environmental Management Plan (oDEMP) has also be produced providing mitigation and protection for decommissioning (Appendix 5.3).

6.6. What environmental effects would remain?

6.6.1. Taking into account the design priorities and mitigation measures set out in Section 6.2, used to aid sensitive assimilation of the Proposed Development within the landscape (including substantial offsetting of solar arrays from the more sensitive receptors in the surrounding landscape context, as well as effective screening from enhanced existing vegetation and considered new planting), the following residual effects would be likely to remain.

6.6.2. There would be a change to the landscape character and views within the Solar PV Site as a consequence of the Proposed Development as presented in Table 6.2. These would reduce with time as mitigation planting matures but would remain given the physical change to the Solar PV Site itself.

6.6.3. A change in landscape character and visual effects would be experienced in the immediate vicinity of the Solar PV Site up to 500m in most directions, with views changing from an agricultural landscape (some short and some longer views) to views over PV Arrays set within the existing landscape context. These changes would be most apparent in areas corresponding to the ZVI identified in Figure 6.7 and immediately following construction of the Proposed Development. As new planting matures and existing vegetation is allowed to grow out proving visual screening and biodiversity benefits, effects would diminish as visibility of the Proposed Development reduces.

Table 6.2: Landscape and Visual Significance of Effects

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Landscape Effects							
Construction							
Adverse, Short-term	Rutland Plateau (Dii) Clay Woodlands LCA - Within Site	High-Medium	Medium	Major-Moderate (significant)	CEMP	None	Major-Moderate (significant)
	Rutland Plateau (Dii) Clay Woodlands -Overall	Medium	Low	Minimal (non-significant)	CEMP	None	Minimal (non-significant)
	Kesteven Uplands LCA – Within Site	High-Medium	Medium	Major-Moderate (significant)	CEMP	None	Major-Moderate (significant)
	Kesteven Uplands LCA – Overall	Medium-Low	Low	Minimal (non-significant)	CEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Operation							
Adverse, Medium-term	Rutland Plateau (Dii) Clay Woodlands LCA Within Site	High-Medium	Medium	Major-Moderate (significant)	Green Infrastructure Design LEMP	None	Major-Moderate (significant) Permanent
	Rutland Plateau (Dii) Clay Woodlands LCA Overall	Medium	Low	Minimal (non-significant)	Green Infrastructure Design LEMP	None	Minimal (non-significant) Permanent
	Kesteven Uplands LCA – Within Site	High-Medium	Medium	Major-Moderate (significant)	Green Infrastructure Design LEMP	None	Major-Moderate (significant) Permanent
	Kesteven Uplands LCA – Overall	Medium-Low	Low	Minimal (non-significant)	Green Infrastructure Design	None	Minimal (non-significant) Permanent

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
					LEMP		
Decommissioning							
Adverse, Short-term	Rutland Plateau (Dii) Clay Woodlands LCA Within Site	High-Medium	Low-Negligible	Slight (non-significant)		None	Slight (non-significant)
	Rutland Plateau (Dii) Clay Woodlands -Overall	Medium	Negligible	Slight-Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	Kesteven Uplands LCA – Within Site	High-Medium	Low-Negligible	Slight (non-significant)	DEMP	None	Slight (non-significant)
	Kesteven Uplands LCA – Overall	Medium-Low	Negligible	Slight-Minimal (non-significant)	DEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Visual Effects							
Construction							
Adverse, Short-term	RG1	High-Medium	Medium	Major-Moderate (significant)	CEMP	None	Major-Moderate (significant)
	RG2	High-Medium	Medium-low	Moderate (non-significant)	CEMP	None	Moderate (non-significant)
	RG3	High-Medium	Low-Negligible	Slight (non-significant)	CEMP	None	Slight (non-significant)
	RG4	Medium	Low-Negligible	Slight-Minimal (non-significant)	CEMP	None	Slight-Minimal (non-significant)
Neutral	RG5	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)
	RG6	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Adverse, Short-term	RG7	High-Medium	Low-Negligible	Slight (non-significant)	CEMP	None	Slight (non-significant)
	RG8	High-Medium	Low-Negligible	Slight (non-significant)	CEMP	None	Slight (non-significant)
Neutral	RG9	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)
Adverse, Short-term	RG10	High-Medium	Low-Negligible	Slight (non-significant)	CEMP	None	Slight (non-significant)
Neutral	RG11	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)
	RG12	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)
	RG13	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Operation							
Adverse, Medium-term	RG1	High-Medium	High-Medium	Major-Moderate (significant)	Green Infrastructure Design LEMP	None	Major-moderate (significant) Permanent
	RG2	High-Medium	Medium-low	Moderate (non-significant)	Green Infrastructure Design LEMP	None	Slight (non-significant) Permanent
	RG3	High-Medium	Low	Slight (non-significant)	Green Infrastructure Design LEMP	None	Slight-Minimal (non-significant) Permanent
	RG4	Local	Low-Negligible	Slight-Minimal (non-significant)	Green Infrastructure Design	None	Minimal (non-significant) Permanent

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
					LEMP		
Neutral	RG5	High-Medium	Negligible	Minimal (non-significant)	Green Infrastructure Design LEMP	None	Minimal (non-significant) Permanent
Adverse, Medium - term	RG6	High-Medium	Negligible	Minimal (non-significant)	Green Infrastructure Design LEMP	None	Minimal (non-significant) Permanent
	RG7	High-Medium	Low-Negligible	Slight (non-significant)	Green Infrastructure Design LEMP	None	Slight-Minimal (non-significant) Permanent
	RG8	High-Medium	Low-Negligible	Slight (non-significant)	Green Infrastructure Design	None	Slight-Minimal (non-significant) Permanent

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
					LEMP		
Neutral	RG9	High-Medium	Negligible	Minimal (non-significant)	Green Infrastructure Design LEMP	None	Minimal (non-significant) Permanent
Adverse, Medium-term	RG10	High-Medium	Low-Negligible	Slight (non-significant)	Green Infrastructure Design LEMP	None	Slight-Minimal (non-significant) Permanent
Neutral	RG11	High-Medium	Negligible	Minimal (non-significant)	Green Infrastructure Design LEMP	None	Minimal (non-significant) Permanent
	RG12	High-Medium	Negligible	Minimal (non-significant)	Green Infrastructure Design	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
					LEMP		
	RG13	High-Medium	Negligible	Minimal (non-significant)	Green Infrastructure Design LEMP	None	Minimal (non-significant)
Decommissioning							
Adverse	RG1	High-Medium	Low-Negligible	Slight-Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	RG2	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	RG3	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	RG4	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Neutral	RG5	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
Adverse	RG6	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	RG7	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	RG8	High-Mediuml	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
Neutral	RG9	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
Adverse	RG10	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
Neutral	RG11	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
	RG12	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
	RG13	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)
Macmillan Way Long Distance Path							
Construction							
Adverse	Macmillan Way Long Distance Footpath	High-Medium	Negligible	Minimal (non-significant)	CEMP	None	Minimal (non-significant)
Operation							
Neutral	Macmillan Way Long Distance Footpath	High-Medium	Negligible	Minimal (non-significant)	LEMP	None	Minimal (non-significant)

Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Decommissioning							
Neutral	Macmillan Way Long Distance Footpath	High-Medium	Negligible	Minimal (non-significant)	DEMP	None	Minimal (non-significant)

6.7. In-combination Effects

6.7.1. Due to close association between the assessment of landscape and visual effects and those related to Residential Visual Amenity and amenity and recreational, assessment of these elements is described in appendices to this assessment. Similar receptor groups or features (e.g. PRoW) have been used in these assessments although given their slightly different focus, (for example for recreational amenity which combines visual effects with other experiential qualities such as noise) the extent of the study areas may vary and they will also draw on findings of other assessments to provide a balanced assessment.

6.7.2. Other related assessments to Landscape and Visual matters which could result in intra-development effects include heritage which contribute to value of a landscape, ecology which contribute to landscape value and provide important guidance on suitable Green Infrastructure interventions that meet the needs of landscape and visual and biodiversity components. Glint and glare may also contribute to visual effects but mitigation screening for both is similar and has been factored into the GI Strategy (Figure 6.10). All these topics are assessed separately but the results of each are taken together to inform design development and have led to the mitigation interventions embedded within the Proposed Development.

6.8. Conclusion and Next Steps

6.8.1. Effects on landscape character resulting from the Proposed Development are likely to be limited to the Solar PV Site itself and local context and as such only implicate two local landscape character areas, namely the Rutland Plateau D(ii) Clay Woodlands, and the Kesteven Uplands LCA. Effects on these landscape character areas are also likely to be greatly limited to areas within the Solar PV Site itself up to approximately 500m from the Solar PV Site boundary. Given the area of the Solar PV Site relative to these LCAs, effects on them as a whole are not likely to be significant, reducing rapidly with distance from the Solar PV Site, and also reducing over time as mitigation planting matures, acting to break up views across the Solar PV Site as well improving GI connectivity and the overall landscape fabric once decommissioning has been completed. Detailed assessment will be undertaken in the LVIA as part of the ES.

6.8.2. Similarly, due to the undulating landscape and generally well vegetated field patterns and landscape structure permeated with woodland blocks that tend to form the backdrop of views, visual effects will be greater within the Solar PV Site and in areas in close proximity to the Solar PV Site. Mitigation planting along with substantial Mitigation and Enhancement Areas will greatly reduce views over built elements of the Proposed Development as it matures over time. Significant effects are only anticipated for Receptor Group 1, the effects on all other receptor groups are anticipated to be not significant.

6.8.3. Detailed assessment of visual effects including use of photopanels and photomontages of the Proposed Development will be used to aid detailed determination of effects and any further mitigation that may be required.

6.8.4. The requirement for further photography including illustrative and specific views as well as agreement on Representative Views and photomontages will be by agreed with relevant local authorities' through further engagement as part of the LVIA and reported in the ES. The oLEMP will also be further developed following feedback from the Stage 2 (formal) consultation to ensure that the proposed interventions including new planting and management of existing vegetation is delivered and managed appropriately in order to fulfil the intended mitigation and enhancement functions.

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Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 7: Ecology and Biodiversity

May 2022

7.0 Ecology and Biodiversity

7.1. Introduction

7.1.1. This chapter considers the potential effects generated by the Proposed Development during construction, operation and decommissioning in relation to Ecology and Biodiversity.

7.2. What might be affected by the Proposed Development?

7.2.1. The Proposed Development, as described in Chapter 5 of this PEIR, has the potential to affect a number of ecological features, including designated sites, priority habitats and protected or notable species. A full description of the ecological baseline conditions identified is set out in the Ecological Baseline Report, which is provided in Appendix 7.1. A summary of the key ecological features subject to this preliminary assessment is provided below.

7.2.2. A desk based study was carried out initially in May 2021 and an additional search (for a wider area) in January 2022 to gather existing records and information on designated sites and protected or otherwise notable species within the 2km of the Site in accordance with industry guidelines/best practice, further details on the study area can be found within section 7.3 of this chapter. Information on non-statutory designated sites, protected, notable and invasive species within a 2km radius of the Site boundary was obtained from the Lincolnshire Environmental Records Centre (LRC) and from the Leicestershire and Rutland Environmental Records Centre (LRERC). The Multi-Agency Geographic Information for the Countryside (MAGIC) database (Defra, 2021; accessed in November 2021) and Natural England's designated site information (November 2021) were also consulted to establish the ecological context of the Site and to search for information on internationally important designated sites up to 10km from the Site, other statutory designated sites within 2km and ponds within 500m of the Site.

7.2.3. A suite of detailed surveys (as described in Appendix 7.1) has also been undertaken for the Solar PV Site and Mitigation and Enhancement Areas including:

- an extended Phase 1 habitat survey (March & April 2021 and January 2022);
- water vole *Arvicola amphibius* and otter *Lutra lutra* surveys (July 2021);
- badger *Meles meles* survey (March & April 2021 and January 2022);
- breeding bird survey (April, June and July 2021);
- wintering bird surveys (November 2021 to March 2022); and
- great crested newt *Triturus cristatus* (GCN) surveys (April 2021).

7.2.4. The surveys enabled the ecological team to provide input into the design of the Proposed Development at an early stage which included the retention of the most valuable habitats onsite such as hedgerows and woodland, and habitat creation and enhancement measures in areas outside the PV Arrays themselves

Designated Sites

7.2.5. No internationally important designated sites for bats are present within 30km of the Site. The closest is Eversden and Wimpole Woods Special Areas of Conservation (SAC), located over 60km to the south. This is designated for its population of barbastelle bat *Barbastella barbastellus*.

7.2.6. Four international designated sites are present within 10km of the Site, the Rutland Water Special Protection Area (SPA) and Ramsar Site, which are located approximately 4.8km to the south-west of the Site, but 8.65 km from the Solar PV Site, Baston Fen SAC is located 4.46 km north east of the Site, Grimethorpe SAC is located 4.67 km north of the Site and Barnack Hills and Holes SAC is located 6.8 km south of the Site.

7.2.7. The Rutland Water SPA is designated primarily for its wintering population of shoveler *Anas clypeata*, teal *Anas crecca*, wigeon *Anas penelope*, gadwall *Anas strepera*, tufted duck *Aythya fuligula*, goldeneye *Bucephala clangula*, mute swan *Cygnus olor*, coot *Fulica atra*, merganser *Mergus merganser* and great crested grebe *Podiceps cristatus*. This site is also designated as an SPA for its assemblage of water fowl including the species above.

7.2.8. Grimethorpe SAC and Barnack Hills and Holes SAC are designated for their calcareous grassland communities and are also orchid rich priority sites. Grimethorpe is also designated for the presence of early gentian.

7.2.9. Baston Fen is designated for its population of spined loach fish. It is located on the Glen River, a tributary of which is the West Glen River.

7.2.10. Eight nationally important statutory designated sites are present within 2km of the Site. All of these sites are Sites of Special Scientific Interest (SSSI), which include Ryhall Pasture and Little Warren Verges SSSI and Newell Wood SSSI, Great Casterton Road Banks SSSI, Tolethorpe Road Verges SSSI, Tickencote Marsh SSSI, Bloody Oaks SSSI and East Wood, Great Casterton SSSI and Clipsham Old Quarry and Pickworth Great Wood SSSI (see Figure 7.1)

7.2.11. Ryhall Pasture and Little Warren Verges SSSI is directly adjacent to the north-west of the Site. This SSSI includes an area of semi-natural unimproved limestone grassland and features a characteristic calcareous plant community. This Site also includes adjacent species-rich roadside verges which fall within Lincolnshire.

7.2.12. Newell Wood SSSI is located approximately 340m north-west of the Site. This SSSI comprises an area of semi-natural woodland on the Site of former clay pits. The woodland is dominated by pedunculate oak *Quercus robur* and silver birch *Betula pendula* with a predominantly acidic ground flora, although some open areas with distinctly calcareous plant species are also present.

7.2.13. Tolethorpe Road Verges SSSI comprises the verges on both sides of Ryhall Road along the Site boundary north-east of Great Casterton. These verges support species-rich calcareous grassland.

7.2.14. The remaining SSSIs are located more than 400m away from the Site boundary and further details regarding these sites can be found in Appendix 7.1)

7.2.15. A total of 98 non-statutory Local Wildlife Sites (LWS) are present within 2km of the Site. The majority of these are designated for habitats (predominantly hedgerows, grassland and woodland) with many also featuring locally or nationally scarce species. These LWS are listed in Annex 1 of Appendix 7.1 and shown on Figure 7.1.

7.2.16. Nine of these LWSs are located wholly or in part within the Site boundary. These are:

- Carlby/Essendine Verge LWS.
- Essendine Dismantled Railway Embankment LWS.
- Essendine, Hedgerow south side MacMillan Way LWS.
- Ryhall/Essendine south-east of the Freewards (south side) LWS.
- Ryhall/Essendine Hedge south-east of the Freewards (south side) LWS.
- Essendine Verge south-east of The Freewards (north side) LWS.
- Ryhall RVNR: Crossroads to the Drift junction (west side) LWS.
- Ryhall Verge (B1176): from crossroads to Ryhall Farm Cott track (east side) LWS.
- Essendine, Hedgerow north side MacMillan Way LWS.

7.2.17. An additional 26 LWS are directly adjacent to the Site boundary or within 10m (generally separated by a minor road). Most of these sites are protected hedgerows of lengths of road verge.

7.2.18. The remaining sites are between 75m and 2km from the Site boundary.

Habitats

7.2.19. The Site consists of 906ha of which approximately 879ha is in agricultural use with associated hedgerows, ditches, ponds, woodland parcels and tracks and buildings. The results of the Phase 1 habitat surveys of the Solar PV Site and the Mitigation and Enhancement Areas are shown on Figure 7.3.

7.2.20. The majority of the Solar PV Site and the Mitigation and Enhancement Areas consists of arable farmland which is largely in intensive agricultural management for cereals, with the majority of field margins measuring less than 1m in width. Many fields are very large (the largest being over 58ha). The fields support a very low diversity of arable weeds.

7.2.21. The arable fields are of low intrinsic ecological value and are not Habitats of Principal Importance (HPI) as defined by the Natural Environment and Rural Communities (NERC) Act 2006 (as amended). The intense nature of the agricultural practice and very limited margins mean they are not considered to be ecologically valuable and are not HPIs.

7.2.22. Areas of improved grassland are present across the Site, predominantly forming margins to arable fields. Improved grassland areas are dominated by perennial rye grass *Lolium perenne* with very few herbs present (predominantly white clover *Trifolium repens* and creeping buttercup *Ranunculus repens*). At the time of the survey, these areas were unmanaged and had relatively long sward (averaging approximately 25cm). This grassland does not meet the description of any HPIs.

7.2.23. Areas of species-poor, semi-improved grassland are also present across the Site, predominantly forming margins to arable fields. These support a slightly higher plant species diversity, and in addition to the species described above, contain grasses such as cock's-foot *Dactylis glomerata*, false oat grass *Arrhenatherum elatius* and red fescue *Festuca rubra*. Herbaceous species include greater plantain *Plantago major*, broadleaved dock *Rumex obtusifolius*, chickweed *Stellaria media*, dandelion *Taraxacum agg*., groundsel *Senecio vulgaris*, spear thistle *Cirsium vulgare*, yarrow *Achillea millefolium*, ragwort *Jacobaea vulgaris*, common mouse-ear *Cerastium fontanum* and creeping thistle *Cirsium arvense*. This grassland does not meet the description of any HPIs.

7.2.24. There are multiple parcels of woodland distributed across the Solar PV Site and Mitigation and Enhancement Areas, some of which are semi-natural broadleaved woodland. These woodlands are dominated by pedunculate oak and ash *Fraxinus excelsior*; however, silver birch, willow *Salix* sp., hybrid black poplar *Populus x euramericana* and alder *Alnus glutinosa* are present. Most woodland parcels feature a relatively dense understorey, consisting predominantly of hazel *Corylus avellana*, holly *Ilex aquifolium*, elder *Sambucus nigra* and hawthorn *Crataegus monogyna*. The ground flora is relatively diverse, with species including bluebell *Hyacinthoides non-scripta,* ground ivy *Glechoma hederacea*, dog's mercury *Mercurialis perennis*, lords-and-ladies *Arum maculatum*, wood sorrel *Oxalis acetosella*, ragged robin *Silene flos-cuculi*, spurge laurel *Daphne laureola*, wood anemone *Anemone nemorosa* and foxglove *Digitalis purpurea*. Some of these species are ancient woodland indicator species; however, MAGIC does not identify any of the woodlands within the Site as ancient semi-natural woodland. This woodland meets the definition of the Lowland mixed deciduous woodland HPI (Maddock, 2011). Additional woodland, including ancient woodland and replanted ancient woodland, is present outside of the Site, adjacent to the northern, southern and north-western Site boundaries.

7.2.25. There are also parcels of onsite plantation woodland which show clear evidence of recent planting (e.g. presence of tree guards, regular lines of young or semi-mature trees) or have been visibly recently planted based on reviewing older aerial imagery. The majority of plantation woodland is broadleaved, with a mixture of similar native species to the semi-natural woodland. Due to the recent age of the plantations, the understorey layer is poorly developed or absent, and the ground layer is species poor. This woodland does not qualify as an HPI. Approximately 0.2ha of plantation woodland towards the east of the Site is dominated by planted non-native coniferous trees including spruce *Picea* sp. and fir *Abies* sp. This woodland does not qualify as an HPI.

7.2.26. A former railway embankment (designated as the Essendine Dismantled Railway Embankment LWS adjacent to Field 19 as shown on Figure 3.2) features dense mixed scrub of comparative high species richness. Woody species include hawthorn, blackthorn, field maple *Acer campestre*, holly, elder, hazel, cherry *Prunus* sp., bramble *Rubus fruticosus*, wych elm *Ulmus glabra*, and occasional dog rose *Rosa* *canina*. The ground flora is diverse with bluebell, dog's mercury, lords and ladies, wood sorrel, and foxglove all present. Other patches of dense scrub are also present across the western half of the Solar PV Site, these are all species-poor and often dominated by a single species, generally either bramble, hawthorn or blackthorn *Prunus spinosa*. The ground flora within these patches are either non-existent or very sparse and lacking in diversity. This habitat is not an HPI.

7.2.27. Most external boundaries and some internal boundaries of the Solar PV Site and Mitigation and Enhancemnt Area feature native hedgerows. Some species-rich sections (as shown in Figure 7.3) are present with over five woody species per 30m section. These include hawthorn, blackthorn, field maple, holly, elder, hazel, cherry, bramble, wych elm, field elm *Ulmus minor* with occasional dog rose. The majority of hedgerows onsite are species-poor, and formed by one to three woody species, usually blackthorn and/or hawthorn. Many hedgerows across the Solar PV Site and Mitigation and Enhancement Areas feature one or several standard trees, including mature pedunculate oak, beech *Fagus sylvatica*, ash, hybrid black poplar, and various willow species pp. The hedgerow bases, including verges of roads, largely support common species such as lords-and-ladies, dog's mercury, common nettle *Urtica dioica*, cleavers *Galium aparine*, ground-ivy and common hogweed *Heracleum sphondylium*. However, the first two species are indicative of older hedgerows and predominantly only present in the species rich hedgerows. Most hedgerows, particularly in the east of the Solar PV Site and Mitigation and Enhancement Areas, are intensively managed by cutting and show structural indicators of poor condition (abundant horizontal and vertical gaps), with some hedgerows defunct and/or left to grow out into scrubby treelines. All the hedgerows onsite are considered to meet the description of the Hedgerows HPI.

7.2.28. An analysis of aerial imagery and mapping revealed the presence of 24 ponds onsite or within 500m of the Site boundary. There are eight ponds onsite or on its boundary, with an additional 16 ponds within 500m of the Site boundary (see Figure 7.2). Of the eight ponds present within the Site or on its boundary, five held water. The majority of these ponds are situated at the edge of pockets of woodland and are heavily shaded, although most ponds have aquatic and marginal vegetation present. These ponds are described in detail under the 'Amphibians' subheading below. All the ponds onsite holding water have potential to meet the description of the Ponds HPI (Maddock, 2011) based on the presence of aquatic species and water quality parameters.

7.2.29. The West Glen River flows through Fields 20, 21, 24 and 26, as indicated on Figure 3.2. This watercourse features a natural river channel dominated by marginal vegetation, predominantly common reed *Phragmites australis* and bulrush *Typha latifolia*. Emergent/submerged plants are also present in patches, but a detailed survey was not undertaken to identify these down to species level. The banks of the river comprise of a mosaic of species poor semi-improved grassland, semi-improved neutral grassland, scattered scrub and tall ruderal vegetation. The river has the potential to meet the description of the Rivers HPI (Maddock, 2011) and as a precautionary approach this has been assessed as being an HPI.

7.2.30. A mixture of dry and wet field ditches are present across Solar PV Site and Mitigation and Enhancement Areas. These generally did not feature aquatic vegetation, with any vegetation present reflecting the surrounding habitat (generally species-poor grassland field margins as described above). This habitat does not meet the description of any HPIs.

7.2.31. Small pockets of tall ruderal vegetation are present, particularly in the western extent of the Solar PV Site and Mitigation and Enhancement Areas. These are too small to map and often form transitional areas between other habitat types. Species noted included common nettle, broad-leaved dock and common hogweed. This habitat does not meet the description of any HPIs.

7.2.32. The Solar PV Site and Mitigation and Enhancement Areas also includes small areas of bare ground (e.g. access tracks), scattered trees and hard standing. There are also several farm buildings present as shown on Figure 7.3.

7.2.33. The Site does not support any ancient woodland; however, there are parcels of this outside the Site on the north-eastern boundary (replanted ancient woodland at Braceborough Little Wood) and north-western Site boundary (ancient woodland and replanted ancient woodland at Newell Wood).

Protected and notable species

7.2.34. The relevant legislation and policy on protected and notable species is set out in Annex 2 of the Baseline Report (Appendix 7.1)

Bats

7.2.35. All species of bats are European Protected Species (EPS) and seven species are also species of Principal Importance (SPIs) and a local Biodiversity Action Plan (BAP) species in Lincolnshire, Leicestershire and Rutland.

7.2.36. Numerous records of bats were returned from the LRC and LRERC with at least eight species. Most are relatively common species, though very low numbers of records of barbastelle *Barbastella barbastellus* and whiskered bat *Myotis mystacinus* were also returned.

7.2.37. The three buildings in the eastern part of the Site are steel-framed structures and do not support potential roost features (PRF) and have negligible suitability for roosting bats.

7.2.38. A total of 163 field and hedgerow trees across the Solar PV Site and Mitigation and Enhancement Areas were assessed as having at least Low suitability for roosting bats with smaller trees being of negligible value and not identified in detail within this report. Additionally, mature patches of woodland onsite are likely to contain further trees with roosting opportunities for bats. The intensively-managed arable fields which make up the majority of the Solar PV Site and Mitigation and Enhancement Areas are likely to be of Very Low suitability for foraging bats as they are dominated by a single species crop and are regularly managed with herbicide, and insecticide. The woodlands (particularly areas of mature woodland with large trees) have suitability for foraging, as do hedgerows, scrub and lines of trees, especially where mature trees and other features, such as ponds, are present and the boundary features are reasonably continuous. Small pockets of semi-improved neutral grassland also have moderate suitability for foraging, especially where these are associated with hedgerows or other woody features.

7.2.39. Hedgerows and lines of trees (as well as linear scrub features such as the Essendine Dismantled Railway Embankment LWS) and the West Glen River may also provide important commuting routes for bats, especially where they form continuous corridors across the Site or between woodland patches, and/or have wide grassland margins.

7.2.40. Trees with bat roost suitability are indicated on Figure 7.4.

Badgers

7.2.41. Numerous records of badgers were returned from the LRC and LRERC.

7.2.42. The intensively-managed arable fields, which make up the majority of the Solar PV Site and Mitigation and Enhancement Areas are of Low suitability for foraging badgers. However, the woodland, hedgerows, scrub and other woody features have suitability for foraging and sett-building this species, and patches of non-woody, semi-natural habitats such as grassland field margins and tall ruderal vegetation provide additional suitable habitat.

7.2.43. A total of 18 badger setts were located across the Site (see Confidential Figure 7.7 of Appendix 7.1). These are predominantly located in field boundaries, at the edges of woodland and in scrub. Of these badger setts, ten constituted main or annexe setts with at least three entrances, and the remainder comprised likely outlier setts with a single, isolated entrance. Badgers are fully protected under the Protection of Badgers Act 1992.

Hazel Dormouse

7.2.44. Hazel dormouse is an EPS and an SPI and local BAP species in Leicestershire and Rutland.

7.2.45. No records of hazel dormouse were returned from LRC and LRERC and the species is rare in Rutland and Lincolnshire. The hedgerows, woodland and scrub onsite are suitable for the species, but due to the extent of gaps and connectivity, only low numbers are likely to be present if they occur onsite.

Water Vole

7.2.46. Water vole *Arvicola amphibius* and their burrows are fully protected under the Wildlife and Countryside Act 1981 (as amended) and are an SPI and a local BAP species in Lincolnshire and Leicestershire and Rutland.

7.2.47. Several records of the species were returned from LRC and LRERC including for the West Glen River, 40m from the Site.

7.2.48. During the survey visit, the surveyor slowly walked along the banks (both sides) and waded within the channel (where accessible and safe to do so). The surveys covered the 1.48 km course of the West Glen River where it crosses the Site south of the railway line including an offsite stretch to gather contextual information, where access allowed. The survey also covered all ditches onsite which held water at the time of survey. Evidence and potential evidence of water vole was noted, and the locations of field signs were marked on an annotated map.

7.2.49. The ditches onsite are unsuitable for water vole with most being dry at the time of the surveys and intensively managed with only narrow margins of short grassland present and an absence of aquatic vegetation. The West Glen River does, however, provide suitable habitats for the species and evidence of their presence was recorded where the river passes through the Site. A plan indicating the evidence of water vole is provided at Figure 7.5.

Otter

7.2.50. Otter is an EPS and an SPI and a local BAP species in Lincolnshire and Leicestershire and Rutland.

7.2.51. The LRC and LRERC returned 20 records of otter. The closest record of an otter to the Site was an observation approximately 15m north of the Site on the West Glen River, west of Carlby in 2009.

7.2.52. The West Glen River has suitability for this species, with areas of dense cover for holt-building. No evidence of otter was returned from the West Glen River during the water vole survey visits; however, this species may be present along this watercourse.

Other SPI mammals

7.2.53. Records were returned from LRC and LRERC for other notable mammals including brown hare *Lepus europaeus* (41 records), hedgehog *Erinaceus europaeus* (38) and harvest mouse *Micromys minutus* (three).

7.2.54. Brown hare is present onsite with the species being recorded during the breeding bird surveys, with a peak of 17 individuals. The arable land comprising the majority of the Site, as well as smaller parcels of grassland, are suitable habitat for this species. Brown hare is an SPI.

7.2.55. The closest record of a hedgehog returned from the LRC and LRERC to the Site was 30m north, to the east of Braceborough Grange, in 2015. The Solar PV Site and Mitigation and Enhancement Areas have some suitable habitat for hedgehog in the hedgerows, woodland, and grassland therefore this species may be present onsite. Hedgehog is an SPI.

7.2.56. The records returned from the LRC and LRERC for harvest mouse are over 40 years old. The intensive arable farmland which dominates the Solar PV Site and Mitigation and Enhancement Areas represents sub-optimal habitat for this species, with the poor semi-improved grassland patches and field margins providing habitat of a higher suitability. No evidence of harvest mouse was detected during the extended Phase 1 habitat survey, although this species is hard to detect and may be present onsite. Harvest mouse is an SPI.

7.2.57. No records of polecat *Mustela putorius* were returned by the LRC or LRERC but this species is reportedly present on the western edge of the Solar PV Site and Mitigation and Enhancement Areas along the Drift (information supplied by Tom Tew of Naturespace). This species is an SPI.

7.2.58. A number of other mammals are present within the Solar PV Site and Mitigation and Enhancement Areas, include several deer species. However, as several species such as muntjac *Muntiacus reevesi*, are non-native and included in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended), they are not an ecological feature which requires further consideration. The native roe deer *Capreolus capreolus* may also be present; however, this is also not included in any lists which would mean the species merits specific further consideration.

Birds

7.2.59. All wild birds, their nests, eggs and young are protected under the Wildlife and Countryside Act 1981 (as amended). There are many species listed as SPIs (discussed as relevant below). Lincolnshire has a group BAP for farmland birds.

7.2.60. A total 1,775 records of birds were returned from the LRC and LRERC. This included records of three Schedule 1 species which have the potential to breed onsite: red kite *Milvus milvus*, kingfisher *Alcedo atthis* and barn owl *Tyto alba*. A further 16 species included in the records, which are SPIs, may also occur within the Site: starling *Sturnus vulgaris*, lapwing *Vanellus vanellus*, skylark *Alauda arvensis*, house sparrow *Passer domesticus*, linnet *Linaria cannabina*, yellowhammer *Emberiza citrinella*, song thrush *Turdus philomelos*, yellow wagtail *Motacilla flava*, reed bunting *Emberiza schoeniclus*, turtle dove *Streptopelia turtur*, tree sparrow *Passer montanus*, bullfinch *Pyrrhula pyrrhula*, cuckoo *Cuculus canorus*, corn bunting *Emberiza calandra*, lapwing *Vanellus vanellus* and grey partridge *Perdix perdix*.

7.2.61. A total of 48 bird species were recorded during the bird survey as either confirmed or likely breeding onsite. This included a range of ubiquitous SPIs and those typical of farmland, hedgerows, woodland and scrub habitats. Additionally, species which are typically ground-nesting were also recorded including skylark *Alauda arvensis* (58 pairs), lapwing *Vanellus vanellus* (one pair) and yellow wagtail (two pairs). All three are SPIs. Indicative territories of breeding birds are indicated on Figure 7.6.

7.2.62. The Solar PV Site and Mitigation and Enhancement Areas support a small number of larger fields, but these are largely in intensive arable use. Therefore, there is potential for wintering species to include species such as lapwing and golden plover *Apicaria pluvialis* as well as very small numbers of ducks. However, given that the larger fields are limited in number and that there are no SPAs for these species in the vicinity (at least 10km), the winter usage of the Site by waders and wildfowl is likely to be very limited.

7.2.63. The wintering bird surveys carried out have recorded a very limited number of species wintering on the Solar PV Site and Mitigation and Enhancement Areas, above the species listed above which are residents. Of note have been small flocks of yellowhammer with a peak of 50 individuals, skylark with a peak of 40 individuals, redwing with a peak of 200, fieldfare with a peak of 450 (but lower numbers at other times).

7.2.64. A larger flock of starling estimated at 3,000 individuals was noted feeding on 24 November 2021 in a field which was recently ploughed located in the centre of the Site, immediately east of the East Coast

Mainline Railway. It should be noted; however, that this large flock was mobile and only much smaller flocks have been recorded on other occasions (peaks of 500 and 200).

7.2.65. Waders have been observed very infrequently. Lapwing was recorded on four occasions, with a peak of 90 individuals on 27 January 2022 but this was in a field offsite to the north-east. The remaining three occasions the birds were onsite but these involved one and two birds only. Golden plover (11 individuals) were recorded on one occasion on 10 January 2022 in an arable field in the northern part of the Site.

7.2.66. Wildfowl were noted very infrequently. One more sizeable flock of mallard *Anas platyrhynchos* was noted on 14 December 2021 with 60 individuals present in an arable field near the centre of the Site, but very low numbers of these species were recorded at other times (nine or fewer individuals). A small field at the centre of the Site immediately south of the West Glen River supported wigeon on one occasion (six individuals), gadwall (two individuals) on one occasion and tufted duck (three individuals) on one occasion. These individuals are likely to have been opportunistically using a small wet area and were not recorded here at other times. Mute swan was recorded very infrequently as well (one observation of two individuals).

7.2.67. Given the very low numbers and frequency of records of wildfowl and the distance from the Rutland Water SPA and Ramsar site, it is highly unlikely that the Site provides functionally linked land to these designated sites.

Reptiles

7.2.68. All reptiles are fully protected under the Wildlife and Countryside Act 1981 (as amended) and SPIs.

7.2.69. A total of 43 records of three reptile species from within 2km of the Site: common lizard *Zootoca vivipara* (22 records), grass snake *Natrix helveticas* (19) and slow worm *Anguis fragilis* (two). Two records from the LRC and LRERC for common lizard originate from within the Site, one adjacent to an isolated patch of woodland in the eastern extent of the Site in 2020, and one adjacent to a road in the north-western extent of the Site in 1996.

7.2.70. The arable land which dominates the Solar PV Site and Mitigation and Enhancement Areas is of Very Poor suitability for reptiles but some suitable habitat for reptiles is present onsite, predominantly longer and less-managed grassland, such as that which forms the (albeit narrow) field margins to arable fields. The riparian vegetation along the banks of the West Glen River are also suitable for grass snake.

Amphibians

7.2.71. A total of 34 records of amphibians were returned from the LRC and LRERC, including ten of Great Crested Newt (GCN) and five of common toad *Bufo bufo*. The closest record of a GCN to the Site was located approximately 470m north-east of the Site in Braceborough during 2013. The closest record of a common toad was located approximately 350m from the Site in Essendine during 2000.

7.2.72. Of the eight ponds on or adjacent to the Site (3, 4, 6, 7, 8, 18, 19, 20), three were found to be dry or absent altogether (18, 19 and 20) during the extended Phase 1 habitat survey. The remaining five ponds (3, 4, 6, 7 and 8) held water. These plus three offsite ponds (1, 2 and 5) which were immediately adjacent to the Site boundary and accessible from the Site, were surveyed using eDNA. The eDNA surveys of these eight ponds (1, 2, 3, 4, 5, 6, 7 and 8) did not return evidence of GCN suggesting they are absent. These ponds were also subject to Habitat Suitability Index (HSI) assessments and were assessed being Poor (five ponds), Below average (one pond), Average (one pond) or Good (one pond).

7.2.73. Ponds 12 and 24 are located 430m and 360m, respectively, from the Site boundary and surrounded by good terrestrial habitat. GCN from these ponds (if present) are unlikely to be using the Site. Ponds 21, 22 and 23 form a small cluster on the far side of a watercourse with the closest pond (Pond 21) being 230m from the Site and are also surrounded by suitable terrestrial habitat, meaning any newts present are unlikely to then be present on the Site. The remaining eight offsite ponds which have not already been surveyed (Ponds 9, 10, 11, 13, 14, 15, 16, 17) vary between 50m and 250m from the Site boundary and were not accessed for survey. The pond locations are indicated on Figure 7.2

7.2.74. GCN is an EPS and an SPI, while common toad is an SPI.

Invertebrates

7.2.75. The LRC and LRERC returned 681 records of 47 invertebrate species within 2km of the Site. The Site generally offers habitat of poor or very poor value for invertebrates due to the intensive management of the arable land, and the majority of habitats are unlikely to support any notable populations or assemblages of invertebrates. The more mature woodland areas and veteran trees within field boundary features may support some saproxylic (dead wood-reliant) species, while the aquatic habitats (particularly the West Glen River) may support notable aquatic species.

Plants

7.2.76. The LRC and LRERC returned 1,200 records of 251 plant species within 2km of the Site. This includes a range of notable species which are typical of more diverse grassland such as bee orchid *Ophrys apifera*, man orchid *Orchis anthropophora*, and arable weeds including corn chamomile *Anthemis arvensis*, hound's -tongue *Cynoglossum officinale*, night-flowering catchfly *Silene noctiflora*, sharp-leaved fluellen *Kickxia elatine*, sulphur clover *Trifolium ochroleucon* and venus' looking-glass *Triodanis perfoliata*.

7.2.77. The majority of the Solar PV Site and Mitigation and Enhancement Area comprises intensively-managed (cultivated and sprayed with fertiliser, herbicide and insecticide), species-poor habitats of low or very low value for plant diversity, and is unlikely to support any notable populations or assemblages of plants. The more mature woodland areas, hedgerows and aquatic habitats may support some notable species. The grassland areas onsite are of very low diversity and unlikely to support notable plant communities. The arable land was not noted to support notable arable weeds during the Phase 1 habitat survey.

7.3. How have we assessed the effects relating to this topic?

7.3.1. The ecological and biodiversity assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of the main guidance document used when assessing impacts to ecological features, which is the Ecological Impact Assessment (EcIA) guidance published by the Chartered Institute for Ecology and Environmental Management (CIEEM) in 2018. Our approach to the assessment of the significance of effect in relation to biodiversity is described in Appendix 7.2.

Legislation, Planning Policy and Guidance

7.3.2. The Ecology Baseline Report (Appendix 7.1) sets out the main legislation pertaining to habitats and species which has been considered in identifying potential ecological features for further considerations. These include:

- Environment Act 2021;
- Natural Environment and Rural Communities (NERC) Act 2006 - Habitats and species of principal importance (England);
- The Conservation of Habitats and Species Regulations 2017 (as amended);

- Wildlife and Countryside Act 1981 (as amended);
- Protection of Badgers Act 1992 (as amended); and
- The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

7.3.3. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

7.3.4. Other relevant guidance includes the Chartered Institute for Ecology and Environmental Management (CIEEM) (2019) Guidelines for Ecological Impact Assessment (EcIA).

Study Area

7.3.5. With the exception of the wintering birds, where the field surveys were extended to neighbouring large fields to gather contextual information on mobile species, the field surveys carried out to inform the baseline conditions covered the Solar PV Site and Mitigation and Enhancement Areas. Discussion are ongoing with the relevant highways authorities with regards to the need for any localised highway improvements within the Potential Highway Works Site, once confirmed, further surveys will be undertaken if any very localised vegetation removal is likely to be required, which will be detailed within the ES.   This is due to the contained nature of the Proposed Development and the type of development, which will have a very limited Zone of Influence (ZoI), in so far as ecological impacts are concerned. The Proposed Development is highly unlikely to have wider ranging impacts, such as additional recreational activities which might have an adverse effect on habitats in the wider area. However, to help gain a better understanding of the ecological context of the Site a desk study included searches for records of protected or notable species and nationally designated and statutory and non-statutory sites within 2km and for internationally important designated site within 10km and internationally designated sites for bats within 30km. This wider search area was used to gather contextual information and is proportionate for the nature and type of development proposed as the proposals would not result in adverse effects at a larger scale.

Assumption and Limitations

7.3.6. At this stage in the development of the Proposed Development, it is assumed that all HPIs will be retained within the Site, with the exception of breaks for highway accesses, internal access tracks and cable corridors where these cannot be aligned with existing field gateways. The design work is ongoing and the ES will provide further information on the potential extents of any loss of habitats.

7.3.7. A rise in temperature and/or precipitation levels associated with climate change is not anticipated to materially affect habitats and associated protected species during the lifetime of the Proposed Development that would alter the conclusions of the preliminary ecology assessment

7.4. What are the potential environmental effects?

7.4.1. This section describes the potential ecological effects that may arise during the construction, operation and decommissioning phases of the Proposed Development. The embedded (primary) mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of this preliminary assessment, when considering the potential effects of the Proposed Development.

7.4.2. In addition an outline Construction and Environmental Management Plan (oCEMP) and outline Decommissioning and Environmental Management Plan (oDEMP) and outline Landscape and Ecological Management Plan (LEMP) (Appendix 5.1 5.3 and 5.2 respectively) have been prepared and include mitigation measures which are intended to avoid the risks of effects during the construction and decommissioning phase such as indirect and direct damage to retained features, direct damage to active bird nests and injury to protected species or damage to habitat of those species.

7.4.3. The CEMP and DEMP will set out the locations of sensitive and retained features and the measures proposed for their protection. The CEMP and DEMP will be secured via a requirement in the DCO and a detailed CEMP and DEMP will need to be prepared in advance of construction and decommissioning commencing, which will be in accordance with the outline document presented with the DCO application. The CEMP and DEMP will need to agreed with the local planning authority prior to construction and decommissioning commencing, respectively. The oCEMP and oDEMP include measures such as details of appropriate fencing to prevent accidental direct damage and water pollution control measures, seasonal restrictions of certain activities to avoid bird nesting, injury to reptiles and amphibians etc.

7.4.4. In order to ensure the beneficial effects of the newly created habitats are fully realised, a management regime will be secured through the production and implementation of a LEMP which will be secured via a requirement in the DCO. As per the CEMP and DEMP the LEMP presented with thjs PEIR is necessarily in outline, but a detailed plan will be prepared and agreed with the Local Planning Authority prior to the operation of the Proposed Development. The LEMP will set out how the newly created and retained habitats onsite will be managed throughout the operational phase of the Proposed Development.

7.4.5. The preliminary assessment presented below considers the potential impact of the Proposed Development. Having taken account of the embedded mitigation along with the measures set out in the oCEMP, oLEMP and oDEMP, the preliminary assessment hasn't identified any likely significant effects.

Designated Sites

7.4.6. During all phases, due to the nature of the Proposed Development, no direct adverse effects to statutory and non-statutory designated sites further afield than the Site or its boundary are considered likely.

7.4.7. The nearest internationally important statutory designated sites identified as part of the desk study work are located approximately 4.8km from the Site and 8.65 km from the Solar PV Site, therefore no direct impacts would occur. None of the species for which the Rutland SPA is notified occur within the Site on a sufficiently regular basis or in significant enough numbers for the Site to be considered functionally linked to the SPA and Ramsar sites. Although linked to the West Glen River via the Glen River no impacts on potential supporting habitat for spined loach will occur as the Proposed Development will not directly or indirectly affect the West Glen River.

7.4.8. The majority of the other statutory and non-statutory designated sites as set out above (paragraphs 7.2.5 - 7.2.18) within and adjacent to the Site will not be directly affected and will be retained and bolstered with buffers to be used for planting of diverse habitats such as wildflower grassland (primary mitigation), though some localised cabling and highways work may be necessary. The extent of these works is currently unknown, but is expected to minimal given the localised nature of the works. The effect is considered to be of no greater significance than District level. Avoidance of designated sites will be considered as the design progresses to avoid or reduce this impact and will be fully assessed and reported within the ES.

7.4.9. There is the potential of accidental damage and other indirect effects to the Ryhall Pasture and Little Warren Verges SSSI and Tolethorpe Road Verges SSSI and LWSs, within and adjacent to the Site to occur during the construction or decommissioning phases. These will be avoided or reduced to insignificant impacts by the implementation of the measures set out in the oCEMP and oDEMP.

7.4.10. Due to the nature of the Proposed Development, construction methodology and associated levels of traffic movements during all phases, no impacts to the SSSIs are likely to occur as a result of noise or air pollution.

Habitats

Construction

7.4.11. As set out above, the extent of the Solar PV retains the HPIs within the Site. The only substantial loss of habitats will be as a result of arable land (albeit of Site value) being replaced with the PV Arrays and associated infrastructure (such as access tracks and fixed plant), permanent grassland underneath the PV Arrays and wildflower grassland in other areas will be delivered as part of the Proposed Development. Areas within the Mitigation and Enhancement Areas will be retained as arable land for the provision of skylark plots as described in Chapter 5 of this PEIR. Offsite ancient and ancient replanted woodland will not be subject to any direct effects as it is not located immediately adjacent to or within 50m of the Solar PV Site.

7.4.12. Where arable land is replaced with hard standing, this represents a minor loss in terms of ecological value and extent and is likely to be an adverse effect of significance at a Site level only. However, where arable land is replaced with other habitats such as grassland (even in the case of grazed permanent grassland with a moderate species diversity) the effect is likely to be an overall beneficial effect of significance at a District level.

7.4.13. There is the potential for retained habitats on and immediately offsite being damaged during the construction phase. However, measures to reduce the risk of accidental encroachment are set out in the draft oCEMP. With these measures in place, any accidental encroachment is likely to be avoided or at worst have an adverse effect of significance at the Site level only.

Operation

7.4.14. During the operational phase, the onsite habitats will be managed in accordance with a Landscape and Ecology Management Plan (LEMP). No additional effects therefore will arise during the operational phase.

Decommissioning

7.4.15. At the decommissioning phase, certain habitats, such as the grassland areas underneath the PV Arrays, may be removed and returned to arable land resulting in an adverse effect of significance at up to District level. However, this adverse effect is likely to represent only a return to the pre-development baseline conditions within the Solar PV Site.

7.4.16. Any small scale vegetation removal required to facilitate the decommissioning of the Proposed Development will have an adverse effect of significance only at a Site level.

7.4.17. There is the potential risk that, at the decommissioning stage, accidental damage to retained habitats might occur as a result of decommissioning activities. Measures to reduce the risk of accidental encroachment are set out in the draft oDEMP. With these measures in place, any accidental encroachment will be avoided or at worst have an adverse effect of significance at the Site level only.

Protected and notable species

7.4.18. This section sets out the potential impacts to protected and notable species at the construction and operation phases based on the current baseline understanding of protected species. However species are not always sedentary and circumstances on site can change over time. As such the predicted impacts set out in this preliminary report will need to be reviewed in light of new information that arises from monitoring surveys, In the absence of future unknown species information , a high level assessment of the decommissioning impacts is presented here as relevant. As above this is based on the removal of the PV Arrays and associated infrastructure and grassland being returned to arable. The updated surveys will be carried out approximately one year prior to decommissioning and the relevant legislation and policy background at that point in time will be used to inform the necessary mitigation to be set out in the Decommissioning Environmental Management Plan (DEMP).

Bats

7.4.19. As the Proposed Development will not remove any trees or buildings suitable for roosting bats, hedgerows or other linear features (with the exception of small breaks which would remain unlit) used by commuting or foraging bats and the lighting scheme will be designed to include lighting which is not continuously lit, no adverse effects will occur on roosting or foraging bats at any phase of the Proposed Development. This design principle was set out at an early stage hence no activity surveys to identify important commuting or foraging areas or detailed assessments of trees or buildings to identify roosts have been carried out.

Construction and Decommissioning

7.4.20. There is the potential for retained habitats (such as trees) with suitability to support roosting features being damaged during the construction and decommissioning phases due to accidental damage from machinery. Measures to avoid or reduce the risk of accidental encroachment are set out in the draft oCEMP and oDEMP. With these measures in place, any accidental encroachment is likely to be avoided or at worst have an adverse effect of significance at the Site level only.

7.4.21. At the decommissioning stage the proposed habitats underneath the PV Arrays will be returned to arable farmland, which would result in a loss of foraging habitats and would be an adverse effect on bats of significance at up to District level; however, a beneficial effect will have been delivered at the operational phase of the Proposed Development and this adverse effect is likely to represent only a return to the pre-development baseline conditions.

Operation

7.4.22. The Proposed Development will include a number of habitat creation measures which will deliver a range of benefits for bats, including the provision of much more extensive foraging habitats, for example the buffers to the retained hedgerows and ditches onsite. This will result in a beneficial effect for these species of significance at up to a District level.

Badgers

7.4.23. The Proposed Development will retain the habitats of highest value as a foraging resource for badgers, such as woodland and hedgerows.

Construction and Decommissioning

7.4.24. Updated badger surveys will be carried out prior to the start of the construction phase to identify any additional setts present within or adjacent to the construction areas. The locations of any setts will be considered and either retained with an appropriate buffer (indicatively 30m but this would depend on the nature of construction in the vicinity) or individual setts will be closed under an appropriate licence. The number of setts to be closed will be limited and priority for retention will be given to the more significant setts, such as main setts. Any small losses in terms of setts would be an adverse impact of significance up to Site level.

7.4.25. There is the potential for retained setts being damaged during the construction and decommissioning phases due to accidental encroachment. Measures to avoid or reduce the risk of accidental encroachment are set out in the draft oCEMP and oDEMP. With these measures in place, any accidental encroachment will be avoided or at worst will have an adverse effect of significance at the Site level only.

7.4.26. At the decommissioning phase, there is potential for an adverse impact of badgers, as they are a highly mobile species and may have established new setts within proximity to potential areas of works. The updated surveys would inform the level of the impacts and the required mitigation, which would be implemented to avoid an adverse effect on the species.

Operation

7.4.27. Suitable gaps (indicatively 30 x 30cm) will be incorporated into all lengths of security fencing to allow badgers to pass beneath. This will also benefit other mammals. The habitat creation and enhancements will likely increase the amount of foraging habitat for badgers, including the extent of grassland beneath the PV Arrays (a more favourable habitat for foraging than arable land), resulting in a beneficial effect of significance at up to District level.

7.4.28. No operational activities have the potential to adversely impact this species.

Water vole and otter

7.4.29. The retention of the West Glen River and associated habitats will ensure no adverse effects on these species will occur through habitat loss. The internal cable network will be horizontal directional drilled (HDD) underneath the West Glen River so not to impact on the water course or the immediately adjacent habitat.

7.4.30. Any works required to the existing crossing points of the West Glen River will be designed so as to allow continued movement through the area by both species (such as by designing bridges with a tall span clear of the water level).

Construction and Decommissioning

7.4.31. There is, however, the potential for habitats which support water vole and otter to be subject to adverse effects as a result either accidental encroachment or habitat degradation during the construction phase. Small scale habitat losses may be required if upgrades to the existing agricultural crossing of the West Glen River are required. Measures to avoid or reduce the risk of accidental encroachment and degradation are set out in the draft oCEMP and oDEMP. With these measures in place, any accidental encroachment would be an adverse effect on these species of significance only at a Site level.

7.4.32. At the decommissioning phase, updated surveys would be needed to assess the potential effects of the any works (such as removing crossing points although this is not anticipated to be required) on these species.

In any case, these works are likely to be limited to very small areas and at worst have an adverse effect of significance at the Site level only.

Operation

7.4.33. During the operational phase, no operational activities have the potential to significantly adversely affect this species.

Hazel Dormouse

7.4.34. No records of hazel dormouse were returned from the desk based study and the species is rare in Rutland and Lincolnshire. As the hedgerows, woodland and scrub will be retained and protected from artificial light pollution or additional fragmentation, no additional surveys for hazel dormouse are proposed as no adverse effects are likely to occur to this species at anything but a very small scale (no greater than Site level) and therefore a European Protected Species (EPS) licence from Natural England is not likely to be required.

Construction and Decommissioning

7.4.35. There is the potential for retained habitats suitable for this species being damaged during the construction and decommissioning phases due to accidental encroachment on a very small scale. The oCEMP and oDEMP include mitigation measures that will avoid an adverse effect or at worst have an adverse effect of significance at the Site level only.

7.4.36. There is a risk, albeit very low, that in the absence of mitigation, any small amounts of habitat clearance may result in the injury of individual dormice or damage to active nests. Measures to reduce these risks are set out in the draft oCEMP and oDEMP. With these measures in place, impacts are likely to be limited and at worst have an adverse effect of significance at the Site level only.

7.4.37. During the decommissioning phase, the removal of PV Arrays and the grassland underneath would not affect dormice. The removal of associated infrastructure such as cabling is likely to only affect very small areas, which would constitute an adverse effect of a significance at a Site level only.

Operation

7.4.38. During the operational phase, no operational activities have the potential to impact these species and therefore no adverse impacts to hazel dormouse are likely to occur. Habitat creation within the buffer zones between retained hedgerows and/or ditches and the security fencing surrounding the PV Arrays will likely result in a beneficial effect on this species, if present, of significance at a Site level.

7.4.39. Management of new and retained habitats will be carried out in a way which will avoid direct impacts to the species (cutting outside the nesting bird and dormouse active season only) in accordance with the measures set out in the outline LEMP (Appendix 5.2).

Other Mammals

7.4.40. The Proposed Development will retain and increase the availability of suitable habitat for hedgehog, brown hare and harvest mouse.

Construction and Decommissioning

7.4.41. There is the potential for retained habitats suitable for these species being damaged during the construction and decommissioning phases due to accidental encroachment. The oCEMP and oDEMP include mitigation measures that will avoid or limited these effects which worst would have an adverse effect of significance at the Site level only.

7.4.42. At the decommissioning phase, any removal of newly created habitats, such as the grassland underneath the PV Arrays, would potentially have a detrimental effect on these species but will represent only a return to the pre-development baseline conditions.

Operation

7.4.43. The small (30 x 30 cm) gaps created in the security fencing will continue to provide access to the Solar PV Site for brown hare and hedgehog, both of which will benefit from the provision of permanent grassland underneath the PV Array in the place of arable land. For these species the Proposed Development will therefore likely result in a beneficial effect of significance at up to District level..

7.4.44. Any habitat creation within the buffer zones between retained hedgerows and/or ditches and the security fencing surrounding the PV Arrays will likely benefit a range of other larger mammals including roe deer.

7.4.45. During the operational phase, no operational activities have the potential to impact these species and therefore no adverse impacts are likely to arise during the operational phase.

Birds

7.4.46. The majority of the breeding bird interest of the Site is currently supported by the habitats of higher value, such as hedgerow, scrub and woodland. These are to be retained and enhanced within the Solar PV Site.

Construction and Decommissioning

7.4.47. It is likely there will be a loss of a number of skylark territories as a result of the installation of the PV Arrays. Research has shown that skylark tend not nest in solar array areas and the loss of these territories would be an adverse effect of significance at up to a District level. Lapwing and yellow wagtail, also ground nesting species, were recorded during the surveys, but the yellow wagtail is present in very low numbers and the lapwing are unlikely to be affected as the pair recorded were in a field located within the Mitigation and Enhancement Areas. The effect on yellow wagtail is likely to be an adverse effect of significance at a Site level only.

7.4.48. There is a risk of active nests being damaged during vegetation removal (hedgerow gaps) should this be carried out in the absence of mitigation. Additionally, there is a risk that retained habitats in use by nesting birds may be damaged during the construction and decommissioning phases due to accidental encroachment. Measures to avoid or reduce these risks are set out in the draft oCEMP and oDEMP. With these measures in place these impacts are likely to be avoided or limited such that at worst would have an adverse effect of significance at the Site level only.

7.4.49. During the decommissioning stage, the removal of the PV Arrays and the grassland underneath is highly unlikely to cause damage to nests. The removal of infrastructure such as cabling may result in the need for small scale vegetation removal, therefore this presents the risk of damage to nests. Measures to reduce these risks are set out in the draft oDEMP and with these measures in place, an adverse effect is likely to be limited and at worst have an adverse effect of significance at the Site level only.

Operation

7.4.50. The provision of supporting habitat such as diverse grassland beneath the PV Arrays and additional scrub or hedgerow in the buffer zones between retained hedgerows and/or ditches and the security fencing surrounding the PV Arrays will for the majority of breeding bird species result in a beneficial effect of significance at up to District level.

7.4.51. The Site does not support wintering wildfowl or waders in significant numbers, and species listed as the qualifying interest of with the Rutland SPA do not occur within the Solar PV Site in significant numbers or regularly. The Proposed Development includes the retention of large sections of arable land within the Mitigation and Enhancement Areas, including where golden plover were recorded. There is unlikely to be any effect on the special interest of the Rutland Water SPA, RAMSAR sites. The provision of fruiting species in scrub areas and seed-baring grasses and wildflowers, to be set out within the LEMP, will provide additional habitat for passerines such as yellowhammer and linnet. Overall, therefore for certain wintering species (i.e. those which use hedgerows and woodland) the Proposed Development will result in a beneficial effect of significance up to a District level and a neutral effect on other species present.

7.4.52. During the operational phase, no operational activities have the potential to cause injury or death to breeding birds. Habitat management work (such as vegetation cutting) will be carried out outside the active season for dormice and nesting birds, in accordance with the LEMP, to avoid damage to active nests.

Reptiles

7.4.53. The Site supports very limited amounts or habitats suitable for reptiles. The majority of the suitable habitat will be retained and enhanced (hedgerow bases and woodland margins). The grassland areas beneath the PV Arrays and within the buffers are also likely to benefit the reptiles present.

Construction and Decommissioning

7.4.54. There is the potential for vegetation clearance work affecting suitable habitats such as small areas of rougher grassland or hedgerow bases at the construction and decommissioning phase to injure or kill individual reptiles. Measures to avoid or limit the risk of killing and injury are set out in the draft oCEMP and oDEMP. With these measures in place an adverse effect is likely to be avoided or limited and at worst to an adverse effect of significance at the Site level only.

7.4.55. The removal of the PV Arrays and grassland underneath at the decommissioning phase is highly unlikely to have any effect on reptiles, as this would likely be kept short by grazing and be unsuitable.

7.4.56. The removal of infrastructure such as cabling might have an effect, but as this will be limited to very small areas, the habitat loss will be an adverse effect of significance at a Site level only.

Operation

7.4.57. The Proposed Development will likely increase the availability and quality of habitat for reptiles, resulting in a beneficial effect of significance up to a Site level.

7.4.58. During the operational phase, no other operational activities have the potential to adversely affect this species. Vegetation management (such as meadow cutting) will be carried out with cuts no lower than 150 mm to avoid injury to reptiles, in accordance with the oLEMP.

7.4.59. ***Amphibians***

7.4.60. The Site supports few terrestrial habitats with good potential to support amphibians and these are to be retained. Direct impacts are limited to loss of arable land, a habitat of poor suitability for amphibians, though all species may cross it occasionally. All onsite ponds are proposed to be retained and none within the Site, or adjacent to it, were found to support GCN, though common toad may be present

Construction and Decommissioning

7.4.61. Adverse effects as a result of injury to individual protected species (great crested newt) during the construction and decommissioning phases are highly unlikely. However to inform the mitigation strategy, further surveys on the presence or likely absence of GCN from nearby ponds through agreement with landowners, will be undertaken and presented within the ES. The level of information needed will depend on the nature of the work to be carried out in these areas.

7.4.62. The removal of the grassland under the Solar PV Arrays at the decommissioning phase is highly unlikely to have an adverse effect on any amphibians, and is likely to represent, at worst, a return to the pre-development baseline conditions. Small scale removal of habitat to enable the removal of infrastructure may result in an adverse effect of significance a Site level only.

Operation

7.4.63. The Proposed Development will result in the retention of breeding habitat and provide an increase in suitable terrestrial habitat. Therefore, with regard to amphibians, there is likely to be a beneficial effect of significance at up to a District level.

7.4.64. There is a risk of injuring amphibians during vegetation management (such as meadow cutting). As GCN are not likely to be present, this risk would only apply to species not protected against killing, though SPIs may also be present.

Invertebrates

7.4.65. The Site's potential to support invertebrates is limited to habitats of very low value.

Construction and Decommissioning

7.4.66. At the construction phase, the losses of habitat that have the potential to support invertebrates are limited to habitats of very low value. The Proposed Development includes the creation of areas which are likely to be of higher value for invertebrates than the arable land being lost. At the decommissioning phase, the removal of the grassland under the PV Arrays is highly unlikely to have an adverse effect on invertebrate populations as these areas will offer very limited habitat for anything but widespread species. Any removal is likely to represent, at worst, a return to the pre-development baseline conditions.

Operation

7.4.67. The Proposed Development will likely result in a small-scale beneficial effect on this species group.

7.4.68. No adverse effects are envisaged at the operational phase as retained habitats would be unaffected in such a way that would impact invertebrates (such as additional habitat removal).

7.5. How would we further mitigate the environmental effects?

7.5.1. This section sets out what further (secondary) mitigation will be implemented to reduce or avoid the impacts of the Proposed Development on the ecological features identified above.

Designated Sites

7.5.2. Details regarding the proposed highway and cabling routes are still being developed and may affect the LWS or SSSIs adjacent to the Site through required excavation works and/or highway access improvements. As the design progresses, opportunities to embed mitigation into the Proposed Development in order to avoid and minimise direct impact will be explored and reported on within the ES. Any works to SSSIs will be agreed in advance with Natural England and appropriate measures for restoration included. Similarly, impacts to LWSs will be mitigated for with appropriate reinstatement of the existing habitats.

Badgers

7.5.3. Updated surveys will also be carried out prior to construction and decommissioning to identify any new setts and to confirm the status of known setts. The requirement for these surveys will be secured within the CEMP and DEMP. These surveys will enable the CEMP, DEMP and LEMP to be amended to provide any necessary additional mitigation to protect badgers and badger setts onsite.

Water vole and otter

7.5.4. Any bridges or crossing points will be designed to allow continued movement by otter and water vole along the West Glen River and other minor watercourses and ditches.

Hazel Dormouse

7.5.5. Prior to the removal of woody vegetation or scrub at the decommissioning phase, an ecologist will undertake a desk based survey and a Site visit to determine whether a survey for the species will be needed.

Birds

7.5.6. The Proposed Development will result in a loss of nesting areas used by skylark. Therefore, measures will be put in place to enhance the value of retained arable habitats for nesting within the Mitigation and Enhancement Areas. This will include the provision of skylark plots as per guidance for arable land in use for growing cereal crops[1]. The plots will be provided by switching off the drill during the seeding of crops (or lifting it up) to create undrilled patches at least 3m wide. Each plot will be between 16m^2 and 24m^2. Two plots per hectare will be provided in these areas. They will be sited away from field boundaries (at least 24m from the edge of the field) and telegraph poles or overhead lines. Some areas of the newly created grassland may also support the species. The Solar PV Site will likely continue to be used by the species for foraging, providing a more reliable food resource (seeds and insects) than intensive arable farmland. Nesting would also continue in suitable farmland offsite. Pairs from within the Solar PV Site and Mitigation and Enhancement Areas and beyond may benefit from the more diverse foraging resource offered by the newly created habitats. Overall, this is likely to significantly reduce the magnitude of the loss and result in neutral effect on this species. These measures will ensure that the

[1] https://ww2.rspb.org.uk/images/skylarkplot_tcm9-132769.pdf

Proposed Development will not result in adverse effect on this feature of more than significance at the Site level.

7.5.7. Similarly, a very small number of territories of lapwing and yellow wagtail may be lost as a result of the Proposed Development. The new grassland areas would also be suitable breeding habitat for yellow wagtail, which use meadows as well as arable land for breeding. Mitigation within retained arable being delivered for skylark will also deliver some benefit for these species, as does the retention of the area shown to be used by lapwing. Overall, these measures will ensure the adverse effects on these species are reduced to no more than an adverse effect of significance at the Site level.

7.6. What environmental effects would remain?

7.6.1. Table 7.1 below summarises the residual effects once all mitigation measures have been considered.

Table 7.1: Ecology and Biodiversity Significance of Effects

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Designated sites not within or adjacent to the Site	All phases	None	International and National	None	N/A	N/A	None
Statutory designated sites within or adjacent to the Site (Construction and Decommissioning)	Accidental damage or minor temporary loss of habitats	Adverse	National	District (non-significant)	Implementation of CEMP and DEMP; Avoidance of designated sites	None	Site (non-significant)
Non-statutory sites within or adjacent to the Site (Construction and Decommissioning)	Accidental damage or minor temporary loss of habitat	Adverse	County	District (non-significant)	Implementation of CEMP and DEMP; Avoidance of designated sites;	None	Negligible

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
					Reinstatement of habitats		
Priority Habitats of Importance for the conservation of biodiversity (Construction and Decommissioning)	Accidental damage or minor temporary loss of habitat	Adverse	District	Site (non-significant)	Implementation of CEMP and DEMP; Avoidance of designated sites	None	Negligible
Other habitats – arable (Construction and Operation)	Loss and replacement of arable habitat with grassland during construction	Beneficial	Site	District (non-significant)	None	None	District (non-significant)

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Other Habitats – grassland (Decommissioning)	Loss of grassland habitat during the decommissioning stage	Adverse	Site	Site (non-significant)	None	None	Site (non-significant)
Bats roosting (all phases)	Accidental damage to roost feature	Adverse	District level	Site (non-significant)	Implementation of the CEMP and DEMP	None	Site (non-significant)
Bats foraging (Operation)	Improved quality of foraging habitat for bats	Beneficial	District level	District (non-significant)	Implementation of LEMP	None	District (non-significant)
Bats foraging (Decommissioning)	Reduced quality of foraging	Adverse	District level	District (non-significant)	Retention of habitats in mitigation and	None	Neutral

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
	habitat for bats as land returned to arable, but habitat in mitigation/enhancement areas likely to be retained				enhancement areas		
Badger setts (Construction and Decommissioning)	Accidental damage to sett	Adverse	Site Level	Site (non-significant)	Implementation of CEMP and DEMP	Implementation of licence if required	Site (non-significant)
Badger foraging (Operation)	Change in foraging habitat quality	Beneficial	District level	Site (non-significant)	Implementation of LEMP	None	Site (non-significant)

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Badger foraging (Decommissioning)	Reduced quality of foraging habitat for badger as land returned to arable, but habitat in mitigation/enhancement areas likely to be retained	Neutral	Site level	Site (non-significant)	None	None	Site (non-significant)
Otter and water vole (construction and decommissioning)	Accidental damage to waterside habitat	Adverse	Site level	Site (non-significant)	Implementation of CEMP and DEMP	Implementation of licence if required	Site (non-significant)

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Otter and water vole (construction)	Small loss of waterside habitat	Adverse	Site level	Site (non-significant)	Implementation of CEMP	Implementation of licence if required	Site (non-significant)
Hazel dormouse (construction and decommissioning)	Accidental damage to habitats	Adverse	Site level	Site (non-significant)	Implementation of CEMP and DEMP	None	Site (non-significant)
Hazel dormouse (operation & decommissioning)	Overall improvement of available habitat in hedgerows, woodland and scrub	Beneficial	Site level	Site (non-significant	Implementation of LEMP	None	Site (non-significant)
Other Mammals (construction and decommissioning)	Accidental damage to habitats	Adverse	Site level	Site (non-significant	Implementation of CEMP and DEMP	None	Site (non-significant

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Other Mammals (Operation and decommissioning)	Overall improvement of available habitat in hedgerows, woodland, scrub and field margins at all phases	Beneficial	Site level	District (non-significant	Implementation of LEMP; Retention of habitats post decommissioning	None	District (non-significant
Breeding birds assemblage (Operation)	Improvement in habitat quality for overall assemblage of birds	Beneficial	Site Level	District (non-significant)	Implementation of positive habitat management through LEMP	None	District (non-significant)
Breeding birds assemblage	Accidental damage to nests	Adverse	Site level	Site (non-significant)	Implementation of CEMP and DEMP	None	Site (non-significant)

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
(construction and decommissioning)							
Yellow Wagtail (construction and operation)	Loss of breeding habitat within Solar PV Site	Adverse	Site	Site (non-significant)	Implementation of CEMP and LEMP	None	Site (non-significant)
Skylark (construction and operation)	Loss of breeding habitat within Solar PV Site	Adverse	Site	District (non-significant)	Implementation of LEMP	Provision of skylark breeding plots in arable fields	Site (non-significant)
Reptiles and amphibians (construction and decommissioning)	Accidental injury or death of	Adverse	Site level	Site (non-significant)	Implementation of CEMP and DEMP	None	Site (non-significant)

Receptor / Feature	Activity	Nature of Effect	Value of Receptor	Effect Significance	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Reptiles and amphibians (operation)	Changes in habitat extent and quality	Beneficial	Site level	Site (non-significant)	Implementation of LEMP	None	Site (non-significant)
Invertebrates (Operation)	N/A	None	Site level	None	N/A	N/A	None

7.7. In-combination Effects

7.7.1. The effects identified already account for impacts arising from the various aspects of the Proposed Development. Planting being proposed as part of design of the Proposed Development to mitigate Landscape and Visual effects has been tailored to increase value for biodiversity and located in areas where its addition would benefit existing habitats or designated sites through connectivity or buffering.

7.7.2. Effects arising from lighting have also been considered and recommendations made to limit this during the construction operational and decommissioning phases.

7.8. Conclusion and Next Steps

7.8.1. The Proposed Development has been designed with the findings of ecological surveys and with known potential effects of solar development proposals in mind. The potential effects of the Proposed Development have been assessed and appropriate avoidance or mitigation measures incorporated into the draft oCEMP, oLEMP and oDEMP.

7.8.2. Therefore, once all measures have been taken into account the majority of the residual effects identified are beneficial.

7.8.3. Additional surveys have also been recommended to be carried out in April/May 2022 targeting additional ponds for the presence of GCN. If required further Phase 1 habitat surveys will be undertaken if any highway works require any vegetation removal.

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Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 8: Cultural Heritage and Archaeology

May 2022

8.0 Cultural Heritage and Archaeology

8.1. Introduction

8.1.1. This chapter describes the potential likely effects of the Proposed Development on the cultural heritage resource, encompassing archaeological remains, built heritage and historic landscape ('heritage assets').

8.2. What might be affected by the Proposed Development?

8.2.1. The Proposed Development has the potential to effect buried archaeological remains during construction work that disturbs the ground; and to the experience of built heritage assets and historic landscape features via changes to the character of their setting.

8.2.2. This chapter presents a summary of the historical and archaeological background of the Solar PV Site and its surroundings, based on the preliminary (draft) desk-based assessment and the recently completed (March 2022) geophysical survey (Appendix 8.1).

8.2.3. This section focuses on the elements of the historic environment resource which are regarded as receptors where there is a potential impact from the Proposed Development.

8.2.4. The date ranges of archaeological periods referred to within this chapter are provided in Table 8.1.

Table 8.1. Period date ranges

Period	Date range
Palaeolithic	500,000 BC - 10,000 BC
Mesolithic	10,000 BC - 4000BC
Neolithic	4000 BC - 2400 BC
Bronze Age	2400 BC - 700 BC

Period	Date range
Iron Age	700 BC – AD 43
Roman	AD 43 – AD 410
Early medieval	AD 410 – AD 1066
Medieval	AD 1066 – 1539
Post-medieval	AD 1539 - 1800
Modern	1801 - present

Prehistoric and Romano-British

8.2.5. Archaeological remains dating to the prehistoric period are in abundance within the Solar PV Site and its surrounding area. This is attested by the presence of the findspots, monuments and former settlement activity, as well as multiple areas of activity identified on the geophysical survey of the Solar PV Site and Mitigation and Enhancement Areas (Appendix 8.1).

8.2.6. Early prehistoric finds have been identified within recorded Palaeochannels towards the centre of the of the Site (Appendix 8.1; Figure 8.2: Asset 2). Further natural variations were detected across the survey during the geophysical survey. The survey recorded particularly strong anomalies (variations in the structure of the subsoil indicative of potential human activity) which were interpreted as natural palaeochannels in the north-west (Fields 5 to 13 as shown on Figure 3.2 and 8.4). There are further variations in the superficial and bedrock geology which are also identifiable across the survey area (Appendix 8.1). The geology of the Solar PV Site is formed of areas of superficial deposits containing sands, gravels, clays and silts. These deposits formed up to *3 million years ago in the Quaternary Period* (BGS 2022). In addition, a single findspot within the eastern area of the Solar PV Site comprised a Lower Palaeolithic handaxe (Figure 8.2: Asset 1). The presence of multiple palaeochannels, recorded natural superficial deposits across the Solar PV Site and findspots, particularly within the centre and the north-west, illustrates the Solar PV Site's potential to contain Palaeolithic archaeological or palaeoenvironmental remains.

8.2.7. The Mesolithic/Neolithic period is represented by flint scatters to the north-east of The Freewards within the centre of the Site, located between two palaeochannels on the valley floor of the West Glen River (Figure 8.2: Asset 3). The size of the assemblage *suggests there was significant Mesolithic/Early Neolithic settlement* (Dodd 2015). It is likely that further remains (flint scatters) are present within the Solar PV Site (in proximity those previous identified).

8.2.8. The Solar PV Site is located within an area of known prehistoric funerary activity, with recorded Bronze Age barrows in the south-west in Field 53, and the centre of the Solar PV Site in Field 35 (Figure 8.2: Assets 4, 5, 6 and 7). Some of these barrows have been identified during the recent geophysical survey (Appendix 8.1), while others had already been known from cropmarks noted on air photos. One suspected Bronze Age round barrow survives as an upstanding monument in Field 35 (Figure 8.2: Asset 4). This evidence suggests that the landscape within the centre of the Solar PV Site formed an important focus for prehistoric funerary activity.

8.2.9. There a relatively few recorded Iron Age sites within the Solar PV Site (Figure 8.2: Asset 8). The remains of one possible settlement is recorded within the centre of the Solar PV Site within Fields 18 and 19. This settlement composed of *pits, post holes, ditches and a possible waterhole dating from the 5th century BC to the 2nd Century BC* (Dodd 2015). Therefore, there is a reasonable potential for further Iron Age remains associated with this settlement to survive in proximity to the known remains.

8.2.10. Across the Solar PV Site and Mitigation and Enhancement Areas the geophysical survey identified multiple areas of possible later prehistoric or Roman period settlement activity (Appendix 8.1; Figure 8.1). These have been presented on a figure of possible archaeological potential (Figure 8.4). An area within Fields 21, 24 and 25 contains the possible remains of a complex of enclosures and agricultural features. Roman period pottery has been recorded to the *south of this area and suggest a Romano-British origin for these anomalies* (Appendix 8.1). Further anomalies interpreted as potential enclosures with settlement activity and ring ditches within them were recorded to the south-west of the main activity in Field 25. The geophysical anomalies within Fields 21, 24 and 25 were also recorded as cropmarks.

8.2.11. Additional features, potentially associated with prehistoric or Roman settlement activity, were identified by the geophysical survey within Fields 35, 36, 48, 49. These anomalies were composed of rectilinear enclosures, with linear and curvilinear ditches and possible internal features. The morphology (shape) of these anomalies suggest that they may be the remains of settlements and a wider network of agricultural land divisions. Within the north-west part of the Solar PV Site, within Field 4 (Figure 8.2: Asset 9), the geophysical survey identified possible ring ditches and an enclosure (again indicative of the remains of roundhouses and property / field boundaries), features previously identified on air photos. At various other locations across the Solar PV Site, similar linear and curvilinear anomalies were detected (Appendix 8.1).

8.2.12. Known recorded Roman period remains within the Solar PV Site and Mitigation and Enhancement Areas comprise findspots within Fields 24, 26 and 29 (Figure 8.2). These findspots comprise of pottery sherds, individual coins and industrial waste. A stone sarcophagus was recovered from Field 36 (Figure 8.2: Asset 10) to the west of

Braceborough near to rectilinear enclosures identified on the geophysical survey. The sarcophagus contained *a male skeleton with two glass vessels and a dish dated to the 4th century* (Hurley 1991). Therefore, there could be the potential for further Roman burials in this area.

Medieval and Medieval Early

8.2.13. Known recorded early medieval archaeological remains within the Solar PV Site and Mitigation and Enhancement Areas comprise findspots of pottery sherds and a complete pot recovered from Field 19. Early medieval discoveries are rare, however, there is the potential for further remains, like these, to survive within the Solar PV Site.

8.2.14. Evidence of medieval activity within the Solar PV Site is limited to the remains of ridge and furrow, some of which are recorded on the National Mapping Programme. Much of this was identified during the geophysical survey, along with other possible agricultural features representing former field boundaries. Whilst these field boundaries may have been in use during the post-medieval to modern periods, they may have been originally set out during the medieval period.

8.2.15. The Scheduled Monument of Essendine Castle is located *c.* 75m to the east of Field 28 and 300m east of the Solar PV Site. Essendine Castle moated manorial site is one of the most impressive of its kind in Leicestershire, with its exceptionally large ditches and pronounced inner banks indicating the defensive nature of the location. The position of the Norman church in the adjacent enclosure is also an unusual feature and indicates the high status of this manorial site (Historic England 2022). The surrounding landscape may have once formed part of the estate or more likely, agricultural hinterland of Essendine Castle.

8.2.16. Recorded within the Solar PV Site is the location of Essendine Park (Figure 8.2: Asset 11), a former deer park associated with Essendine Castle. The park was in existence in 1286, and by 1447 it consisted of 200 acres of wood, twenty acres of land and twenty acres of meadow. Within Fields 49 and 50 is the former medieval Uffington Old Wood (Figure 8.2: Asset 12).

Post-medieval to modern

8.2.17. The Solar PV Site appears to have been predominantly under agricultural use throughout the post-medieval and modern periods, with any associated archaeological remains being of probable negligible value. These former field boundaries, some which coincide with depictions on early Ordnance Surveys, are recorded on the geophysical survey. Located near to the northern boundary of the Site between Fields 37 and 38 is the farm of Braceborough Grange dating to the post-medieval period and currently still a working farm (Appendix 8.2; Figure 8.2: Asset 14).

8.2.18. Further isolated historic farms dating to the 19th century are located within the surrounding landscape, close to the boundaries of the Site, attesting to the agricultural nature of the Solar PV Site and its surrounding area during this period. Park Farm is the only 19th century farm located within the Solar PV Site, and is located between Fields 30, 31 and 34.

8.2.19. Recorded within the eastern part of the Site, within Fields 39, 40 and 41 is the former historic 'parklands' of Braceborough Grange Park (Figure 8.2: Asset 13) and Shillingthorpe Hall Park (Figure 8.2: Asset 16). These were established in the late 19th century and went out of use in the early 20th century. There may be remnants of these features surviving as landscape features or buried archaeological remains within the Mitigation and Enhancement Areas.

8.2.20. By the mid-20th century, many of the fields forming irregular shaped plots were extended to very large fields to accommodate modern agricultural (machine) working of the landscape.

Undated

8.2.21. Most of the potential buried archaeological remains identified from cropmarks on air photos or from the recent geophysical survey (Appendix 8.1) are undated. Their form and morphology may lead to reasonably well-informed judgments on their likely origins and character; however, in some cases, it is only through further field evaluations (trial trenching) that a robust commentary can be provided on their nature and thus importance.

Designated Heritage Assets

8.2.22. No designated heritage assets comprising Listed Buildings, Conservation Areas, Scheduled Monuments or Registered Parks are located within the Solar PV Site or Mitigation and Enhancement Areas.

8.2.23. One Scheduled Monument is located within proximity of the Solar PV Site (Appendix 8.3; Figure 8.3: see '**A**'). Essendine Castle *c.* 75m to the west of Field 28 and 300m east of the Solar PV Site.

8.2.24. A total of approximately forty designated heritage assets are located within a 1km study area around the Solar PV Site and Mitigation and Enhancement Areas. These comprise two Grade I Listed Buildings, one Grade II* Listed Building, and thirty-seven Grade II Listed Buildings (Fig. 8.3). The closest designated heritage assets are the Grade II* Listed Building Church of St Mary *c.* 80m to the west of Field 28 and associated with Essendine Castle (Figure 8.3: see '**B**'); and Grade II Listed Banthorpe Lodge *c.* 180m to the north-west of Field 25 (Figure 8.3: see '**C**').

8.2.25. The Ryhall Conservation Area is located within the 1km study area, located *c.* 820m to the south-west of Field 18 (Figure 8.3: see '**D'**).

8.2.26. There are two Registered Parks and Gardens (RPGs) within the 1km Study Area, comprising the Grade II Greatford Hall (also encompassing a Conservation Area), located *c.* 600m to the east, and the Grade II Uffington Park, which is located approximately 650m to the south. Several other RPGs lie slightly further afield, including Holywell Hall Park (Grade II) to the north-west; Burghley House (Grade II*) to the south; and Grimsthorpe Castle (Grade I) to the north.

Buried Archaeological Remains

8.2.27. The potential for buried archaeological remains within the Solar PV Site has been based on information gathered from the on-going desk-based assessment and the geophysical survey (Appendix 8.1). This information has allowed for a preliminary assessment of the potential likelihood for buried archaeological remains to be presented on Figure 8.4.

8.2.28. It is relevant to note that the potential for buried archaeological remains to be present (as depicted on Figure 8.4) should not be confused with the potential importance of such remains or the likely impact that the Proposed Development may have on their value (significance). This is discussed further below.

8.3. How have we assessed the effects relating to this topic?

8.3.1. The cultural heritage assessment follows the general approach to undertaking environmental impact assessments as explained in chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to cultural heritage is described in Appendix 8.2.

8.3.2. The historic environment resource within the Solar PV Site has been characterised by on-going desk-based assessment and informed by the recently completed geophysical survey (Appendix 8.1). Further details of the resources accessed are presented below.

Legislation, Planning Policy and Guidance

8.3.3. The legislative and policy framework that has directed the assessment presented here is as follows:

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

8.3.4. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

8.3.5. This PEIR section and the on-going assessment work is being conducted with reference to the following key guidance documents:

- Chartered Institute for Archaeologists (CIfA) (2020) *Standard and Guidance for Historic Environment Desk-Based Assessment*;
- Historic England (English Heritage) (2008) *Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment*;
- Historic England (2015) *Historic Environment Good Practice Advice in Planning Note 2: Managing Significance in Decision-Taking* (2015);
- Historic England (2017) *Historic Environment Good Practice Advice in Planning Note 3: The Setting of Heritage Assets*;
- Department for Culture, Media and Sport (2013) *Scheduled Monuments and Nationally Important but non-Scheduled Monuments - Annex 1: Principles of Selection for Scheduled Monuments*;
- Department for Digital, Culture, Media and Sport (2018) *Principles of Selection for Listed Buildings*

8.3.6. The assessment presented within this PEIR is informed by consultation of a range of documentary and cartographic sources, including:

- The National Heritage List for England;
- Rutland Historic Environment Record;
- Lincolnshire Historic Environment Record;
- Historic mapping and aerial photographs held online at The Genealogist, National Library of Scotland, GetMapping & other cartographic websites;
- Geological data held by the British Geological Survey.

8.3.7. Further desk-based work will be undertaken following the completion of the geophysical survey to develop a more robust model of the potential for buried archaeological remains within the Solar PV Site, and to inform the next stage of field evaluations (trial trenching). All of this work will inform the assessment undertaken to support the DCO Application.

8.3.8. The assessment of effects will be reported following industry best practice. This can be summarise as: i) a description of the heritage assets potentially affected; ii) an analysis of their values (cultural significance); iii) a conclusion of their importance; iv) an understanding of the change; v) an assessment of the impact on significance (allowing for any mitigation); and vi) weighting the effect. In regard to this latter point (the weighting of the effect), this will be framed in commonly understood terms such as those used in the NPPF (i.e, ‘less than substantial harm’)

Study Area

8.3.9. An initial study area, 1km from the edges of the Solar PV Site, was adopted to capture information on designated heritage assets. A site visit then followed to test the robustness of the adopted study and to ascertain whether further assets should be included or whether some of those originally selected to be scoped out from further assessment. This is discussed further below.

8.3.10. In regard to the assessment of potential archaeological remains, a study area extending several kilometres beyond the Solar PV Site was used to collect information from the historic environment record (the HER). This data set comprises details, a bibliography of sorts, on previous discoveries and investigations. Details on archaeological discoveries from further afield have also been reviewed when they can shed additional light on the potential for buried remains within the Solar PV

Site. This information will be included within the assessment that accompanies the DCO application.

Assumptions and Limitations

8.3.11. It is important to acknowledge the limitations of the information presented here (and that specifically depicted on Figure 8.4). With very few archaeological investigations having been undertaken in the Solar PV Site and its environs, the information gleaned from the on-going desk-based assessment is biased towards those types of archaeological remains that can be more readily identified from air photos (cropmarks) and / or in some cases from artefacts recovered from the ploughsoil (chance finds from fieldwalking).

8.3.12. Geophysical survey is an industry standard prospecting technique for buried archaeology remains. In this specific instance the survey (Appendix 8.1) has proven to be a relatively reliable approach to further explore the potential for buried remains, in so far as it has verified the presence of remains previously noted as cropmarks and revealed a finer grain of detail at these locations, while also identifying previously unrecorded remains. However, as per the desk-based sources of information, the geophysical survey results present a bias towards identifying certain types of buried archaeological remains.

8.4. What are the potential environmental effects?

8.4.1. This section describes the potential cultural heritage effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within chapter 5 of this PEIR, have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development. Archaeological Remains

8.4.2. The potential effects of the Proposed Development would occur in association with the construction groundworks, which have the potential to physically impact upon any surviving buried archaeological remains. Construction activities relating to the installation of Solar Farms typically result in relatively very minor below-ground disturbance (compared to other forms of development such that required for the foundations for residential development or minerals extraction).

8.4.3. The extent of this disturbance is contingent on the nature of the construction techniques used and therefore will vary across the Solar PV Site.

8.4.4. The excavation of trenches for the low voltage distribution or grid connection cables, access tracks, temporary compounds and the foundations for the Solar Stations, have the potential to result in the damage to or loss of buried archaeological remains which may be present within their footprint.

8.4.5. The installation of the Mounting Structures (sometime known as piles) will involve very minimal disturbance of the subsoil. Should a pile location (or even several pile locations) coincide with buried archaeological remains, the quantity of displaced archaeological remains in the case of larger features, such as the in-filled ditches described above, would be insignificant compared to that left undisturbed. For discrete or less robust buried features such as pits, post holes or stake holes, the probability that piles would be aligned in such a way that any more than a tiny percentage of the features would be affected is very low, and complete avoidance is the most likely outcome.

8.4.6. Furthermore, the Proposed Development presents an opportunity to restrict further damage to the buried archaeological resource by removing the Solar PV Site from arable use and therefore the effects of modern ploughing.

8.4.7. It is therefore considered at this stage that the impact on buried archaeological remains, as a result of the Proposed Development would not be significant. Following further field investigation, these matters will be further explored in the proposed detailed assessment (including field evaluations) that will support the DCO Application.

Settings of heritage assets and the historic landscape

8.4.8. The Proposed Development would change the character of land parcels lying within the wider and peripheral setting of several Listed Buildings, Conservation Areas, RPGs and Scheduled Monuments.

8.4.9. The preliminary assessment that has been undertaken to date (following industry guidance on the matter, see above) has not identified any key historical relationships between the character of the land parcels within the Solar PV Site and proximate designated heritage assets. Further to this, the assessment to date (see para 8.2.20) has not identified any heritage significance (value) in the existing historic landscape character of the land parcels within the Solar PV Site.

8.4.10. Regarding the ways in which the designated heritage assets are experienced, the key aspects of their settings comprise their immediate surroundings. The preliminary assessment of the form of the Proposed Development and its distance from any of these heritage assets suggests that no material views or experiences of them would be changed and certainly not adversely affected due to the retention of existing hedgerows/woodland and intervening Mitigation and Enhancement Areas.

8.4.11. For instance, to the west of the Site Boundary, off Bourne Road lies the scheduled remains of the former medieval moated manor site and the associated Grade II* Listed Church of St Mary. These two designated heritage assets are of high importance. Their heritage values are very different despite them being intrinsically and intimately related. The moated site is one of approximately 6,000 similar sites in England and as described above, due to its large earthworks (the ditches of the former moat and surrounding ponds) is one of the more impressive of its kind in the east midlands. The presence of the Church, in an adjacent enclosure (or island) is also a very important and rare association. These key heritage values (significances) can only be experienced while in proximity to the earthworks and Church, the approach along the track to the south playing a critical role in this experience. It is also relevant to note that most important aspect of the experience of the heritage significance of the Church is from within the building. The way in which the manorial complex (including the Church) is experienced lying on the edge of village, next to the stream, and visible from the road is also relevant to its heritage experience. Although lying within their setting, the Proposed Development (located approximately 300m to the east, beyond an existing hedgerow) would not form any part of the meaningful experiences of the heritage significance of these heritage assets. The potential visibility of the Proposed Development, when one is looking away from the assets or too distant from them to be able to experience them would not result in an adverse impact.

8.4.12. As shown on Figure 8.3 all the other designated assets, with the exception of Banthorp Lodge (**C**), are located more than 700m away from the Solar PV Site, and the intervening existing settlements, topography, hedgerow and woodland would restrict any potential visibility. Banthorpe Lodge is located immediately adjacent to the East Coast Mainline railway and surrounded by mature trees and hedgerows, limiting any potential visibility of the Proposed Development. These matters will be further explored and robustly assessed to support the DCO Application.

8.5. How would we mitigate the environmental effects?

8.5.1. Mitigation through design (avoidance) can allow important or sensitive buried archaeological remains to be safeguarded completely from any disturbance i.e., by leaving areas as open space or utilising non-ground disturbing construction techniques.

8.5.2. Areas of greater archaeological potential have been identified and presented on Figure 8.4. Further investigations in the form of archaeological trial trenching at those of areas of greater archaeological potential will allow for a robust statement to be made on the extent and importance of surviving remains. This will allow the mitigation to be designed, and thus allow any residual effects to be reported. Where physical impacts cannot be avoided it is likely that an industry standard programme of archaeological investigations (mitigation) in advance and during construction will be employed.

8.5.3. While the preliminary assessment of the potential effects on the built heritage (and historic landscape) has not identified any significant effects that would warrant mitigation, this matter will be further explored. This detailed assessment may identify further opportunities for localised 'landscape screening' to ensure that the impact on the values (significance) of any effected heritage assets can avoided or minimised.

8.6. What environmental effects would remain?

8.6.1. It is anticipated that allowing for the implementation of the mitigation the residual effects on the heritage resource will be limited (and certainly not significant). A list of activities and their significance of effects are displayed on Table 8.2.

Table 8.2: Cultural Heritage and Archaeology Significance of Effects

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction of mounting structures (piles) and their removal during decommissioning - Potential displacement of and removal of buried archaeological remains	Adverse Long-term	Buried archaeological remains	(Potentially) high	None or very low	None or negligible	Opportunity to avoid any particularly sensitive locations with non-ground disturbing construction techniques, such as concrete shoes.	None	None or negligible
Construction associated with the trenches for cables, access	Adverse Long-term	Buried archaeological remains	(Potentially) high	Low	Minor	Opportunity to avoid any particularly sensitive	Archaeological investigations prior to	Minor

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
tracks, foundations for inverters and temporary compounds - Potential displacement of and removal of buried archaeological remains						locations with non-ground disturbing construction techniques.	and during construction.	
Operation of Solar Farm - The removal of the Solar PV Site from arable use and the temporary cessation of	Medium-term, temporary, beneficial	Buried archaeological remains	(Potentially) high	Low	Minor	None	None	Minor beneficial

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
ploughing would prevent any further degradation of buried remains.								
Operation of Solar Farm - Changes to the setting of built heritage and historic landscape features.	Permanent (but reversible)	Listed Buildings, Conservation Areas, RPGs, Scheduled Monuments	High for designated heritage assets.	No change or negligible.	None or negligible	Landscape screening, LEMP	None	None or negligible

8.7. In-combination Effects

8.7.1. The LVIA has identified the potential for significant effects on the landscape character within the extent of the Site only for the Rutland Plateau and Kesteven Uplands local character area. There is also potential for significant effects on Receptor Group 1 which is defined by the extents of the Site. The potential effects associated with dust generation and noise during the construction, operation and decommissioning phase are not significant. Therefore, the combination of the non-significant effects identified within this chapter and the effects identified in the other chapters, it is considered that the Proposed Development would not create significant in-combination effects on the assets identified within this chapter.

8.8. Conclusion and Next Steps

8.8.1. The results of the geophysical survey will be assessed in further detail, alongside more detailed desk-based assessment to provide a robust model of the potential for archaeological remains within the Solar PV Site. This will be supported by targeted further field evaluation (trial trenching) to explore the extent and value (significance) of any surviving remains. These works will be designed in consultation with the relevant heritage stakeholders.

8.8.2. Further detailed assessment of the historic landscape character and the ‘setting’ of heritage assets will be undertaken. Based on the preliminary findings, this is likely to conclude that no adverse effects will occur as a result of changes, as brought about by the Proposed Development, to the settings of these assets.

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Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 9: Access and Highways

May 2022

9.0 Access and Highways

9.1. Introduction

9.1.1. This chapter considers the potential effects generated by the Proposed Development during construction and decommissioning in relation to Access and Highways. As agreed with the Planning Inspectorate (PINS), potential effects during operation have been scoped out of the assessment as no likely significant effects are anticipated on the basis of the low numbers of anticipated staff vehicle movements during that phase.

9.2. What might be affected by the Proposed Development?

9.2.1. The Proposed Development, as described in Chapter 5 of this PEIR, is likely to affect the surrounding highway network, as well as the walking and cycling network (including equestrians) in the immediate vicinity of the Site. A summary of the existing transport network, subject to this preliminary assessment is provided below.

Highway Network

9.2.2. At this stage, it is not possible to determine (or fix) the point of arrival within the United Kingdom for the PV Modules and other components of the Proposed Development. On that basis, an initial feasibility exercise has been undertaken to determine potential access routes along the Local Road Network (LRN) to the Site, from the Strategic Road Network (SRN).

9.2.3. In terms of the SRN, the A1, which connects Grantham and Stamford, is located approximately 6km west of the centre of the Site (OS grid reference TF052115). The A47 is located to the south of the Site and passes through Peterborough. The A47 is accessed via the A15, which connects Bourne and Peterborough, which is located approximately 6.5km east of the centre of the Site.

9.2.4. The A47 can also be accessed via the A1175, which is located approximately 4.5km south of the centre of the Site, which provides a vehicular link between Stamford and Market Deeping and a link between Stamford and Oakham along the A606. The A6121, which connects Ryhall, Essendine and Carlby, separates the north-western extent of the Site from the remainder, routing on a general north-east to south-west alignment. The B1176 segments the north-westernmost extent of the Site and is routed on a general north-south direction.

9.2.5. For access from the SRN to the Solar PV Site via the LRN, three key routes have been identified to reach the access point to the primary construction compound (discussed within Chapter 5 (Project Description) of this PEIR). The location of the primary construction compound for the Proposed Development is to be located directly opposite to the National Grid Ryhall Substation.

9.2.6. It is acknowledged that due to the rural nature of the surrounding area, a number of the local roads are subject to weight restrictions (primarily <7.5t) allowing for access only by vehicles below this weight limit.

9.2.7. The routes to the primary construction compound have been selected based on the proximity and distance to the SRN, the presence of any vehicle restrictions (in terms of physical geometric constraints or weight restrictions) that may hinder access for construction vehicles and to avoid residential areas by as much as is practicably possible.

9.2.8. A total of three routes were identified within the initial feasibility review. An assessment of each route was presented during scoping discussions with key stakeholders to review the suitability of each route.

9.2.9. A plan summarising the extent of Routes 1, 2 and 3, as well as presenting the surrounding vehicular weight limit restrictions, is provided within Figure 9.1. The routes are summarised as follows:

- **Route 1** proposes to access the Solar PV Site from the A1 in the west, which forms part of the SRN, via the B1081 Old Great North Road, Ryhall Road and the A6121 Essendine Road (see Figure 9.2).
- **Route 2** proposes to access the Solar PV Site from the east and the junction of the A47 with the A15 at Peterborough which forms part of the SRN. Vehicles will travel via the A15, the A1175 Main Road, Uffington Road via Stamford, before joining onto the A6121 Ryhall Road and the A6121 Essendine Road (see Figure 9.3).
- **Route 3** proposes to access the Solar PV Site via the junction of the A47 with the A15 from the east, before travelling via Bourne (A15) and Raymond Mays Way (south of Bourne), before finally joining onto the A6121 Stamford Road (see Figure 9.4).

9.2.10. A summary of the links within the study area is included at Figure 9.5.

9.2.11. A summary of the baseline traffic flows on the links for Routes 1, 2 and 3 is included at Appendix 9.1 The baseline traffic flows do not capture traffic flows along the SRN, as the traffic impact of the Proposed Development is not considered to be significant enough to warrant capacity assessments of the SRN.

Walking and Cycling Network

9.2.12. Due to the rural nature of the Proposed Development, there is a limited provision of footways alongside the carriageways of the roads in the vicinity of the Site. However, there are footways that run along the northern and southern kerbline of the A6121 through Essendine, the southern kerbline through Ryhall, and the northern and southern kerbline of Ryhall Road through Great Casterton.

9.2.13. There are also four Public Rights of Way (PRoW) that pass either through or alongside the boundaries of the Solar PV Site.

9.2.14. There are no on or off-road cycling facilities within the immediate vicinity of the Site. Along the western edge of the Solar PV Site, 'The Drift' becomes a Byway open to all traffic, although within the immediate vicinity of the Solar PV Site it is an adopted part of the local road network. Nonetheless, the surrounding roads are generally lightly trafficked and therefore would not deter on-road cyclists.

9.2.15. With respect to equestrians, there are two bridleways located within the Solar PV Site. PRoW bridleway BrAW/1/1 crosses the eastern extent of the Solar PV Site in a general north-south alignment, whilst PRoW bridleway E169/1 routes through the north-western extent of the Solar PV Site between the A6121 and B1176 in a general north-west to south-east alignment.

9.3. How have we assessed the effects relating to this topic?

9.3.1. The access and highways assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to access and highways is described in Appendix 9.2.

9.3.2. The assessment will be undertaken using a robust interpretation of the number of construction vehicles and construction staff that will be required. A robust interpretation of construction represents a worst-case for decommissioning so no assessment specific to decommissioning has been undertaken.

9.3.3. With respect to the operational phase, the estimated number of traffic movements were calculated using similar recent projects and based on assumptions on the likely levels of ongoing maintenance and management activity that would be required. This informed the scope of the assessment whereby operational traffic movements were scoped out, as agreed with the Planning Inspectorate (PINS).

9.3.4. The assessment has been undertaken primarily through a desktop-based assessment, which has been supported by a series of site visits to validate the findings of construction routing assessments and suitability of any access points.

9.3.5. To inform traffic flows, a review of the existing Department for Transport (DfT) static counts has been undertaken along Routes 1 to 3, to identify where there are already baseline Annual Average Daily Total (AADT) traffic flows within the area, which also provide an indication of the existing proportions of any Heavy Goods Vehicles (HGVs) along the routes where DfT count data is available.

9.3.6. Where 'gaps' have been identified in the existing DfT static counts along the potential routes from the SRN to the Solar PV Site, a number of Automatic Traffic Counter (ATC) surveys were undertaken, which recorded seven day 24-hour traffic flows, speeds and vehicle classifications across the LRN. The surveys were undertaken the week commencing 11th October 2021, which was identified as a suitable period for the surveys to take place as it was within a 'traffic neutral' month and was outside of any school holiday periods, as per the DfT Transport Analysis Guidance (TAG) UNIT M1.2 (2020).

9.3.7. The locations of the DfT counts and ATC counts on the respective links are identified within Figure 9.2 to Figure 9.4, with the full ATC data included at Appendix 9.3.

9.3.8. A summary of all the link locations is provided within Figure 9.5.

9.3.9. It is noted that the baseline traffic flows may have been influenced or impacted by the Covid-19 pandemic. On that basis, it will be agreed prior to submission with the relevant stakeholders whether the baseline flows are representative or whether any additional adjustments to the data are required.

Legislation, Planning Policy and Guidance

9.3.10. The polices included within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5). The policies included in these documents, along with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide.

9.3.11. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

9.3.12. With respect to the relevant industry standard guidance material, this assessment has been prepared with reference to the following guidance document:

- Guidelines for the Environmental Assessment of Road Traffic (GEART), produced by the Institute of Environmental Assessment (IEA) (now the Institute of Environmental Management and Assessment (IEMA) 1993).

9.3.13. As the scope of the assessment is yet to be fully agreed with the local highway authorities or other key stakeholders, it is proposed to assess the impact of the Proposed Development for the purposes of this report as per the liaison and correspondence to date, which has suggested that the use of the IEMA GEART is appropriate.

9.3.14. Further details regarding the assessment methodology can be found within Appendix 9.2.

9.3.15. In line with industry guidance and best practice, the PEIR has considered the potential impacts associated with the construction phase of the Proposed Development with regard to:

- Severance;
- Driver Delay;
- Pedestrian Delay;
- Pedestrian and Cyclist Amenity;
- Fear and Intimidation;
- Accidents and Road Safety; and
- Hazardous Loads.

9.3.16. For the purposes of the PEIR, the IEMA GEART assessments that utilise total changes in traffic flow, rather than local capacity assessments, are considered to be more appropriate. It is not considered that the Proposed Development would generate sufficient demand within the peak hours to warrant the need for local capacity assessments.

9.3.17. To validate this assumption, reference is made to the (now superseded) DfT 'Guidance on Transport Assessment' (2004) which sets out a threshold of 30 two-way vehicle trips in any peak hour to warrant the need for further assessment. It is noted that the light goods vehicles (LGV) and heavy goods vehicles (HGV) trips associated with the Proposed Development will take place outside the peak hours and would therefore not meet this threshold, meaning no localised capacity assessments are considered to be required.

Study Area

9.3.18. It is proposed for the full extent of Routes 1, 2 and 3 to form the scope of the study area for the assessment to assess the relevant access and highways effects of the Proposed Development.

9.3.19. The study area primarily comprises the LRN across Routes 1, 2 and 3 as these are the links that are likely to be most impacted by the Proposed Development as they will carry the vast majority of deliveries to the primary compound and LGV trips to the Solar PV Site.

9.3.20. The study area will focus on trips from the SRN to the primary compound as this is likely to generate the greatest number of construction vehicles. The details on any subsequent assessments from the primary construction compound to the secondary construction compounds will be provided within the ES once details are available on the construction phasing and requirements for each secondary construction compound.

Assumptions and Limitations

9.3.21. The nature of the Proposed Development is such that the greatest impact is likely to occur during the construction phase, with this being the focus of the assessment of access and highways effects presented in the PEIR.

9.3.22. There will likely be a negligible amount of traffic associated with the operational phase, with initial calculations suggesting typically four staff onsite across the day and up to a total of 20 staff per day at any one time. As such, operation has been scoped out of the assessment.

9.3.23. Construction traffic trip rates were generated by comparing the number of PV modules and associated construction vehicles at a comparable recent Nationally Significant Infrastructure Project (NSIP), the consented Cleve Hill Solar Park application. The Proposed Development is considered as comparable in terms of the type and extent of works required. This assessment was then used to develop robust trip rates that could be applied to the Proposed Development to determine the anticipated numbers of construction vehicles.

9.3.24. For the purposes of this preliminary assessment, it will be assumed that the construction phase of the Proposed Development will require a worst-case daily trip generation of 105 two-way daily LGV trips and 54 two-way daily HGV trips.

9.3.25. The methodology used to develop the construction trip rates has been presented to key stakeholders and agreed as reasonable.

9.3.26. The construction traffic impact of the Proposed Development will be assessed at a future year of 2026, when construction is anticipated to commence. TEMPRO growth factors will be used to growth the historic DfT counts and observed 2021 traffic data up to a future year of 2026 (commencement of construction).

9.3.27. Subject to agreement with the relevant local authorities and key stakeholders, further adjustments may be required to factor in the impacts of the COVID-19 pandemic on baseline traffic flows or any other limitations in the collection of baseline. However, no such adjustments have been made to the traffic data within this PEIR. The details of any adjustments will be discussed within the ES and agreed with the relevant stakeholders, as appropriate.

9.3.28. With respect to the decommissioning phase, the effects are considered to be similar to, or of a lesser magnitude than the effects generated during the construction phase. However, there can be a high degree of uncertainty regarding decommissioning as engineering approaches and technologies evolve over the operational life of the Proposed Development, meaning that future traffic flows cannot be accurately fixed to a future point in time. Therefore, it is considered that the peak construction represents a worst case for the decommissioning phase.

9.3.29. Through consultation with stakeholders regarding the access routing strategy, it is currently propsoed that HGVs will access the Solar PV Site from the SRN via Route 1 from the west, before accessing the primary construction compound located opposite the National Grid Ryhall Substation, before departing the Solar PV Site to the SRN via Route 3 towards the east (see Figure 9.5).

9.3.30. This approach has been chosen as Route 1 provides the shortest, most direct route from the SRN, to minimise the distances that any HGVs need to travel. In addition, the A6121 is a road that already accommodates a level of HGV activity, meaning there is a precedent already in place for its use by HGVs. With respect to the use of Route 3 for vehicles exiting the Proposed Development, this approach was chosen to minimise the opportunities for any conflicting HGV movements along Route 1. It is noted that there is limited scope for any widening or temporary works along the A6121 to help facilitate two-way HGV flows, so the use of Route 3 reduces the chances for any conflict between HGVs to occur.

9.3.31. Using the proposed routing strategy, the only link within the study area required to accommodate two-way HGV flows is Link 1 (Uffington Lane), where the access to the primary construction compound is to be situated approximately 1km to the south-east of the junction with the A6121 Essendine Road.

9.3.32. The routing arrangement, including individual access points, will continue to be developed as part of the ongoing consultation with key stakeholders and will be confirmed as part of the ES.

9.3.33. It is acknowledged that LGVs could reasonably utilise Routes 1-3 to access the Site. On that basis, it is assumed that LGV trips will utilise Routes 1-3 evenly.

9.3.34. As noted later in this section, it is proposed to implement a shuttle service for staff which is likely to take place at one of the land parcels accessed from the A6121. The trips associated with the shuttle bus are incorporated within the relevant links as additional HGV movements. Further details on the shuttle service arrangement will be provided within the ES once agreement has been reached with the local highway authorities and key stakeholders.

9.3.35. The assessment assumptions will be reviewed and updated within the ES, once agreement is reached with the relevant stakeholders.

9.3.36. In addition to the assessments undertaken within the ES Chapter, a Transport Assessment/Statement will be prepared in accordance with best practice guidance and submitted as an appendix to the ES. The scope of the Transport Assessment/Statement will be agreed with the key stakeholders prior to the submission of the application. The Transport Assessment/Statement will set out the proposed transport strategy for the Proposed Development, which will inform the environmental assessments and mitigation measures proposed within the ES.

9.4. What are the potential environmental effects?

9.4.1. This section describes the potential access and highways effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development.

9.4.2. The environmental effects related to access and highways are considered to be associated primarily with construction traffic. Based on the information available, it is assumed that the decommissioning phase will be no worse than the construction phase.

9.4.3. The effects of the construction phase of the Proposed Development are discussed below.

9.4.4. An assessment of the percentage impact of the anticipated levels of construction traffic associated with the Proposed Development on the future year of 2026 is provided at Appendix 9.4.

9.4.5. It is noted that the assessment of effects presented below is a preliminary assessment and will be assessed again at a later date within the ES, following further consultation with the local highway authorities and key stakeholders.

Severance

9.4.6. With the exception of Link 1, the impact of the construction phase of the Proposed Development is likely to have an adverse, local, temporary and medium-term impact on severance, with an increase of up to 2% of the daily AADT, and 5% increase in the total number of daily HGVs along Ryhall Road (Links 4 and 5).

9.4.7. With respect to Link 1, it is noted that there is an increase of 41% in the total AADT. However, this is due to the link having very low levels of existing traffic (<400 AADT observed within the survey) and the link serving as the proposed primary construction compound access. It is also considered that there are a minimal number of pedestrian desire lines across this link, meaning the change in severance will not be significant. Further details on the potential impact on PROW users can be found in Appendix 6.5. Therefore, even when considering the impact on Link 1, the effect on severance is likely to remain non-significant overall.

Driver Delay

9.4.8. The construction phase of the Proposed Development is likely to have adverse, local, temporary and medium-term impacts on driver delay.

9.4.9. Across the links assessed, with the exception of Link 1, the construction phase of the Proposed Development will result in an increase of up to 2% of the daily AADT, and 5% increase in the total number of daily HGVs along Ryhall Road (Links 4 and 5). In terms of vehicle trips, this is the equivalent to up to 62 additional two-way vehicles (including 27 HGVs) on these links over the course of the day.

9.4.10. Whilst no localised capacity assessments have been undertaken, it is considered that this uplift would fall well within the typical levels of daily traffic fluctuation on the highway network, which is generally regarded as being in the order of 10%. In addition, due to the restrictions in the timings for construction vehicles and the arrangements for staff who will arrive and depart outside of the peak hours set out in the oCTMP; there will be a non-significant traffic impact on the morning and evening peak hours, when the local road network is generally the most congested.

9.4.11. With respect to Link 1, whilst the construction phase of the Proposed Development will result in an increase of 41% to the AADT, and 111% to the daily numbers of HGVs, it is considered that this uplift is due to the low existing usage of Link 1. Whilst the uplift in traffic flows may result in more delay than at present, it is not considered that this will be significant due to the low volumes of existing traffic and minimal delay that takes place at present.

9.4.12. On that basis, it is considered that the construction phase of the Proposed Development will have a non-significant effect on driver delay.

Pedestrian Delay

9.4.13. The construction phase of the Proposed Development is likely to have adverse, local, temporary and medium-term impacts on pedestrian delay.

9.4.14. With the exception of Link 1, the construction phase of the Proposed Development will result in an increase of up to 2% of the daily AADT, and 5% increase in the total number of daily HGVs along Ryhall Road (Links 4 and 5), which is regarded as a non-significant impact.

9.4.15. Across Link 1, there will be an increase of up to 41% of the daily AADT, and 111% increase in the total number of HGVs.

9.4.16. However, there are a minimal number of pedestrian desire lines across these links, and within the LRN as a whole, meaning the impact of this increase on Link 1 will be non-significant.

9.4.17. As a result, the construction phase of the Proposed Development is considered to result in a non-significant effect on pedestrian delay overall.

Pedestrian and Cyclist Amenity

9.4.18. The construction phase of the Proposed Development is likely to have adverse, local, temporary and medium-term impacts on pedestrian and cyclist amenity.

9.4.19. The construction phase of the Proposed Development will result in a change of well below the quarter threshold recommended within the IEMA GEART guidance, with a maximum increase of 2% on Ryhall Road (excluding Link 1).

9.4.20. Whilst the increase on Link 1 exceeds this threshold, there are no key desire lines or provisions for pedestrians or cyclists across this link. Whilst there may be some associated recreational use of this link by pedestrians and cyclists, it is likely that this would be on an ad-hoc basis and outside of the typical proposed construction site working hours, as well as being influenced by other factors such as time of year and weather.

9.4.21. On that basis, it is considered that the construction phase of the Proposed Development will have a non-significant effect on Pedestrian and Cyclist Amenity overall.

Fear and Intimidation

9.4.22. The construction phase of the Proposed Development is likely to have adverse, local, temporary and medium term impacts on Fear and Intimidation.

9.4.23. Due to the rural nature of the Site, the majority of the LRN does not benefit from any footway provision, meaning pedestrians are not segregated from traffic. However, the volume of pedestrians using the LRN is also considered to be low, with the majority of pedestrian trips likely associated with recreational activity and are likely taking place outside of times where construction traffic from the Proposed Development would be operational.

9.4.24. The scope of any required pedestrian baseline studies to confirm the conclusions above will be agreed with key stakeholders as part of the ES.

9.4.25. As the construction phase of the Proposed Development will lead to a negligible increase across the majority of the LRN (excluding Link 1), the assessment methodology suggests this will lead to a non-significant effect on Fear and Intimidation overall.

9.4.26. Across Link 1, there will be an increase of up to 41% of the daily AADT and a 111% increase in the total number of daily HGVs. However, the increase is more apparent in percentage terms due to Link 1 experiencing low levels of traffic flow and usage at present. It is considered that as there are minimal desire lines across Link 1, there are fewer receptors to impact and cause any perceived changes in Fear and Intimidation. On that basis, any potential change in Fear and Intimidation on Link 1 would be non-significant.

Accidents and Road Safety

9.4.27. The construction phase of the Proposed Development is likely to have adverse, local, temporary and medium-term impacts on Accidents and Safety.

9.4.28. An initial review of the accidents occurring over the most-recent three-year period has been undertaken in order to identify existing accident clusters across the construction routes to the Site. A cluster is considered to be identified where more than five accidents occurred over the three-year period within close proximity of the Site.

9.4.29. The review revealed that none of the junctions or links located along the LRN within proximity of the Proposed Development had more than five accidents within the three-year period, with no collision clusters evident.

9.4.30. It is noted that detailed collision data has been requested from the local highway authorities, which will be reviewed and discussed further within the ES once it has been made available.

9.4.31. Construction traffic would only access the Solar PV Site via the proposed construction traffic routes and access points pursuant to the oCTMP, and will consequently avoid using inappropriate roads or other part so the network that have identified constraints, where possible. It is also acknowledged that construction and HGV operator staff will be appropriately trained to minimise the propensity for accidents to occur.

9.4.32. On that basis, and using professional judgement, it is considered that the construction phase of the Proposed Development would have a non-significant effect on Accidents and Safety.

Hazardous Loads

9.4.33. The construction phase of the Proposed Development has the potential to generate adverse, local, temporary and medium-term impacts on Hazardous Loads.

9.4.34. Analysis of the LRN indicates that there are no particular features, such as significant vertical drops immediately beyond the carriageway, which would suggest that the transfer of materials poses a particular risk beyond that which would be expected on the general highway network.

9.4.35. On that basis, the construction phase of the Proposed Development on Hazardous Loads is considered to result in a non-significant effect.

9.5. How would we mitigate the environmental effects?

Mitigation Measures

9.5.1. In addition to the embedded mitigation, the following additional mitigation measures will be implemented as part of the Proposed Development:

Outline Construction Traffic Management Plan

9.5.2. An Outline Construction Traffic Management Plan (oCTMP) will be prepared and provided in support of the DCO Application.

9.5.3. The oCTMP will set out the management, mitigation and monitoring strategy for construction traffic for the Proposed Development. The oCTMP will be updated and form a 'live' document, being updated as necessary with contractor input to set out the strategy to manage construction vehicle access to the Site. A draft oCTMP is included at Appendix 9.5 of this PEIR.

9.5.4. A CTMP will be secured via a DCO requirement and will include details on the following:

- Required access routes from the external highway network;
- Solar PV Site entry and exit points, including compound locations; and
- Details of any accreditation for construction vehicles.

9.5.5. A Decommissioning Traffic Management Plan (DTMP) will be secured via a requirement and provided in the future once details on the decommissioning phase are available, which will focus on the traffic impacts and traffic management measures to be associated with the decommissioning phase. The DTMP will be agreed with the Local Planning Authorities prior to the commencement of the decommissioning phase.

9.5.6. In advance of the DTMP, the principles as to how the decommissioning phase will initially be mitigated and managed, an Outline Decommissioning Environmental Management Plan (oDEMP) will be submitted in support of the DCO Application. A draft oDEMP is included at Appendix 5.2 of this PEIR.

Travel Plan

9.5.7. An outline Travel Plan (oTP) will be prepared and provided in support of the DCO application.

9.5.8. The oTP will set out the strategy to reduce the vehicular impact of construction staff trips on the highway network, by encouraging the use of sustainable modes, where appropriate.

9.5.9. The oTP will include details on the measures such as the staff shuttle bus service, provision of any staff parking facilities, as well as the other proposed measures to be implemented to encourage mode shift away from private car use.

9.5.10. A detailed Travel Plan (to be in accordance with the outline) will be secured via a requirement through the DCO and the final details will be agreed with the local planning authorities, prior to the commencement of the construction phase.

Shuttle Bus

9.5.11. The Proposed Development will seek to employ the use of a shuttle bus service for staff who will park within the primary construction compound which will contain a designated parking area, to remove staff trips from the LRN. The shuttle will then transfer staff to the relevant area of construction across the Solar PV Site, which will be subject to phasing of the construction works.

9.5.12. Further details of the shuttle bus service will be provided within the ES and will be secured via a requirement, to be provided prior to commencement of the construction phase.

9.6. What environmental effects would remain?

9.6.1. The access and highways environmental effects associated with the Proposed Development are primarily associated with construction, with negligible effects associated with the operational use. Decommissioning is assumed to be no worse than construction, meaning the effects during the decommissioning phase would be less than what has been assessed for the construction phase (see Table 9.1).

Table 9.1: Access and Highways Significance of Effects

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation	Additional Mitigation Measures	Residual Effect Significance
Construction								
Severance	Adverse, Local, Temporary, Medium term	NMUs having to cross local road network	High	Negligible	Negligible (non-significant)	Use of CTMP and agreed construction traffic routes.	None	Negligible adverse (non-significant)
Driver Delay	Adverse, Local, Temporary, Medium term	Drivers of motor vehicles	Low	Negligible	Negligible (non-significant)	Use of CTMP and agreed construction traffic routes. Use of TP	None	Negligible adverse (non-significant)
Pedestrian Delay	Adverse, Local, Temporary, Medium term	NMUs using local highway network	High	Negligible	Negligible (non-significant)	Use of CTMP and agreed construction traffic routes. Use of TP	None	Negligible adverse (non-significant)
Pedestrian and Cyclist Amenity	Adverse, Local, Temporary, Medium term	NMUs using local highway network	High	Negligible	Negligible (non-significant)	Use of CTMP and agreed construction traffic routes.	None	Negligible adverse (non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation	Additional Mitigation Measures	Residual Effect Significance
Fear and Intimidation	Adverse, Local, Temporary, Medium term	NMUs using local highway network	High	Negligible	Negligible (non-significant)	Use of CTMP and agreed construction traffic routes. Accreditation of vehicles and staff to ensure safety protocols.	None	Negligible adverse (non-significant)
Accidents and Safety	Adverse, Local, Temporary, Medium term	All receptors	High	Negligible	Negligible (non-significant)	Use of CTMP and agreed construction traffic routes. Accreditation of vehicles and staff to ensure safety protocols.	None	Negligible adverse (non-significant)
Hazardous Loads	Adverse, Local, Temporary, Medium term	All receptors	High	Negligible	Negligible (non-significant)	Ongoing engagement with stakeholders has indicated mitigation unlikely to be required.	None	Negligible adverse (non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation	Additional Mitigation Measures	Residual Effect Significance
Decommissioning								
Severance	Adverse, Local, Temporary, Medium term	NMUs having to cross local road network	High	Negligible	Negligible (non-significant)	Use of DTMP and agreed traffic routes.	None	Negligible adverse (non-significant)
Driver Delay	Adverse, Local, Temporary, Medium term	Drivers of motor vehicles	Low	Negligible	Negligible (non-significant)	Use of DTMP and agreed traffic routes.	None	Negligible adverse (non-significant)
Pedestrian Delay	Adverse, Local, Temporary, Medium term	NMUs using local highway network	High	Negligible	Negligible (non-significant)	Use of DTMP and agreed traffic routes.	None	Negligible adverse (non-significant)
Pedestrian and Cyclist Amenity	Adverse, Local, Temporary, Medium term	NMUs using local highway network	High	Negligible	Negligible (non-significant)	Use of DTMP and agreed traffic routes.	None	Negligible adverse (non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation	Additional Mitigation Measures	Residual Effect Significance
Fear and Intimidation	Adverse, Local, Temporary, Medium term	NMUs using local highway network	High	Negligible	Negligible (non-significant)	Use of DTMP and agreed traffic routes. Accreditation of vehicles and staff to ensure safety protocols.	None	Negligible adverse (non-significant)
Accidents and Safety	Adverse, Local, Temporary, Medium term	All receptors	High	Negligible	Negligible (non-significant)	Use of DTMP and agreed traffic routes. Accreditation of vehicles and staff to ensure safety protocols.	None	Negligible adverse (non-significant)
Hazardous Loads	Adverse, Local, Temporary, Medium term	All receptors	High	Negligible	Negligible (non-significant)	Ongoing engagement with stakeholders has indicated mitigation unlikely to be required.	None	Negligible adverse (non-significant)

9.7. In-combination Effects

9.7.1. To assess potential in-combination effects, consideration has been given as to whether any receptor identified as being affected by the Proposed Development could be affected in combination with effects identified in other topic assessments presented within the PEIR.

9.7.2. In-combination effects can be recognised through relationships between environmental topics. This section identifies where the Access and Highways receptors could be influenced by effects recognised under other environmental topics and sets out where this could result in a combined effect on that receptor.

9.7.3. The other topics where there is potential for in-combination effects to arise alongside the identified Access and Highways receptors are as follows:

- Landscape and Visual (Chapter 6);
- Ecology and Biodiversity (Chapter 7);
- Noise and Vibration (Chapter 10);
- Air Quality (Chapter 11);
- Climate Change (Chapter 15) and
- Socio-economics (Chapter 16).

9.7.4. Access and Highways is a source of effects for multiple receptors in other topics (e.g. air quality, noise, and vibration) across multiple receptors. While the source of effect arises from the Access and Highways components of the Proposed Development (primarily the construction phase), these effects may act together with other sources such as transport noise or emissions, which may then act in combination with other sources of noise or emissions. These effects are addressed primarily within the other topic sections rather than in this section that focuses on Access and Highways.

9.7.5. The receptors identified within the effects of other topics may also be the same receptors affected by Access and Highways. For example, local residents may be affected by Access and Highways effects in combination with other effects such as Noise and Vibration, and Air Quality as considered in Chapters 10 and 11 of this PEIR, respectively.

9.8. Conclusion and Next Steps

9.8.1. The Proposed Development will generate additional vehicles on the network during the construction and decommissioning phase that would have the potential to have the following environmental effects:

- Severance;
- Driver Delay;
- Pedestrian Delay;
- Pedestrian and Cyclist Amenity;
- Fear and Intimidation;
- Accidents and Road Safety; and
- Hazardous Loads.

9.8.2. The assessment indicates the potential for adverse effects. However, these would be local, temporary and medium-term and not significant.

9.8.3. In summary, the assessment presented within this PEIR will be updated as appropriate, following further consultation and liaison with key stakeholders on the construction routes, access points, mitigation measures, and whether any further baseline studies are required.

9.8.4. The updated assessment will be agreed with the relevant key stakeholders and presented within the ES supporting the DCO Application.

References

Department for Transport (DfT) (2004). Guidance on Transport Assessment.

Department for Transport (DfT) (2017). National Transport Model TEMPRO Database.

Department for Transport (DfT) (2020). Transport Analysis Guidance M1.2: Data Sources and Surveys.

Institute of Environmental Assessment (IEA) (1993). Guidelines for the Environmental Assessment of Road Traffic.

Mallard Pass
Solar Farm

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Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 10: Noise and Vibration

May 2022

10.0 Noise and Vibration

10.1. Introduction

10.1.1. This chapter considers the potential effects generated by the Proposed Development during construction and decommissioning as noise and vibration could arise from onsite activities, such as the construction of onsite access tracks, installation of PV panels and the Primary Onsite substation and associated infrastructure. The movement of construction traffic, both onsite and travelling on public roads, to and from the Site also represents a potential source of noise and vibration for consideration.

10.1.2. During the operation of the Proposed Development, the main potential source of noise would be associated with electrical and mechanical plant, both the equipment located within the individual PV Arrays and the Primary Onsite Substation. Operational traffic would be very limited and associated impacts have been scoped out as agreed with the Planning Inspectorate (PINS). The Proposed Development would generate non-significant levels of vibration during operation and therefore this was also scoped out as agreed with PINS.

10.2. What might be affected by the Proposed Development?

10.2.1. Residential properties are considered to be sensitive to noise and vibration and have been considered in detail in this chapter. Commercial and industrial receptors are considered to have a low or negligible sensitivity to noise. Although some of these receptors are present, for example south of Essendine, given this reduced sensitivity and the likely magnitude of effects, these do not require further detailed consideration.

10.2.2. A baseline noise survey has been undertaken in January and late February 2022 to characterise the noise environment in further detail in consultation with the local planning authorities: the survey and results are detailed in Appendix 10.1. The survey was undertaken in line with guidance in British Standard (BS) 4142 'Methods for rating and assessing industrial and commercial sound' (British Standards Institution (BSI), 2014, amended 2019) in consultation with the Environmental Health Departments of South Kesteven District Council (SKDC), Rutland County Council (RCC) and Lincolnshire County Council (LCC).

10.2.3. The baseline noise environment was observed to be varied but typical of the rural location of the Site, with a range of natural noise sources and a varying influence of road traffic. Although occasional train pass-bys can be heard, they will tend not to influence the background noise environment due to their infrequent and brief nature.

10.2.4. This survey demonstrated that in the day-time, background levels of 35 to 40dB L_{A90} could be typically experienced at properties neighbouring the Solar PV Site, with higher noise levels of 44 to 49dB L_{A90} for locations exposed to traffic noise on roads carrying higher traffic such the A6121 or, to a lesser extent, the B1176. Some locations to the north-east of the Solar PV Site experienced a quieter environment during the day-time due to their increased distance from road traffic. During quieter evening periods, levels measured at the fixed positions tended to decrease to 30 to 32dB L_{A90} as activity levels decreased, and often below 30dB L_{A90} at night-time. This is considered typical of properties neighbouring the Solar PV Site and of this type of rural area.

10.3. How have we assessed the effects relating to this topic?

10.3.1. The noise assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to noise and vibration is described in Appendix 10.3.

Legislation and Planning Policy

10.3.2. The following legislation has been taken into account in the assessment of effects:

- Environmental Protection Act 1990; and
- Control of Pollution Act 1974.

10.3.3. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE), Planning Practice Guidance (PPG), and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. More information is included in Appendix 10.3. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide.

10.3.4. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

Study Area

10.3.5. Assessment of operational and construction noise effects have focused on noise-sensitive receptors within 500m of the Solar PV Site, or 800m from the Primary Onsite Substation, based on professional judgment and experience of similar developments which suggests that significant effects are unlikely beyond this distance.

10.3.6. A selection of receptor locations, which was determined as representative of dwellings in the study area for the noise study (rather than an exhaustive list of all dwellings), is shown in Figure 10.1. A detailed list of these representative receptors and their minimum separation distance from the Solar PV Site is set out in Table 10.2.9 of Appendix 10.2.

10.3.7. A location marked as Park Farm and located within the Site was initially considered but it was subsequently confirmed by the relevant landowner that it was not residential and therefore not noise-sensitive.

10.3.8. Dwellings exposed to traffic noise along the construction traffic route, which is described in Chapter 9: Access and Highways, were also considered in terms of how the traffic noise levels they currently experience may change during the construction period.

Assumption and Limitations

10.3.9. There were no significant restrictions associated with the COVID-19 pandemic in place during the survey. It was therefore expected that the pandemic would have had either no substantial influence on human activity and road traffic levels and therefore background noise, or that levels would only be marginally lower than normal therefore resulting in a more conservative assessment.

10.3.10. With the exception of the Primary Onsite Substation, the assessment of potential levels of operational noise from the Solar PV Site has been based for the purposes of the PEIR on a representative area of 200 x 200m rather than modelling noise from the entire Solar PV Site.

10.3.11. Electrical plant associated with energy generation would likely be distributed around the Solar PV Site. As the exact equipment used and its location is not determined in detail at this stage, Appendix 10.2 considers different technology approaches which may be used, such as central or string inverter options, based on representative manufacturer noise emission data. The assessment is based on a worst-case assumption that a centralised inverter approach is likely to be used as this resulted in the highest potential noise levels on the basis of the assumptions made.

10.3.12. Noise modelling is also undertaken on a conservative basis which does not account for the screening from the PV Modules themselves. In addition, although some of the plant may be located in outdoor enclosures, their sound reduction has been neglected for the purpose of this robust assessment in the absence of detailed information on their acoustic performance.

10.3.13. For the potential works which would be required for construction and decommissioning, in the absence of further details at this stage, reasonable worst-case working locations were considered, and typical noise emissions of construction plant items were referenced from BS 5228-1 (see Appendix 10.2). These were used to predict the average sound pressure level for the daily construction working period over different phases of the construction for different receptors.

10.3.14. The Proposed Development will include different items of mainly electrical plant, some of which have associated cooling equipment. As the final plant specification and approach is not known at this stage, an assessment of potential noise emissions based on an indicative plant layout and specification has been undertaken. Specifically, Appendix 10.2 has considered potential plant elements associated with a central or string inverter approach and the potential noise emissions associated based on manufacturer data and experience of similar recent developments. The potential noise from Single Axis Tracking motors has also been considered.

10.4. What are the potential environmental effects?

10.4.1. This section describes the potential noise and vibration effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR, such as construction working hours, have been considered as part of the assessment, when considering the potential effects of the Proposed Development.

Construction noise and vibration

10.4.2. Potential levels of noise associated with different construction activities are evaluated in Appendix 10.2. For receptors located at less than 100m from the Solar PV Site (such as Green Lane Farm, Vale Farm, Wood Farm Cottages, Heath Cottage, North Lodge Farm, North Lodge House, Sunny Acres (Essendine Road), construction noise levels of 65 to 75dB L_{Aeq} (over the working day) could be experienced during earth works. Piling of the Mounting Structure support structures would potentially generate similar levels for these properties if percussive piling is used, which is a clear possibility, increasing to 77dB for works closer than 50m at Green Lane Farm, but this would only be for a very brief period with the activity moving further away rapidly.

10.4.3. Whilst this represents a potential for medium construction noise magnitude should these activities be ongoing at these levels for extended periods, the construction activities will move more than 100m from each of the properties concerned within a period of a few weeks at most, and therefore the associated levels would last less than one month. For the majority of the construction period, works would be undertaken at distances of 200m and more from the properties, corresponding to reduced levels below 65dB. When accounting for the short duration of the worst-case impacts, and the reduced magnitude of change when work would be undertaken further away when work would be undertaken further away, these activities are considered a low magnitude of change and therefore minor effects which are not significant.

10.4.4. Specific construction activities associated with cable laying works (e.g. horizontal directional drilling (HDD) or other trenchless techniques) could be required outside of the assumed day-time construction hours (i.e. evening, Sundays, Bank Holidays or at night). For the closest receptors to the south or east of the Site, *i.e.* North Lodge Farm or Banthorpe Lodge, which are located more than 500m from the area where HDD may potentially be used, corresponding worst-case noise levels of 50dB L_{Aeq} are predicted which would represent negligible or minor impacts for daytime or evening work. However, this would represent a potentially medium magnitude and therefore a moderate adverse noise effect if experienced at night, even for a limited period, which would therefore be significant. Some properties on the outskirts of Essendine (such as those on Glen Crescent) could be around 700m from the works, and therefore potentially exposed to levels between 45 and 47 dB L_{Aeq}, and therefore potentially marginally above thresholds for moderate and therefore significant effects for night-time work. Other properties would be 900m or more away from the proposed HDD works with associated levels of 45dB or less which would be associated with low magnitudes and minor effects even for night-time work, which is not significant.

10.4.5. Some of these construction activities, such as piling operations, drilling or vibratory rolling techniques, can generate vibration levels in close proximity to their use. The proposed HDD drilling would be undertaken at such a distance from the nearest sensitive receptors that the associated vibration levels would be negligible (<0.3mm/s). Percussive piling at distances of 40-50m from Green Lane Farm could generate worst-case Peak Particle Velocity (PPV) levels marginally above 0.3mm/s but below

1mm/s: these would potentially be just noticeable but would not correspond to a correspond to a low magnitude. Similarly, vibratory ground compaction, if used, would generate levels between 0.3mm/s and 1mm/s for works within 40 to 70m of dwellings, also corresponding to a low magnitude. Therefore, construction vibration is potentially associated with minor adverse effects which are not significant.

10.4.6. The noise impact of construction traffic is assessed in Appendix 10.2 based on the assessment of the projected changes in traffic flow presented in Chapter 9: Access and Highways. Based on the highest volume of traffic expected (54 daily HGV two way trips), the methodology set out in CRTN has been used to determine the associated maximum total change in the average day time traffic noise for locations neighbouring the access route. In all cases, an increase in noise levels of 0.1 dB or less was predicted. For the primary construction compound access on Uffington Lane, the relative increase in traffic would be higher but the absolute level of traffic remains very low, and no noise-sensitive receptors are located alongside this road, such that no additional effects arise. This therefore corresponds to a negligible effect which is not significant.

Decommission noise and vibration

10.4.7. Decommissioning is likely to involve activities of similar or reduced intensity as for the construction phase and therefore result in comparable noise and vibration effects in the most part; however, HDD or piling are unlikely to be required for this phase. The corresponding impacts would therefore minor and not significant.

Operational noise

10.4.8. The main potential source of operational noise is the Primary Onsite Substation, which would typically include one large transformer as well as other voltage regulation electrical plant which can generate noise in operation, including a tonal character. As the proposed location for this equipment is more than 600m from the nearest noise-sensitive receptors (North Lodge Farm and Bungalow or properties in Ryhall), based on indicative selections, the associated levels of operational noise from this facility would be of less than 30dB L_{Aeq} at these properties.

10.4.9. As the noise from the Primary Onsite Substation is likely to include a tonal character which may be clearly audible, a penalty of +4dB is applied in accordance with BS 4142 (see Appendix 10.3). This potentially results in rated noise levels of 33dB L_{Ar} which are below background noise levels experienced at these locations during the daytime, resulting in a low impact. This noise level would, however, be above those experienced during very quiet periods (for example at night) but would remain low in absolute terms such that that they correspond to a minor effect which is not significant. The context of the area with the existing National Grid Ryhall Substation at a similar position will mean that in practice, the source is less likely to be noticeable.

10.4.10. Although the rest of the Proposed Development electrical plant will mainly operate during the daytime, in which background levels tended to be more elevated, daylight periods may extend to early morning periods (05:00 to 07:00) and evening periods during the summer months. Therefore, as a worst-case, the electrical plant noise from the Proposed Development has been considered against these quieter periods. These periods will also tend to experience lower temperatures, and therefore plant components providing cooling are likely to operate at reduced duty during these periods. The plant has nevertheless been assumed to operate at full duty which is also likely to be conservative.

10.4.11. The predictions, provided in Appendix 10.2, suggest that for properties located within 100m of the Solar PV Site, predicted worst-case noise levels of between 35 to 42dB L_{Aeq} could be experienced if the main sources of noise identified (central inverters in particular) were placed on the closest edge of the Solar PV Site to these properties. This includes Green Lane Farm, Vale Farm, Wood Farm Cottages, Heath Cottages, North Lodge Farm and Bungalow, Sunny Acres (Essendine Road). Depending on the locations, there could be combination effects of noise from different fields which would represent potential increases of 3 to 5dB but this is not considered in detail at this stage.

10.4.12. The noise from the inverters is likely to be dominated by cooling functions of the plant but will likely include a tonal component. To account for this on a conservative basis, a further penalty of +4dB is added: this results in potential worst-case rated levels of 40 to 46dB L_{Ar} which would be comparable to those experienced during the day-time for the receptors identified. However, during quieter evening or night—time periods, these rated levels could be more than 5 or 10dB above the typical background noise levels experienced. According to the criteria of Appendix 10.3, and accounting for the context of the Proposed Development in the area, this would potentially represent a medium to high magnitude of impact in the absence of further mitigation.

10.4.13. In contrast, at distances of 200m or more from the main noise-generating plant items identified, even in the worst-cases identified, noise levels were generally at or close to 30dB L_{Aeq} which means that rated noise levels would be lower than 35dB L_{Ar}: due to the low absolute level of the noise, this would correspond to a low magnitude of change.

10.4.14. In conclusion, there is a potential for medium to high magnitude impacts from operational noise on some receptors under worst-case assumptions and in the absence of any mitigation. This corresponds to moderate to major adverse noise effect which would therefore be significant.

10.5. How would we mitigate the environmental effects?

Construction

10.5.1. This section discusses indicative mitigation measures identified to reduce the potential significant effects identified, based on the worst-case assumptions made at this stage in the above assessment. These additional measures have been included in the draft oCEMP but were not assumed in the above assessment of construction effects. The suitability of the proposed mitigation measures discussed below will need to be determined at a later stage, in particular once the final locations from which HDD works will be conducted and the necessary equipment have been determined. The worst-case noise levels predicted above for HDD work assumed a location for the drilling rig at ground level (and not down in a pit) and at the closest potential point to the noise-sensitive receptors identified. Furthermore, the assumed source levels for this activity may not arise in practice based on many factors, including soil condition and type of equipment used.

10.5.2. As HDD activities associated with the trenchless work potentially may be required to continue for a continuous period even at night, it is proposed to use local temporary solid screening south and east of the HDD working area(s), the height and mass of which would provide at least a 5dB(A) reduction in sound pressure level. The acoustic screening performance would be achieved for example using temporary solid barriers with a height of at least that of the drilling equipment, located in proximity (around 10m or less) of the trenchless drilling work, although a similar acoustic performance could be achieved in other ways. Trenchless/HDD works will be completed in the shortest practical timescale and night-time noise generation minimised. The closest residents to the works shall be notified of the start and completion of the works if undertaken at night-time. This will be implemented through the CEMP to be secured through a requirement of the DCO.

10.5.3. Good practice management measures to minimise construction noise and vibration will also be referenced in the oCEMP and implemented by the contractor:

1) The Site access road surface will be checked and maintained prior to use;
2) Mobile plant and stationary plant items to be routed or located to maximise separation distance from noise-sensitive receptors (where possible), accounting for site-specific constraints;
3) Select quieter plant units where possible;
4) All plant when not in use is to be switched off;
5) Operate only well-maintained construction plant selected for the specific activity; and
6) Provide Site specific induction inclusive of good neighbourly behaviour and follow the Considerate Construction Scheme requirements.

10.5.4. The above would represent best practice. Further guidance in this regard in BS 5228-1 will also be referenced.

10.5.5. HGV deliveries to the Site and works likely to generate substantial levels of noise, aside from HDD drilling, should also be limited to daytime hours of 07:00 to 19:00 during weekdays or Saturday mornings (until 13:00 hours), unless otherwise agreed with the local authorities. Other construction activities unlikely to generate high noise levels (*e.g.* Site access and inductions, light vehicle movements etc.) may continue during other day-time periods including Saturday afternoons (13:00 to 19:00).

10.5.6. It is also recommended that, should percussive piling be used for the support structures/foundations for the solar array, this should be further restricted to no more than two periods of four hours each with at least one hour of no piling between these four hour periods and restricted to the hours of 08:00 to 18:00 Monday to Friday and 08:00 to 12:00 on Saturdays.

Operation

10.5.7. Primary mitigation of operational noise has involved adjusting the design of the Proposed Development to maximise (where possible) the distance from areas including noise-generating plant from noise-sensitive receptors. In particular, the area for the Primary Onsite Substation is located at least 600m from the nearest noise sensitive receptors.

10.5.8. Selection of the final solar and electrical plant technology approach would be made on the basis of different considerations including noise. The detailed design of the Proposed Development, including final plant locations and selections, can be controlled through an OEMP to be secured as a requirement of the DCO that would establish suitable noise limits at the boundary of the Site. This should be determined such that cumulative rated noise levels L_{Ar}, including the applicable character correction, do not exceed either 35dB at neighbouring properties. For North Lodge Farm and Bungalow, this would apply to the total noise from the Primary Onsite Substation and solar plant.

10.5.9. This is considered achievable through measures including:

1) placement of the potentially noisiest sources (such as central inverters, if used) to maximise distance to noise-sensitive receptors;
2) selection of suitably quiet units based on manufacturer noise data;
3) use of dedicated noise-reducing enclosures or suitably placed solid screening (which could achieve reductions of at least 5 to 10dB if suitably designed).

10.5.10. To demonstrate the feasibility of this approach, the illustrative site layout shown in Figure 5.1 has applied a buffer of 250m around residential properties outside which the central inverters could be placed in line with the mitigation principles set out above.

10.6. What environmental effects would remain?

10.6.1. Assuming implementation of the above mitigation measures, Table 10.1 summarises the residual effects.

Table 10.1: Noise and Vibration Significance of Effects

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction Noise (non-HDD work)	Adverse. Short-term	Dwellings	High	Low	Minor, (Non-significant)	Restriction of working hours, good practice measures (oCEMP)	None	Minor (Non-significant)
Construction Noise (HDD work)	Adverse. Short-term	Dwellings	High	Medium	Moderate (Significant)	Localised screening and management (oCEMP)	None	Minor (Non-significant)
Construction Vibration	Adverse. Short-term	Dwellings	High	Low	Minor (Non-significant)	Restriction of working hours, good practice	None	Minor (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
						measures (oCEMP)		
Construction Traffic Noise	Adverse. Short-term	Dwellings	High	Negligible	Negligible (Non-significant)	None	None	Negligible (Non-significant)
Decommissioning Noise and Vibration	Adverse. Short-term	Dwellings	High	Low	Minor (Non-significant)	Restriction of working hours, good practice measures (oCEMP)	None	Minor (Non-significant)
Operational Noise	Adverse, Long-term	Dwellings	High	Medium to High	Minor (Non-significant)	Final design and selection of electrical plant, attenuation and/or screening if	None	Minor (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
						required (DCO requirement) secured through an OEMP.		

10.7. In-combination effects

10.7.1. The other topics where there is potential for intra-development effects to arise alongside the identified noise and vibration receptors are as follows:

- Access and Highway (Chapter 9); and
- Air Quality (Chapter 11).

10.7.2. The effect of noise from construction traffic were assessed in the present chapter and found to be very limited, such that there is not considered to be a potential for significant In-combination effects associated with this aspect of the Proposed Development.

10.8. Conclusions and next steps

10.8.1. The assessment has identified potential significant noise effects if HDD is required and remains active at night, but this can be mitigated through localised solid screening or use of quieter equipment.

10.8.2. Operational noise from some of the electrical plant in the Solar PV Site may become significant if placed in relative proximity to some of the closest receptors, but this can be mitigated through increased separation distance in combination with selection of suitably quiet equipment and/or standard noise control measures such as acoustic enclosures or localised solid screening.

10.8.3. Other construction and operational noise and vibration effects were identified and may be audible / perceptible at times but are such that, providing construction working hours are controlled in a standard manner, their effect would be minor or negligible.

10.8.4. Additional noise modelling will be undertaken for the Solar PV Site based on an indicative site design using reasonable worst-case assumptions and presented within the ES. Potential impacts on recreational users in the area will also be considered in further detail and presented within the ES. Further consultation on the assessment methodology will be undertaken with the local authorities' environmental health departments.

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Chapter 11: Air Quality

May 2022

11 Air Quality

11.1 Introduction

11.1.1 This chapter considers the potential effects which would be generated by the Proposed Development at existing sensitive receptors from vehicles associated with the construction phase of the Proposed Development.

11.1.2 Dust emissions during the construction and decommissioning phases will be controlled by mitigation measures included in the outline Construction Environmental Management Plan (oCEMP). On that basis, there are expected to be no likely significant effects to air quality at existing sensitive receptors and as such associated impacts have been scoped out of the ES.

11.1.3 It is not anticipated that there are any potential likely significant environmental effects generated by the operational phase of the Proposed Development as traffic is expected to be very limited and as such, associated impacts have been scoped out of assessment as agreed with the Planning Inspectorate.

11.1.4 With regard to impacts to air quality associated with vehicle movements during the decommissioning phase, at this stage it is assumed that the number of construction vehicles during the decommissioning phase will be no greater than during construction. For the purposes of EIA, given the anticipated lifetime of the Proposed Development it is expected that, at the point of decommissioning, with improvements in vehicle technology and policy shifts towards low emission vehicles, there will be no likely significant effect to air quality and associated impacts have been scoped out.

11.2 What might be affected by the Proposed Development?

11.2.1 The Proposed Development, as described in Chapter 5 of this PEIR, has the potential to affect air quality in the vicinity of the Site. A summary of the key receptors which are subject to this preliminary assessment is provided below.

Key Receptors

11.2.2 Existing sensitive receptors at the roadside of the three proposed construction traffic routes, as indicated in Figures 9.2, 9.3 and 9.4, have the potential to be impacted by the potential increase in emissions (nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$)) from construction traffic for the duration of the construction phase, which is anticipated to be 24 months in duration as specified in Chapter 5 (Project Description) of the PEIR.

11.2.3 High sensitivity receptors include residences, healthcare and childcare facilities located along the proposed construction routes. Commercial and industrial uses are a consideration; however, they are considered to be low sensitivity receptors.

11.2.4 The Site is not located within an Air Quality Management Area (AQMA). The nearest AQMA (no.6 AQMA), declared for exceedances of the annual and 1-hour mean NO_2 Air Quality Objective (AQO) concentrations by SKDC, is located approximately 25km north-west of the Site in Grantham. Due to the distance, it is not expected this AQMA will be affected by the Proposed Development.

11.2.5 On proposed construction Route 2, there are two potentially sensitive ecological sites: Math/ Elsea Wood Site of Special Scientific Interest (SSSI) and Park Wood Ancient Woodland, which are located within 200m of the roadside.

11.2.6 A baseline air quality review has been undertaken to determine the existing air quality within 3.5 km of the Site with reference to:

- Air quality data from the recent RCC and SKDC Annual Status Reports; and
- Background pollution maps from the Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management (LAQM) website.

11.2.7 Neither RCC nor SKDC currently undertake any automatic air quality monitoring and therefore no monitoring data is available for particulate matter (PM_{10} and $PM_{2.5}$). RCC utilised 11 diffusion tubes to monitor annual mean nitrogen dioxide (NO_2) concentrations across its administrative area in its latest year with available data, 2018, whilst SKDC utilised 58 diffusion tubes during 2020, the most recent year with available data. There are no diffusion tubes located within 1.5km of the Site; however, one RCC and 11 SKDC diffusion tubes are located between approximately 2km and 3.5km from the Site. Table 11.1 provides the latest annual mean NO_2 concentrations at the nearest diffusion tube locations to the Site for the years 2015 to 2020. The locations of the diffusion tubes are illustrated in Figure 11.1.

11.2.8 The pollutant concentrations recorded at the diffusion tubes in 2020 are not considered to be representative of "normal" air quality conditions. Whilst it is expected that as a result of the COVID-19 pandemic behaviours will change in the future, the impact of this on long-term air quality is currently unknown and therefore the use of 2020 data will be omitted from any analysis, but has been included for information.

Table 11.1: Annual Mean NO_2 Diffusion Tube Data (µg/m³)

Diffusion Tube ID	Diffusion Tube Name	Site Type	Distance from Site (km)	2015	2016	2017	2018	2019	2020
4 (RCC)	Tickencote	Rural	4.9	14.1	17.7	12.8	18.5	-	-
SK1/ SK2 (SKDC)	Scotgate	Roadside	2.9	35.7	36.7	32.7	30.7	28.4	21.4
SK3 (SKDC)	Essex Road	Roadside	2.7	15.1	16.3	16.0	13.8	13.1	9.5
SK4 (SKDC)	Opp Stam' Sch	Roadside	2.2	35.9	36.6	33.4	29.9	30.3	21.3
SK5/ SK6 (SKDC)	East St	Roadside	2.1	34.1	37.8	32.8	31.1	30.1	23.5
SK7 (SKDC)	Stam' School	Roadside	2.2	34.1	38.8	38.8	32.7	32.8	25.5
SK8 (SKDC)	London Inn	Roadside	2.7	25.9	27.8	25.0	25.7	22.5	15.8
SK9 (SKDC)	All Saints Rd	Roadside	2.7	27.7	26.4	26.7	25.0	23.9	17.9
SK10 (SKDC)	Avondale	Roadside	3.2	15.3	19.9	22.0	20.2	18.3	14.7
SK58 (SKDC)	Wharf Rd Stamford	Roadside	2.6	-	-	33.1	31.1	24.6	19.3

11.2.9 There have been no exceedances of the annual mean NO_2 objective of 40 µg/m³ at any of the diffusion tubes located nearest to the Site in the years between 2015 and 2019 with available monitoring data recorded. The location with the highest concentration in 2019 was SK7 (Stam' School), located on the A6121 East Street in Stamford, monitoring 32.8 µg/m^3 or 82% of the annual mean AQO. As such it is considered likely that no exceedances of the annual mean AQO will be experienced within the vicinity the Site.

11.2.10 The 1-hour mean AQO for NO_2 is 200 µg/m^3 and should not be exceeded more than 18 times within a year. In line with Local Air Quality Management Technical Guidance (LAQM.TG(16)), exceedances of the 1-hour mean NO_2 AQO are unlikely to occur where the annual mean concentration is below 60 µg/m^3. Concentrations at nearby diffusion tubes shown in Table 11.1 therefore shows that the 1-hour mean NO_2 AQO is unlikely to be exceeded at these locations.

Defra Predicted Background Concentrations

11.2.11 Defra background concentrations have been obtained from the national maps published by Defra. These estimated concentrations are produced on a 1 km by 1km grid basis for the whole of the UK. The Site falls into multiple grid squares. The minimum and maximum predicted concentrations for NO_2, PM_{10} and $PM_{2.5}$ are provided in Table 11.2 for current year (2022), the anticipated earliest year of construction (2026), and the year of completion (2028). Predicted concentrations across the whole Site for NO_2, PM_{10} and $PM_{2.5}$ in 2026 can be seen in Figures 11.2, 11.3 and 11.4, respectively.

Table 11.2: Estimated annual mean background concentrations in 2022, 2026 and 2028 in µg/m^3

Year	Background (µg/m^3)		
	NO_2	PM_{10}	$PM_{2.5}$
2022	6.1 – 8.8	13.5 – 17.2	8.0 – 9.6

Year	Background (µg/m^3)		
	NO_2	PM_{10}	$PM_{2.5}$
2026	5.5 – 8.2	13.1 – 16.8	7.6 – 9.2
2028	5.3 – 8.0	13.1 – 16.7	7.6 – 9.2

11.2.12 It can be seen that the modelled background concentrations are below the relevant annual mean AQOs for NO_2, PM_{10} (40 µg/m^3) and $PM_{2.5}$ (25 µg/m^3) in all years across the Site.

11.3 How have we assessed the effects relating to this topic?

11.3.1 The air quality assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to air quality is described in Appendix 11.1.

Legislation and Planning Policy

11.3.2 The following legislation has been taken into account in the assessment of effects:

- Air Quality (England) Regulations (2000);
- Air Quality (England) Regulations (Amendment) (2002); and
- Air Quality Strategy (2007).

11.3.3 The policies included within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy have been taken into account in the assessment of effects and the development of measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

11.3.4 This chapter has also been informed by the following policy and guidance documents:

- Environmental Protection UK (EPUK) and Institute of Air Quality Management (IAQM) Land-Use Planning & Development Control: Planning for Air Quality (2017);
- Defra Local Air Quality Management Technical Guidance (LAQM.TG(16)) (2021);
- Design Manual for Roads and Bridges (DMRB) (2020); and
- IAQM Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (2020).

Study Area

11.3.5 The study area covers a zone of influence of 5km from the Site boundary.

Assumptions and Limitations

11.3.6 The following assumptions and limitations have been considered:

- It has been assumed that construction phase mitigation measures included in the oCEMP will be effectively implemented and, as such, no significant effects will arise from construction activities; and
- The ability to predict likely significant air quality effects is dependent upon the traffic flow predictions made by the Transport Consultants for the project. It has been assumed that construction traffic flows and routing are robust.

11.4 What are the potential environmental effects?

11.4.1 This section describes the potential air quality effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR and included in the draft outline Construction Environmental Management Plan (oCEMP), have been considered as part of this assessment, when considering the potential effects of the Proposed Development.

Construction phase

11.4.2 The impacts of vehicle emissions (NO_2, PM_{10} and $PM_{2.5}$) associated with the construction of the Proposed Development have the potential to effect existing sensitive receptors located at the roadside of the proposed construction routes for the anticipated 24 months of construction.

11.4.3 As detailed in Chapter 9 (Access and Highways) of this PEIR, three potential construction routes to the Solar PV Site have been identified in Figures 9.2 (Route 1), 9.3 (Route 2) and 9.4 (Route 3). It is expected that light duty vehicles (LDVs) are to be evenly distributed across all three routes, whilst heavy duty vehicles (HDVs) will be managed to access the Solar PV Site from the SRN (A1) via Route 1 to access the

Solar PV Site and depart the Solar PV Site to the SRN (A15) via Route 3.

11.4.4 During the peak construction year, there is predicted to be a maximum of 104 LDVs and 54 HDVs on any one road link per day. Full predicted trip generation can be seen in Appendix 9.3.

11.4.5 When screened against EPUK/ IAQM guidance as detailed in Appendix 11.1, it is anticipated that dispersion modelling of additional vehicles associated with the construction phase will not be required. However, these anticipated traffic flows will be reviewed as the project progresses and if they exceed the EPUK/ IAQM screening criterion, the dispersion modelling would be undertaken in line with EPUK/ IAQM methodology, as well as discussed and agreed in advance with RCC and SKDC.

11.4.6 With regard to the impact of construction traffic on sensitive ecological receptors, DMRB and IAQM guidance state the potential for significant effects is caused by a cumulative increase in annual average daily traffic (AADT) flows of 1,000 vehicles on any one road link per day. As stated above, the predicted trip generation is well below this threshold and, as confirmed with the Transport Consultants, it is not considered likely that the cumulative impact will cause an increase greater than 1,000 vehicles per day.

11.4.7 Given the predicted construction traffic trip generation, any impact to air quality is expected to be negligible with reference to EPUK/ IAQM significance criteria, therefore there are no likely significant effects.

11.4.8 Emissions associated with construction activities may impact local air quality concentrations. However, a CEMP, to be secured via requirement through the DCO, will be implemented to minimise dust emission and establish non-road mobile machinery (NRMM) controls during the construction phase to control impacts to a negligible level. On that basis, there are no anticipated significant adverse effects on air quality from dust emissions or NRMM during the construction phase as embedded mitigation measures will minimise emissions.

Operational phase

11.4.9 There are not anticipated to be any potential likely significant environmental effects to air quality during the operation of the Proposed Development, as agreed with the Planning Inspectorate (PINS), as traffic flows are expected to be below EPUK/ IAQM screening criterion and no combustion plant will be present on the Site.

Decommissioning phase

11.4.10 At this stage it is assumed that the number of construction vehicles during the decommissioning phase will be no greater than during construction. However, given the operational life of the solar it is expected that baseline air quality conditions will be much improved due to improving vehicle technology and emerging national policy to reduce vehicle emissions. Therefore, there are not anticipated to be any potential significant effects to air quality during the decommissioning of the Proposed Development.

11.5 How would we mitigate the environmental effects?

11.5.1 A draft outline Construction Transport Management Plan (oCTMP) (Appendix 9.4) and draft oCEMP (Appendix 5.1) has been produced for the Proposed Development to mitigate the impacts to air quality during construction. The oCTMP includes a one-way system for HGVs accessing the Site to minimise the number of HDVs travelling on any one road link.

11.6 What environmental effects would remain?

11.6.1 The measures implemented via the oCTMP and oCEMP are considered sufficient to minimise impacts to air quality from emissions associated with construction traffic and NRMM. Therefore, it is not anticipated that there will be any significant residual effects with regard to air quality.

Table 11.1: Air Quality Significance of Effects

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction								
Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of additional construction traffic movements	Adverse, short-term	Existing sensitive receptors located on construction routes	High	Negligible	Negligible (Non-significant)	oCTMP	None	Negligible (Non-significant)
Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a	Adverse, short-term	Existing sensitive receptors	High	Negligible	Negligible (Non-significant)	oCEMP	None	Negligible (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
result of NRMM								
Potential impact to human health and amenity from dust emissions	Adverse, short-term	Existing sensitive receptors	High	Negligible	Negligible (Non-significant)	oCEMP	None	Negligible (Non-significant)
Operation								
Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of additional	Neutral, Long-term	Existing sensitive receptors	High	Negligible	Negligible (Non-significant)	None	None	Negligible (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
traffic movements								
Decommissioning								
Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a result of additional construction traffic movements	Adverse, short-term	Existing sensitive receptors	High	Negligible	Negligible (Non-significant)	None	None	Negligible (Non-significant)
Potential increase in concentrations of NO_2, PM_{10} and $PM_{2.5}$ as a	Adverse, short-term	Existing sensitive receptors	High	Negligible	Negligible (Non-significant)	None	None	Negligible (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
result of NRMM								
Potential impact to human health and amenity from dust emissions	Adverse, short-term	Existing sensitive receptors	High	Negligible	Negligible (Non-significant)	None	None	Negligible (Non-significant)

11.7 In-combination Effects

11.7.1 The other topics where there is potential for intra-development effects to arise alongside the identified air quality receptors are as follows:

- Ecology and Biodiversity (Chapter 7);
- Access and Highways (Chapter 9); and
- Noise and Vibration (Chapter 10).

11.7.2 The effect of emissions from construction traffic to air quality were found to be negligible based on current predicted trip generation, such that there is not considered to be a potential for significant in-combination effects associated with this aspect of the Proposed Development.

11.8 Conclusion and Next Steps

11.8.1 Emissions from construction vehicles during the anticipated 24 months of construction programme have the potential to increase concentrations of NO_2, PM_{10} and $PM_{2.5}$ at existing sensitive receptors at the roadside of the three proposed construction routes.

11.8.2 At this stage, predicted traffic flows during the peak of construction are below the EPUK/IAQM indicative criteria for the possibility of impacts to air quality and as such there are not expected to be any likely significant potential environmental effects to air quality. This will remain under review in line with the development of the oCTMP.

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Chapter 12: Water Resources and Ground Conditions

May 2022

12.0 Water Resources and Ground Conditions

12.1. Introduction

12.1.1. This chapter considers the potential effects generated by the Proposed Development during construction, operation and decommissioning in relation to Water Resources and Ground Conditions.

12.2. What might be affected by the Proposed Development?

12.2.1. The Proposed Development, as described in chapter 5 of this PEIR, has the potential for effects on the following receptors:

- Topography and land use;
- Rainfall
- Solid geology;
- Superficial geology
- Contaminated land;
- Hydrogeology;
- Surface hydrology;
- Site drainage;
- Hydrological regime and surface water morphology;
- Surface Water Continuity;
- Flooding;
- Public Water Supplies;
- Private Water Supplies (PWS);
- Abstraction and Discharge Consents; and
- Designated Receptors.

12.2.2. These receptors have been described in more detail below drawing upon the following sources of information:

- A desk study, undertaken in March 2022, included:
  - Identification of underlying geology and hydrogeology;
  - Collation of data provided through consultations;
  - Assessment of topography and slope characteristics;
  - Identification of catchments, watercourses, springs and water features; and
  - Collation of flood plain information and water quality data.
- Envirocheck Report, 2022;
- Argyll Report, 2021;
- Ordnance Survey (OS) 1:50,000 Map (Digital);
- OS 1:25,000 Map (Digital);
- National River Flow Archive (NRFA);
- Environment Agency Flood map for planning, 2018;
- Environment Agency Historical Landfill Sites Map;
- Environment Agency Catchment Data Explorer;
- Defra MAGIC Map;
- Meteorological Office Rainfall Data and Climate Averages;
- UK Centre for Ecology and Hydrology, UK Rainfall;
- The British Geological Survey (BGS) Geology Map (Digital);
- National Library of Scotland Map Finder;
- Internal Drainage Boards (IDB) Map; and
- A Site walkover (8 to 10 March 2022).

Topography and Land Use

12.2.3. The Site's topography and land use inferred from the desk study was confirmed during the Site walkover from 8 to 10 March 2022.

Rainfall

12.2.4. The National River Flow Archive (NRFA) reports Average Annual Rainfall (AAR) of 614mm at the Holywell Book at Holywell gauging station, which is located approximately 53m north of the Site.

12.2.5. As monthly long term climate data is not freely available from the NRFA, long term average rainfall data (1991 to 2020) is obtained from the Meteorological Office at the Wittering climate station, which is located approximately 5.8km south of the Site. This is shown in Table 12.1 below.

Table 12.1: Long term average rainfall for Wittering Climate Station (1991 - 2020)

Month	Jan	Feb	Mar	Apr	May	Jun
Rainfall (mm)	46.96	38.92	38.99	44.15	49.55	52.91
Month	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Rainfall (mm)	55.51	59.86	52.85	63.34	57.50	53.01

Solid Geology

12.2.6. British Geological Survey (BGS) mapping indicates that the Site is underlain by sedimentary rocks of the Inferior Oolite Group to the north-west, overlain by the Great Oolite Group in the centre, which is overlain by Ancholme Group to the south-west.

12.2.7. The Inferior Oolite Group includes formations of Upper and Lower Limestone of the Lincolnshire Limestone Formation.

12.2.8. The Great Oolite Group includes formations of Argillaceous rocks (subordinate sandstone and mudstone) of the Rutland Formation, Limestone of the Blisworth Limestone Formation, Mudstone of the Blisworth Clay Formation and Limestone of the Cornbrash Limestone Formation.

12.2.9. The Ancholme Group includes formations of Mudstone of Kellaways Clay, Sandstone and Siltstone of Kellaways Sand and Mudstone of the Oxford Clay Formation.

12.2.10. Several north-west to south-east faults are inferred to the west and south of the Site.

Superficial Geology

12.2.11. BGS superficial data does not record superficial deposits across a majority of the Site; however, where superficial deposits are present they comprise areas of Alluvium - clay, silt, sand and gravel, and areas of river terrace deposits – sand and gravel, in the centre of the Site. Furthermore, in the east and southern extent of the Site, there are areas of head – clay, silt, sand and gravel, and glaciofluvial deposits of mid Pleistocene sand and gravel.

12.2.12. Infiltration testing has been conducted at the location of the proposed Primary Onsite Substation (as shown on Figure 5.1) in March 2022 in seven locations, with results pending. The results of the infiltration testing will provide localised geology at the location of test pits and will be provided in the ES.

Contaminated Land

12.2.13. Desk studies have highlighted that no active landfill sites are present within the Site; however, industrial works (Essendine Industrial Estate) and transport infrastructure (the East Coast Mainline Railway) and associated machinery which are both present within the Site and may give rise to isolated areas of contamination.

12.2.14. Three active Upper Tier Control of Major Accident Hazards (COMAH) sites are recorded within the Essendine Industrial Estate, all registered to The Heys Group Ltd. A Notification of Installations Handling Hazardous Substances (NIHHS) is also registered to Stamford Storage Limited within the industrial estate but is 'Not Active'. Planning Hazardous Substances Consents have also been granted to Stamford Storage and Baxters Warehousing Peterborough Ltd within Essendine Industrial Estate.

12.2.15. Historic mapping indicates the presence of several former gravel pits and two former landfill sites within the southern area of the Site. One of the former landfill sites is recorded as accepting household waste while the other is a Local Authority Landfill site recorded as accepting dry domestic and construction waste which was operational until 1979.

12.2.16. Historical mapping also indicates that the central Site area is located on land that was used for the quarrying of sand and clay. Similarly, there are several disused gravel and stone pits in the northern extent of the Site which is also in close proximity to areas of landfilling with the potential for contamination which could migrate to the Site.

12.2.17. The East Coast Mainline railway line bisects the Site in a northwest to southeast orientation, while remnants of the dismantled Great Northern Railway - Essendine and Bourne Branch remain within the northern area of the Site.

12.2.18. A fuel station and associated garage was formally present in the western extent of the Site (E503773 N311650) along with undefined industrial buildings which are still currently in use.

12.2.19. The Site is recorded as being within Intermediate and Higher probability radon area where radon protective measures are necessary in the construction of any new buildings

Hydrogeology

12.2.20. The BGS Geoindex 1:625,000 Hydrogeology map shows that the Site is underlain by aquifers of the Inferior Oolite Group, the Great Oolite Group and the Kellaways Formation and Oxford Clay Formation.

12.2.21. The BGS Geoindex 1:625,000 Hydrogeology map shows that the north-west extent of the Site is underlain by the Inferior Oolite Group, a 'highly productive aquifer' where flow is virtually all through fractures and other discontinuities and is described as "*yielding up to 40l/s in Lincolnshire. Copious springs at outcrops, and is brackish at confined depths*".

12.2.22. The centre of the Site is underlain by the Great Oolite Group, a 'moderately productive aquifer' where flow is virtually through all fractures and other discontinuities. This is described as a significant limestone aquifer producing large yields.

12.2.23. The eastern extent of the Site is underlain by the Kellaways Formation and Oxford Clay Formation aquifer. Its character is described as "*rocks with essentially no groundwater*" which is due to "*largely clays confining underlying aquifers. Kellaways Sand near base yields small quantities, often brackish*".

12.2.24. Information provided by the Environment Agency available on the Department for Environment, Food and Rural Affairs (Defra) Multi-Agency Geographic Information for the Countryside (MAGIC) Map viewer shows that the Site lies within a Drinking Water Safeguard Zone for surface water. There are two large Zone I Inner Protection Zones located within the boundaries of the Site, to the north-east and south. The associated Zone II Outer Protection Zone is also located within the

Site boundary. The Zone II to the north is extensive across the north and west of the Site. The Zone II to the south also extends over the south of the Site. The source to the south also has a Zone III Total Catchment Zone which covers a small area to the south-east of the Site.

12.2.25. The Environment Agency 'Catchment Data Explorer' shows that most of the Site overlies the groundwater body Welland Mid Jurassic Unit waterbody which has an overall status of 'Good'. The groundwater bodies Welland Limestone Unit A is located to the east of the Site which has an overall status of 'Poor' and the Welland Lower Jurassic Unit waterbody to the west which has an overall status of 'Good'.

Surface Hydrology

12.2.26. The West Glen River flows from north-west of the Site before flowing east then south and bisecting the centre of the Site adjacent to the East Coast Mainline railway line as shown in Figure 12.1. It then flows eastwards and joins the River Wellend.

12.2.27. The River Gwash is located approximately 50 m south of the Site and flows in an eastwardly direction, adjacent to the A6121, before meandering south and draining into the River Wellend.

12.2.28. The East Glen River is located approximately 86m north-east of the Site, flowing south before joining the West Glen River.

12.2.29. There is a small unnamed watercourse (potentially modified) in the north-west extent of the Site, west of Vale Farm.

12.2.30. There is a small unnamed pond, approximately 17,000 m² in area, immediately adjacent to the Site which is connected to the West Glen River.

12.2.31. The Environment Agency 'Catchment Data Explorer' shows that the Site lies within three waterbody catchments; The West Glen – confluence West Glen tributary to confluence East Glen River waterbody catchment (ID GB105031050770), the East Glen River waterbody catchment (ID GB105031055480) and the Gwash waterbody (ID GB105031050610). All of these waterbodies are located within the Welland Management Catchment. The West Glen and Gwash waterbodies have an ecological status of 'Moderate'. The East Glen waterbody has an ecological status of 'Poor'.

12.2.32. Figure 12.1 shows the main surface watercourses and their associated catchments within the study area.

12.2.33. There is a network of anthropogenically modified drains and ditches within the boundary line which are explain further in the following section (Site Drainage).

Site Drainage

12.2.34. A hydrology Site walkover was conducted in March 2022 to identify the drainage characteristics of the Site.

12.2.35. The Site is shown to be predominantly served by a network of anthropologically made cross drainage ditches typical of agricultural land.

12.2.36. Drains within the Site are assessed to feed into the wider catchment served by the East Glen River.

12.2.37. Site observations and anecdotal evidence indicates that the Site is drained by a network of subsurface drainage pipes.

Hydrological Regime and Surface Water Morphology

12.2.38. The hydrological regime within the Site is typical of lowland agricultural plains and is drained by man-made ditches of slow running water; however, the Site is not located within the catchment of an Internal Drainage Board (IDB). These ditches drain to several natural watercourses and in turn the wider hydrological system.

12.2.39. Consultations with LCC have confirmed that LCC have a memorandum, of understanding with IDBs within the area to extend their operational ownership across the whole of Lincolnshire. The Site is shown to fall within the extended management boundaries of the Black Sluice and Upper Whitham IDBs. Consultations with LCC has confirmed that IDB consents and byelaws are not applicable for the extended operational areas which the Site falls within.

Surface Water Continuity

12.2.40. Surface drainage ditches at the Site appear to be relatively continuous and free from natural blockages (such as trees / brash), although some ditches are heavily vegetated or stagnant, promoting the growth of weeds.

12.2.41. Several manmade flow controls and crossings were observed along the watercourses within the Site to support access for agricultural and the adjacent railway line, as shown in Plates 12.1 and 12.2.

Plate 12.1: Watercourse Crossings within the Site (West Glen River at E 504909, N 312076)

Plate 12.2: Watercourse Crossings within the Site (Land Drain at E 505939, N 312244)

Flooding

12.2.42. The Site is primarily located within Flood Zone 1, an area classed as having a low probability of flooding. The eastern and southern extents of the Site are located adjacent to the West Glen River, an area within Flood Zone 3 (see Figure 12.2), and which is described by the Environment Agency as having a 'high probability' of river and surface water flooding in the National Planning Practice Guidance (NPPG) 'Flood Risk and Coastal Change', Table 1 (Paragraph 065, Reference ID: 7-065-20140306), published by the Ministry of Housing, Communities and Local Government (now the Department for Levelling Up, Housing and Communities) in 2014 and updated in 2021.

12.2.43. The Environment Agency Flood Map for Planning indicates the Site does not benefit from the protection of flood defences.

12.2.44. The Defra Spatial Flood Defences dataset (Defra, 2022) indicates flood defences are located along the banks of the River Gwash and the West Glen River.

12.2.45. Defences along the River Gwash are located approximately 600m west of the Site and comprise privately owned engineered high ground. The flood defence is shown to have crest levels in the range of approximately 19.1 to 29.5m AOD and a Standard of Protection (SoP) of 25 years.

12.2.46. Defences along the West Glen River run along the banks of the watercourse through the centre of the Site and comprise privately owned natural high ground. The flood defence is shown to have crest levels in the range of approximately 13.6m to 21.8m AOD and a SoP of 50 years.

Public Water Supplies

12.2.47. Consultation with Anglian Water and the Environment Agency was carried out on 16 February 2022 to identify public water abstractions within 2km of the Site boundary as per the PWS Study Area. A response to this information request from Anglian Water and the Environment Agency has not been received at the time of writing. Responses identifying public water abstraction will be reported in the ES.

Private Water Supplies

12.2.48. Consultation with RCC and SKDC was carried out on 16 February 2022 to identify Private Water Supplies (PWS) located within the PWS Study Area.

12.2.49. RCC confirmed four PWS within 2km of the Site. They also provided details of the source type of the PWS which will be confirmed through consultation:

- North Lodge: Borehole source, located immediately within the Site at TF 05270 10935;
- Hales Lodge: Borehole source, located approximately 1.92 km north east of the Site at SK 98221 13088;
- Tickencote Hall: Surface water source, located approximately 780 m north west of the Site at SK 98900 09410; and
- Tickencote Warren: Borehole source, located approximately 392 m east of the Site at SK 97900 11260.

12.2.50. SKDC confirmed three PWS, which supply seven properties within 2km of the Site. One PWS supplies Banthorpe Lodge, Kettles Barn, The Stables and Glen Lodge. Spa Cottage was noted by SKDC to be unoccupied. They also provided details of the source type of the PWS which will be confirmed through consultation:

- Banthorpe Lodge, Borehole source, located approximately 210m east of the Site at TF 06200 11000.
- Kettles Barn, Borehole source, located approximately 210m east of the Site at TF 06188 10989.
- The Stables, Borehole source, located approximately 192m east of the Site at TF 06166 10999.
- Glen Lodge: Borehole source, located approximately 222m east of the Site at TF 06209 10971.
- Bowthorpe Park: Borehole source, located approximately 1.8km north of the Site at TF 06686 15415.

- Spa House: Borehole source, located approximately 1km north of the Site at TF 07050 14600.
- Spa Cottage: Borehole source, located approximately 1.2km north of the Site at TF 07376 14568.

12.2.51. Spa Lodge Farm will also be contacted in addition to those confirmed by SKDC due to its close proximity to coordinates provided of the Spa House PWS.

12.2.52. Visits to properties identified to be served by PWS will be undertaken prior to the DCO Application and reported within the ES. Further details and the assessment of these supplies is provided in the 'What are the potential environmental effects?' Section and summarised in Table 12.3.

Abstractions and Discharge Consents

12.2.53. Numerous surface and groundwater abstraction points are recorded at the Site and in the near vicinity; however, the vast majority of these are for industrial and agricultural use with abstraction points for potable use confined to the north-western extent of the Site, as well as one within the central area of the Site. These are all groundwater abstractions recorded for general farming and domestic use.

12.2.54. There are seven discharge consents recorded onsite with a further 16 recorded within 250m of the Site. Of the seven onsite, five are recorded at the Essendine Terminal Pumping Station on Bourne Road, adjacent to Essendine Industrial Estate with Anglian Water Services Limited recorded as the operator. The consents are dated between 1969 and 2020 with the property type recorded as Pumping Station on Sewerage Network (Water Company). Discharge type recorded within the consents include Sewage Discharges - Storm Sewage Overflow - Storm tank/emergency overflow - Pumping Station - Water Company, with discharge into a watercourse recorded as Freshwater Stream/River.

Another discharge consent is recorded on Essendine Road in the western extent of the Site with Towells Haulage Limited as the operator. The consent was effective between 1979 and 1996 with discharge onto land and the discharge type unknown.

12.2.55. The final discharge consent on the Site is an operational consent in the eastern extent of the Site. This is an Environmental Permit, which allows the release of wastewater or effluent to the environment. The permit will stipulate conditions which must be followed. It may be prudent to review who has management responsibility for the permit, ensure the discharge activity is well managed and that infrastructure is in a good state of repair. Further action could include contacting the Environment Agency to ensure compliance with the permit and asking the vendor to confirm that there have been no breaches of the permit conditions. This would be undertaken prior to the DCO Application.

Designated Receptors

12.2.56. There are 18 statutory designations relating to water within the Wider Study Area, identified through the use of Natural England and the Joint Nature Conservation Committee (JNCC) GIS datasets, as shown in Table 12.2.

Table 12.2: Statutory Designated Sites within 5 km of the Site

Designated Site	Distance and Direction from the Site	Hydrologically Linked to Site?
Ryhall Pastures and Little Warren Verges SSSI	Located onsite.	Yes – Partially located within the Site boundary and hydrologically connected by field drain.

Designated Site	Distance and Direction from the Site	Hydrologically Linked to Site?
Newell Wood SSSI	Approximately 34m north-west of the Site.	No – Hydrologically disconnected. Is located upslope of the Site and is disconnected by an unclassified road providing a hydrological barrier and an unnamed surface watercourse.
Great Casterton Road Banks SSSI	Approximately 91m south of the Site.	No - Hydrologically disconnected by the River Gwash.
Bloody Oaks Quarry SSSI	Approximately 460m south-west of the Site.	No – Hydrologically disconnected by A1 and existing drainage infrastructure.
Tickencote Marsh SSSI	Approximately 1.17km west of the Site.	No – Hydrologically disconnected by road network providing a hydrological barrier, intervening topography and the River Gwash.
East Wood, Great Casterton SSSI	Approximately 1.39km south of the Site.	No – Hydrologically disconnected by intervening topography and an unnamed watercourse located north of the receptor.
Clipsham Old Quarry and Pickworth Great Wood SSSI	Approximately 1.98km north-west of the Site.	No - Hydrologically disconnected by intervening topography and road network

Designated Site	Distance and Direction from the Site	Hydrologically Linked to Site?
		providing a hydrological barrier.
Shackwell Hollow SSSI	Approximately 2.21km south-west of the Site.	No – Hydrologically disconnected by road network providing a hydrological barrier, intervening topography and the River Gwash.
Staton's Pit Local Nature Reserve (LNR)	Approximately 3.06km north of the Site.	No – Hydrologically disconnected by intervening topography, surface water features including a network of field drains and the West Glen River, and road network providing a hydrological barrier.
Dole Wood Site of Special Scientific Interest (SSSI)	Approximately 3.54km north-east of the Site.	No – Hydrologically disconnected by intervening topography, surface water features including a network of field drains and the East Glen River, and road network providing a hydrological barrier.
Langtoft Gravel Pits SSSI	Approximately 3.6km east of the Site.	No - Hydrologically disconnected by West Glen River and network of field drains and roads providing a hydrological barrier.

Designated Site	Distance and Direction from the Site	Hydrologically Linked to Site?
Empingham Marshy Meadows SSSI	Approximately 3.89km west of the Site.	No – Hydrologically disconnected by two unclassified roads providing a hydrological barrier, and intervening topography.
Banark Hills and Holes SSSI, SAC, National Nature Reserve (NNR)	Approximately 3.93km south-east of the Site.	No – Hydrologically disconnected by road network providing a hydrological barrier, intervening topography and the River Wellend.
Ketton Quarries SSSI	Approx 4.08km south-west of the Site.	No – Hydrologically disconnected by road network providing a hydrological barrier and intervening topography.
Castle Bytham Quarry SSSI	Approximately 4.41km north-west of the Site.	No - Hydrologically disconnected by intervening topography, road network providing a hydrological barrier, and the West Glen River.
Baston and Thurlby Fens SSSI, Special Protection Area (SAC)	Approximately 4.46km north-east of the Site.	No – Hydrologically disconnected by intervening topography, surface water features including a network of field drains and the East Glen River, and road network providing a hydrological barrier.

Designated Site	Distance and Direction from the Site	Hydrologically Linked to Site?
Whitewater Valley SSSI	Approximately 4.63km south of the Site.	No – Hydrologically disconnected by road network providing a hydrological barrier, intervening topography and the River Wellend.
Grimsthorpe Park (SSSI, SAC)	Approximately 4.67km north of the Site.	No – Hydrologically disconnected by intervening topography, surface water features including a network of field drains and the West Glen River. The road network also creates a hydrological barrier.

12.2.57. All hydrologically-dependent designations are considered to be hydrologically disconnected from the Site, with the exception of Ryhall Pastures and Little Warren Verges SSSI, (in terms of surface and sub-surface water effects, as development is proposed in areas that are hydrologically down-gradient) or are of sufficient distance to remain unaffected by the Proposed Development. As such, effects on designations have been scoped out of this assessment, with the exception of Ryhall Pastures and Little Warren Verges SSSI.

12.3. How have we assessed the effects relating to this topic?

12.3.1. The Water Resources and Ground Conditions assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice (see paragraph 12.4.1), as detailed below. Our approach, as agreed in consultation with the

Environment Agency and Natural England, to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to access and highways is described in Appendix 12.1.

Legislation, Planning Policy and Guidelines

12.3.2. The following legislation, guidance and information sources have been considered in carrying out this assessment.

- Water Framework Directive (2000/60/EC) as implemented in England via the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
- The Groundwater Directive (GWD) (2006/118/EC) as implemented by the Groundwater (Water Framework Directive) (England) Direction 2016;
- The Groundwater Daughter Directive to WFD (2006/118/EC) as implemented Environmental Permitting (England and Wales) Regulations 2016;
- The Bathing Water Directive (2006/7/EC) as implemented by the Bathing Water Regulations 2013;
- Flood and Water Management Act 2010; and
- Land Drainage Act 1991.

Planning Policy

12.3.3. The National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy, have been taken into account in the assessment of effects and the development of measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

12.3.4. This PEIR section and the on-going assessment work is being conducted with reference to the key guidance documents as described in the following paragraphs.

12.3.5. Produced by the Northern Ireland Environment Agency (NIEA) and Scottish Environment Protection Agency (SEPA) partnership NetRegs, the Pollution Prevention Guidelines (PPGs) and the replacement series Guidance for Pollution Prevention (GPPs) give advice on statutory responsibilities and good environmental practice. Each PPG and GPP addresses a specific industrial sector or activity.

12.3.6. Whilst the PPG documents have now been archived by the Environment Agency, they still provide a useful and relevant resource for managing onsite activities. The following are of relevance to surface water groundwater, coastal waters and soil resources:

- GPP1 'Understanding your environmental responsibilities – good environmental practices' (2020);
- GPP2 'Above ground oil storage tanks' (2018);
- GPP4 'Treatment and disposal of wastewater where there is no connection to the public foul sewer' (2017);
- GPP5 'Works and maintenance in or near water' (2018);

- PPG6 'Working at construction and demolition sites' (2012);
- GPP8 'Safe storage and disposal of used oils' (2017);
- PPG18 'Managing fire water and major spillages' (2000);
- GPP21 'Pollution incident response planning' (2021); and
- GPP22 ('Dealing with spills' (2018).

12.3.7. Other relevant guidance comprises the following:

- The Construction Industry Research and Information Association (CIRIA) (2015), Environmental Good Practice on Site (C741);
- CIRIA (2001), Control of Water Pollution from Construction Sites (C532); and
- CIRIA The Sustainable Drainage System (SuDS) Manual (2015).

Study Area

12.3.8. The water resources and ground conditions core study area includes all areas where 'Site Works' is proposed as shown in Figure 12.1. A wider study area includes 5km around the core study area. Both study areas are shown on Figure 12.1.

12.3.9. At distances greater than 5km within lowland catchments, it is considered that schemes such as a solar farm are unlikely to contribute to a hydrological effect, in terms of chemical or sedimentation effects, due to attenuation and dilution over distance of potentially polluting chemicals.

12.3.10. A smaller 2km study area is based on the Site boundary and is used to assess PWS (the PWS Study Area) as shown in Figure 12.1.

12.3.11. These study areas are defined based on professional judgement and experience assessing similar scale developments within lowland agricultural environments and similar hydrological catchments in England.

Assumption and Limitations

12.3.12. Weather conditions during the Site walkover were changeable with minor precipitation events and extended periods of dry weather, whilst the preceding week had persistent rainfall. The weather conditions are not considered to materially affect the site visit.

12.3.13. With the exception of PWS consultation and walkover, all data considered necessary to identify and assess potential significant effects was available.

12.4. What are the potential environmental effects?

12.4.1. This section describes the potential water resources and ground condition effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of the Proposed Development, when considering the potential effects of the Proposed Development.

12.4.2. A draft Water and Construction Management Plan (WCMP) (Appendix 12.2) has been prepared and describes water management measures to control surface water runoff and drain hardstanding and other structures during the construction, operation and decommissioning of the Proposed Development and will form part of a Pollution Prevention Plan (PPP) to be implemented for the Proposed Development. The measures set out in the draft WCMP will be included within the oCEMP, OEMP and oDEMP which will submitted with the DCO Application and secured by a DCO requirement. As part of the design of the Site to prevent potential effects, watercourses will be buffered by set distances determined as part of the WCEMP, which infrastructure will not encroach on. Minimum buffers have already been incorporated into the design as described in Chapter 5 of this PEIR. The buffer of watercourses, in conjunction with the measures set out in the WCMP, will be sufficient to avoid potential effects on the hydrological and hydrogeological resource, as the effectiveness of the construction measures has been demonstrated on several solar farm construction sites for which Arcus have provided technical advice. Buffer distances from drains will also be included as part of the WCMP, as this has also proved to be an effective sediment control measure for access track upgrades for a large scale construction project, on flat agricultural land, for which Arcus provided construction advice.

12.4.3. It is also noted that, currently, the fields within the wider study area are typically used for arable farming, and are ploughed to within a closer distance of the ditches and Main River than the offsets proposed for the Proposed Development (as described in Chapter 5 of this PEIR). The Proposed Development is therefore likely to improve drainage than the baseline scenario. The Proposed Development will not require application of nitrates to the fields as per the current agricultural regime, and this will lead to improvements in water quality compared to the baseline scenario.

Potential Construction Effects

12.4.4. The effects that could result from construction activities are assessed in the following paragraphs.

Chemical Pollution

12.4.5. Potential risks include the spillage or leakage of chemicals, fresh concrete, foul water, fuel or oil, during use or storage onsite. These pollutants have the potential to adversely affect soils, surface water, subsurface water and groundwater quality, and hence effects on the biodiversity of receiving watercourses.

Surface Hydrology

12.4.6. Watercourses and drainage ditches could be at risk from a pollution incident during construction.

12.4.7. Considering the measures set out in the draft WCMP, effects on surface hydrology (moderate sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant, as outlined in Table 12.4.

Groundwater, Near-surface and Bedrock

12.4.8. Pollutants coming into contact with bedrock also have the potential to indirectly alter the chemical pH of the groundwater resource. The chemical pH alterations to bedrock are difficult to rectify due to the fractured nature of the rock and lengthy attenuation and dispersal of chemicals. As noted previously, due the lack of superficial deposits across much of the Site and highly and moderately productive underlying aquifers, groundwater may be present near the surface, which pollutants may come into contact with.

12.4.9. Considering the measures set out in the draft WCMP, effects on groundwater and near-surface (high sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant, as outlined in Table 12.4.

Erosion and Sedimentation

<u>Surface Hydrology</u>

12.4.10. Erosion and sedimentation can occur from excavations, de-watering, ground disturbance and overburden stockpiling, the largest element of which, within the Proposed Development, would be the Primary Onsite Substation and primary and secondary construction compounds.

Sediment entering watercourses and drainage ditches has the potential to affect water quality, ecology and flood storage capacity.

12.4.11. Due to the buffer distances between construction areas and watercourses and ditches, which will be outlined as part of the WCMP, and the largely flat topography of the Site, overland flow generation is likely to be minimal. Any silt generated during construction will be entrained within cut off ditches before reaching watercourses and land drains, with the exception of any new watercourse crossings.

12.4.12. Considering the measures set out in the draft WCMP, effects on surface hydrology (moderate sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant, as outlined in Table 12.4.

Groundwater and Near-surface Water

12.4.13. Sediment also has the potential to change near-surface flow in superficial geology deposits by creating a physical barrier within naturally occurring drainage micropores. Sediment entering near-surface water in superficial deposits also has the potential to impact on groundwater quality within bedrock deposits / fissures.

12.4.14. Considering the measures set out in the draft WCMP, effects on groundwater and near-surface (high sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant, as outlined in Table 12.4.

Impediments to Flow

12.4.15. Following final design of the Proposed Development, the number of new and upgraded watercourse crossings required will be determined. Minimisation of the number of new watercourse crossings required will be achieved through the development of the project design and by utilising existing access roads as far as possible. The minimisation of the number of proposed crossings and re-use of existing watercourse crossings will reduce one of the main activities that could give rise to impediments of flows.

12.4.16. Where watercourse crossings are required, they will be located in appropriate areas which will consider the impact to the surface hydrology. This will include being located on straight and stable sections of rivers and be perpendicular to the river to ensure that the crossing is as short as possible. The most suitable type of crossing will be selected for location, which will preferably open culverts or single span bridges where required.

12.4.17. Due to this and considering the measures set out in the draft WCMP, effects on surface hydrology (moderate sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant, as outlined in Table 12.4.

Changes in Soil Interflow Patterns

12.4.18. Some excavations, associated with Primary Onsite Substation compound and primary and secondary construction compounds, may need temporary sub-surface water controls, such as physical cut-offs or de-watering. These temporarily divert flows away from the excavation and temporarily lower the local water table and sub-surface water levels in the superficial geology. Localised temporary changes to soil interflow patterns may therefore arise.

12.4.19. Foundations for the compounds and new interior access tracks also have the potential change sub-surface flow by creating physical barriers within naturally occurring drainage macropores in soil.

12.4.20. No substantial impediments to near-surface water flow will be created as the detailed Site drainage design will take into account any severance of saturated areas to ensure hydrological connectivity is maintained.

12.4.21. The Proposed Development will involve the installation of PV Arrays arranged on Mounting Structures. The Mounting Structure posts will be driven into the ground up to a maximum depth of 2.5m. It is considered that installing Mounting Structure posts will have a negligible effect on the displacement or change in sub-surface water flow. This is due to the thin nature of the supporting frame.

12.4.22. Due to this, effects on soil and near-surface water (high sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant.

Compaction of Soils

12.4.23. 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 runoff rates and increased erosion. The superficial geology underlying the Proposed 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.

12.4.24. Existing access tracks have been used in the design where practicable, further reducing the potential for soil compaction. Furthermore, the percentage of the core study area proposed for the construction of new access tracks is small.

12.4.25. For these reasons, the magnitude of this effect will be negligible. Given the moderate sensitivity of soils and negligible magnitude of effect, the significance of effects associated with the compaction of soils is considered to be negligible and non-significant.

Bedrock Excavation

12.4.26. Excavated material required for the Proposed Development will be obtained offsite for new access tracks, compound and laydown areas. The foundations for the compound and Primary Onsite Substation will not require excavations depths that would interact with bedrock. The Mounting Structure posts and fencing will not be driven to depths that will interact with bedrock.

12.4.27. For this reason, there will be no loss of bedrock. Given the moderate sensitivity and negligible magnitude of effect, the significance of effects associated with the loss of bedrock is negligible and non-significant

Migration of Pollutants from Contaminated Land

12.4.28. Presence of former landfill sites and infilled land (former gravel pits, quarry) within the Site as well as landfilling within close proximity of the Site could have resulted in ground gases being present at the Site. A very significant risk of soluble rock has also been recorded within the Site which could create a pathway for gases to migrate within the Site and pose a potential risk to Site workers and enclosed spaces within the Proposed Development.

12.4.29. Contaminated land may be present at the Site associated with industrial activities within the Essendine Industrial Estate (including COMAH sites) and other potentially contaminative sources such as the former fuel station and storage tanks associated with farming activities. It should, however, be noted that these are small isolated areas within the Site as a whole.

12.4.30. There is a potential for migration of any pollutants in the soil due to the very significant risk of soluble rock, combined with a lack of superficial deposits recorded across a majority of the Site which could have provided a barrier to contaminants from migrating to underlying bedrock aquifers.

12.4.31. A full Phase 1 Contaminated Land Desk Study report will be undertaken and reported within the ES submission. It is considered likely that a Phase 2 Intrusive Ground Investigation will be recommended to be undertaken post consent/pre-construction, to identify and characterise any contamination and allow for a period of ground gas and groundwater monitoring. This work would be secured via requirement of the DCO.

12.4.32. The Phase 1 Contaminated Land Desk Study report will include a Conceptual Site Model (CSM) which will identify the potential for any pollutant linkages and outline any further action and mitigation measures where necessary. It is considered at this stage, risks to the Proposed Development resulting from contaminated land are likely to be low and therefore non-significant, however this will need to be confirmed within the ES submission following the completion of the Phase 1 Desk Study.

Flood Risk

12.4.33. The Site is primarily located in Flood Zone 1, an area assessed as having an annual probability of river or sea flooding in any year greater than 1 in 1,000 years.

12.4.34. The Site is partly located within Flood Zone 2 and 3 (see Figure 12.2), an area described as ‘high probability’ and assessed as having a 1 in 100 or greater annual probability of river or sea flooding in any year.

12.4.35. The Solar PV Site is proposed to be located entirely out with of the modelled 1:100-year (with an allowance for climate change) fluvial flood extents, with the exception of two small areas located to the of the East Coast Main Line Railway and south of Greatford Level Crossing.

12.4.36. The FRA, provided at Appendix 12.3, assesses fluvial flooding associated with the West Glen River using modelled in channel levels provided by the Environment Agency. The FRA outlines that the Proposed Development will not be impacted in up to and including the 1:100-year (20% climate change allowance) fluvial event as agreed in consultation with the Environment Agency.

12.4.37. The FRA concludes that the risk of the Proposed Development flooding from all sources is negligible and non-significant.

Increase in Runoff

12.4.38. Access to the Proposed Development during construction will be designed to minimise requirement for new interior access tracks, limiting the requirement for new hardstanding.

12.4.39. The FRA identifies that the installation of PV Arrays does not have the potential to significantly increase surface water runoff rates compared to the baseline scenario.

12.4.40. The PV Arrays have the potential to concentrate rainfall under the drip lines. As the topography of the Site is generally flat-lying, rainfall will not drain quickly downslope and will preferentially infiltrate where it lands.

12.4.41. The area under the PV Arrays will be seeded with a suitable grass/flower mix to prevent rilling (incisions in soil caused by concentrated water flow) and an increase in surface water runoff rates. With the implementation of suitable planting, the ground cover is unlikely to generate surface water runoff rates beyond the baseline scenario.

12.4.42. Area of hardstanding (i.e., the Primary Onsite Substation compound) will be served by a drainage system which incorporates Sustainable Drainage Systems (SuDS) mechanisms to prevent an increase in surface water runoff.

12.4.43. As such, effects associated with runoff are considered to be of negligible magnitude for surface water receptors of moderate sensitivity, which is considered to be a negligible and non-significant effect.

Effects on Public Water Supplies

12.4.44. The Site is located within Source Protection Zones which noted abstraction points to the north and south. The Environment Agency and Anglian Water were contacted regarding these; however, responses are outstanding and will be reported and considered within the ES.

12.4.45. Further assessment of public water supplies will be required following consultation with the Environment Agency and Anglian Water.

12.4.46. Table 12.3 details PWS within 2km of the Site, within the PWS Study Area. Further assessment of PWS will be required following any Site visits required and further detailed layout of proposed infrastructure.

Table 12.3: Effects on PWS

PWS	Potential to be Hydrologically Connected to the Proposed Development?	Distance from the Proposed Development	Comment
North Lodge (Groundwater)	Yes – is close proximity to Proposed Development.	Located 570m from potential Primary Onsite Substation. Located 112m from Solar PV Site.	Borehole. Source and infrastructure to be confirmed with resident.
Hales Lodge (Groundwater)	No – the Proposed Development is considered to be a sufficient distance from the borehole that its	Located 1.92km from junction for vehicle access route.	Borehole. Source and infrastructure to be confirmed with resident.

PWS	Potential to be Hydrologically Connected to the Proposed Development?	Distance from the Proposed Development	Comment
	water quality or quantity is likely to be unaffected.		
Tickencote Hall (Surface water)	No – based on coordinates provided, the source is located upstream of the Proposed Development.	Located 788m from the existing access track which is part of the Proposed Development.	Surface water source likely to be River Gwash, located 50m from source. Source and infrastructure to be confirmed with resident.
Tickencote Warren (Groundwater)	Yes – is located in close proximity to the Proposed Development.	Located 392m from junction for vehicle access.	Borehole. Source and infrastructure to be confirmed with resident.

12.4.47. The North Lodge is considered to be hydrologically connected to the Site based on current information as it is located in close proximity to the Proposed Development, including the Primary Onsite Substation which are likely to require deeper excavation depths than the Mounting Structures.

12.4.48. Hales Lodge is located approximately 1.92km from the vehicle access route for the Proposed Development. This junction is located along the existing A1 where there is existing hardstanding. Any junction improvements are unlikely to require deep excavations. Given the shallow excavation depths, the substantial distance between the Proposed Development and the abstraction point, it is considered that the Proposed Development will not impact upon the quality or quantity of water abstracted at this PWS based on current information.

12.4.49. Based on current information regarding Tickencote Hall, as the PWS source is surface water and is located upstream of the Proposed Development infrastructure, it is considered to be hydrologically disconnected from the Site.

12.4.50. Tickencote Warren is currently considered to be hydrologically connected to the Site based on current information. It is located 397m from the vehicle access route at the A1. As previously discussed, this is an area of existing hardstanding where deep excavations will not be required. Following consultation with resident and confirmation of the source location, given the shallow excavation depths at the Site and sufficient distance from the PWS, it may be considered to be hydrologically disconnected.

12.4.51. Further information regarding the source and infrastructure is required through consultation with residents and will be considered in the ES.

Effects on the Condition of Designated Sites

12.4.52. A designated site that was found to be hydrologically connected to and within the Site, was determined to be Ryhall Pastures and Little Warren Verges SSSI. It is hydrologically connected as it is located on and downslope of the Site and is connected by a field drain.

12.4.53. Construction activities have the potential to impact SSSI leading to a shift in the hydrochemistry or hydrological conditions sufficient to negatively change the ecology of the receptor. This could lead to downgrading of the designated sites condition.

12.4.54. Considering the measures set out in the draft WCMP, effects on designated sites (high sensitivity receptor) are considered to be of negligible magnitude and therefore negligible and non-significant.

Potential Operational Effects

12.4.55. Potential effects associated with operation of the Proposed Development are:

- Increased or decreased run-off rates;
- Continued or decreased erosion and sedimentation from runoff from areas of proposed hardstanding and the PV Arrays;
- Alterations to natural flow pathways from runoff from areas of hardstanding;
- Reduced chemical loading of watercourses associated with the cessation of nitrate application; and
- Risk of chemical pollution from minor spills from maintenance vehicles.

12.4.56. The nature of these effects has been discussed in relation to the construction phase. As there would be substantially less activity during operation, and as there is unlikely to be any significant ground disturbance during operation, the magnitude of these effects is similarly reduced.

12.4.57. Land under the PV Arrays would be allowed to naturally vegetate following seeding with a wildflower or grass mix and be grazed by livestock. As vegetation becomes established under the PV Arrays there is likely to be a decrease in surface water runoff rates and a reduction in the potential for sediment and agricultural pesticides (phosphates and nitrates) to transfer into the wider hydrological catchment compared to the baseline scenario, where agricultural fields remain tilled for substantial parts of the year.

12.4.58. Whilst alterations to natural flow pathways will not be introduced during the operational phase, any changes during construction will continue through operation, as the majority of infrastructure will remain in place.

12.4.59. The Mounting Structure posts will be inserted at a maximum depth of 2.5m below ground level. Existing sub surface agricultural field drains can lie at greater depths and therefore are unlikely to be impacted. Should some of the existing subsurface land drains be damaged during the construction phase the function is unlikely to be impaired to the point of causing backing up of near surface water. The existing agricultural land use will not result in significant flows within any sub surface drainage. As such in a scenario where the Mounting Structures posts impacts upon sub surface drains the potential loss of flow would not be of a significant rate and would not significantly interrupt the drainage within the Site and wider catchment. Due to this, this would not result in a significant effect.

Potential Decommissioning Effects

12.4.60. Potential effects of decommissioning the Proposed Development are similar to those during construction, with groundworks and excavations required to remove foundations and hardstanding. These effects would be substantially lower in magnitude than during construction as grounds will be reinstated to a pre-existing condition and would be controlled by a PPP. Where infrastructure would be left in place, drainage features would also remain where this is compatible with the PPP.

12.4.61. As a result, the effects associated with decommissioning are assessed to be negligible and non-significant.

12.5. How would we mitigate the environmental effects?

12.5.1. Proposed mitigation measures could reduce or avoid effects from the Proposed Development that may impact water resources and ground conditions. Proposed mitigation measures are based on best practice guidance and would break pollutant linkages between sources and water resources and ground condition receptors.

12.5.2. Buffer distances between proposed construction works and watercourses and drainage ditches have been maximised to reduce the potential for chemical pollutants to be transferred to the water environment.

12.5.3. Mitigation measures are outlined within the draft WCMP (provided at Appendix 12.2). An Outline Excavated Materials Management Plan (OEMMP) which sets out specific measures will be provided as part of the ES. They comprise good practice methods and works that are established and effective measures to which the Applicant will be committed through the DCO application and the ES.

12.5.4. In order to maintain the current level or improve the drainage, it is necessary to ensure that construction methods, as adhered to in accordance with the measures set out within draft WCMP and the outline Construction Environmental Management Plan (CEMP), secured by a DCO requirement, do not seriously disrupt the established drainage network and that no areas are surcharged, either by water discharge or spoil.

12.5.5. An Outline Surface Water Management Strategy, secured by a DCO requirement, will be provided as an Appendix to the ES and will outline the required surface water drainage design parameters to isolate potentially contaminated runoff associated with firefighting water.

12.5.6. Although the WCMP is a draft and will evolve to take account of consultee feedback and detailed design, there is sufficient confidence in the effectiveness of the measures set out in the draft WCMP for them to be treated as part of the Proposed Development for the purposes of the assessment presented in Section 12.4 of this chapter. Measures and procedures outlined in the draft WCMP will be adopted and incorporated into the CEMP, OEMP and DEMP to be agreed with statutory consultees and the planning authority following consent by way of an appropriately worded DCO Requirement.

12.5.7. Where possible, the existing network of access tracks which serve the agricultural operations will be utilised, limiting the requirement to construct new access roads and disturb soils. Where new access tracks are required, they will be designed to avoid crossing surface water, where possible. Utilising existing access roads and tracks limits the potential for increased surface water runoff rates and sedimentation effects during construction.

12.5.8. The oCEMP describes water management measures to control surface water runoff and drain hardstanding and other structures during the construction and operation of the Proposed Development. This will form part of Pollution Prevention Plan (PPP) to be implemented for the Proposed Development.

12.5.9. These buffer distances, in conjunction with measures set out in the oCEMP, will be sufficient to avoid potential effects on water resources, as the effectiveness of the construction measures has been demonstrated on several solar farm construction sites for which Arcus have provided technical advice.

12.5.10. In addition, areas of hardstanding (i.e., the substation compound) will be served by a drainage system which incorporates Sustainable Drainage Systems (SuDS) mechanisms to prevent an increase in surface water runoff.

Further Mitigation

12.5.11. Subject to completion of consultation with residents and final Proposed Development layout, further mitigation may be determined to be necessary. This further mitigation is likely to comprise water quality monitoring and will be considered and reported in the ES.

12.5.12. Water quality monitoring may be required at any PWS determined to be hydrologically connected and with the potential to be impacted by the Proposed Development. PWS identified to be hydrologically connected and with the potential to be impacted will be identified within the ES and any monitoring required outlined in the WCMP.

12.6. What environmental effects would remain?

Construction Effects

12.6.1. During construction the residual effects following the implementation of embedded and further mitigation measures are considered to be either minor or negligible. This is not considered to be significant.

Operational Effects

12.6.2. There would be substantially less activity during operation, and as there is unlikely to be any significant ground disturbance during operation, the magnitude of these effects is similarly reduced.

12.6.3. All operational effects are anticipated to be negligible and non-significant.

Decommissioning Effects

12.6.4. Potential effects of decommissioning the Proposed Development are similar to those during construction, with groundworks and excavations required to remove foundations and hardstanding. These effects would be substantially lower in magnitude than during construction as grounds will be reinstated to a pre-existing condition and would be controlled by a

PPP. Where infrastructure would be left in place, drainage features would also remain where this is compatible with the PPP.

12.6.5. As a result, the effects associated with decommissioning are assessed to be negligible and non-significant.

Table 12.4 - Water Resources and Ground Activity Significance of Effects

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction								
Chemical Pollution	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Chemical Pollution	Adverse, short-term	Groundwater, near-surface water	High	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Erosion and Sedimentation	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Erosion and Sedimentation	Adverse, short-term	Groundwater, near-surface water	High	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Impediments to Flow	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Soil Interflow	Adverse, short-term	Soil, near-surface water	High	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Increased runoff and flood risk	Adverse, long-term	Surface water	Moderate	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Downgrade in designated status	Adverse, short-term	Designated receptor	High	Negligible	Negligible	WCMP, CEMP	None	Negligible (Non-significant)
Operation								
Chemical Pollution	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP, SuDS	None	Negligible (Non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Chemical Pollution	Adverse, short-term	Groundwater, near-surface water	High	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Erosion and Sedimentation	Adverse, long-term	Surface water	Moderate	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Erosion and Sedimentation	Adverse, long-term	Groundwater, near-surface water	High	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Impediments to Flow	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Soil Interflow	Adverse, short-term	Soil, near-surface water	High	Negligible	Negligible	WCMP	None	Negligible (Non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Increased runoff and flood risk	Adverse, long-term	Surface water	Moderate	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Impacts on Land Drains	Adverse, long-term	Surface water (drainage infrastructure)	Moderate	Negligible	Negligible	Embedded Design	None	Negligible (Non-significant)
Decommissioning								
Chemical Pollution	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Chemical Pollution	Adverse, short-term	Groundwater, near-surface water	High	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Erosion and Sedimentation	Adverse, long-term	Surface water	Moderate	Negligible	Negligible	WCMP	None	Negligible (Non-significant)

Description of Effect	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Erosion and Sedimentation	Adverse, long-term	Groundwater, near-surface water	High	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Impediments to Flow	Adverse, short-term	Surface water	Moderate	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Soil Interflow	Adverse, short-term	Soil, near-surface water	High	Negligible	Negligible	WCMP	None	Negligible (Non-significant)
Impacts of Public Water Supply	Further assessment of public water supplies will be required following consultation with the Environment Agency and Anglian Water and will be reported and assessed in the ES.							
Impacts on Private Water Supply (PWS)	Further information regarding the source and infrastructure is required through consultation with residents to inform the need for water quality monitoring. This will be reported and assessed in the ES.							

12.7. In-combination Effects

12.7.1. The other topics where there is potential for intra-development effects to arise alongside the identified hydrology receptors are as follows:

- Ecology and Biodiversity (Chapter 7); and
- Climate Change (Chapter 15).

12.8. Conclusion and Next Steps

12.8.1. Based on current assessment work to date, effects from the Proposed Development are not considered to be significant. This is following embedded and further mitigation measures outlined in the draft WCMP.

12.8.2. Further consultation regarding private and public water supplies is required to inform the assessment and will be reported in the ES.

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Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 13: Agricultural Land and Soils

May 2022

13.0 Agricultural Land and Soils

13.1. Introduction

13.1.1. This section considers the potential effects of the Proposed Development on agricultural land and businesses during construction, operation and decommissioning. It identifies the baseline of the study area in terms of agricultural land quality, soil type and distribution, and occupying farm businesses. It identifies the potential effects, both direct and indirect and negative and positive, within the study area.

13.2. What might be affected by the Proposed Development?

13.2.1. The key receptors considered in respect of agriculture are:

1) agricultural land quality. The quality of agricultural land, its pattern and distribution, and the potential effects on the land quality as a resource, are considered;

2) soil structure. Soil has many different functions and can be affected positively or negatively by land use and management even if agricultural land quality is not affected; and

3) local farm businesses. Land management is influenced by many factors, and the effects on the ability to farm land may have localised implications, positive or negative.

Agricultural Land Quality

13.2.2. Agricultural land quality is assessed by use of the system of Agricultural Land Classification (ALC) devised by the Ministry of Agriculture, Fisheries and Food (MAFF). This is a methodology, last revised in 1988, that classifies land according to the extent to which its inherent physical or chemical characteristics impose long-term limitations on agricultural use.

13.2.3. The ALC system divides land into five grades 1 to 5, with grade 3 divided into subgrades of 3a and 3b. The National Planning Policy Framework (NPPF) (2021) places Grades 1, 2 and 3a within the definition of the 'best and most versatile agricultural land' (BMV). Natural England in their Technical Information Note TIN049 (2012) estimates that 42% of agricultural land in England is within the BMV category.

13.2.4. An ALC survey of the Solar PV Site and Mitigation and Enhancement Areas was undertaken in late 2021. This was carried out at a semi-detailed level and involved examining the soils on a regular 200m grid. It involved analysis of the soils and land quality at 217 locations, from which it has been possible to map the distribution of land quality and soil types.

13.2.5. The results are presented in Table 13.1, Figure 13.1 and reported in full at Appendix 13.1. The ALC identifies the areas in hectares and the proportions of land, in each grade. All figures are rounded to the nearest hectare or whole percentage point.

Table 13.1: Agricultural Land Classification Results (Study Area)

ALC	Area (Ha)	Area (%)
Grade 1	0	0
Grade 2	110	12
Grade 3a	320	36
Grade 3b	415	47
Grade 4	10	1
Grade 5	0	0
Non-agricultural	30	3
Urban	4	<1

ALC	Area (Ha)	Area (%)
Not Surveyed	0	0
Total	**889***	**100**

*Excludes the Land for Potential Highway Works Site

13.2.6. The ALC results for the Solar PV Site area (i.e. excluding the Mitigation and Enhancement areas and Potential Highway Works Site) are presented in Table 13.2. The ALC identifies the areas in hectares and the proportions of land, in each grade. All figures are rounded to the nearest hectare or whole percentage point. The results take the measurements to the field edges, within which the Solar PV Site is located, on the basis that this reflects the limitations to agricultural use discussed below. Areas of woodland are shown on Figure 13.2, but are not included in the table below.

Table 13.2: ALC Results for the Solar PV Area

ALC	Area (Ha)	Area (% of total Site)
Grade 1	0	0
Grade 2	36	6
Grade 3a	273	47
Grade 3b	261	45
Grade 4	10	2
Grade 5	0	0
Non-agricultural	0	0
Urban	4	<1
Not Surveyed	0	0
Total	**584**	**100**

Soil Integrity, Structure and Environmental Benefits

13.2.7. The semi-detailed ALC and soil survey carried out in December 2021 determined that the soils within the Solar PV Site and Mitigation and Enhancement Areas are predominantly developed over limestone and are quite variable spatially, e.g., due to variations in soil depth to impenetrable rock, stone/rock content and wetness class. A log of all the soil profiles recorded onsite is given as Annex 3 of the ALC Report.

13.2.8. The soils identified were grouped into soils of the Elmton 1, Elmton 3, Denchworth, Fladbury1 and Sherborne Associations:

- Elmton 1 soils are mainly permeable and well-drained;
- Elmton 3 soils are usually shallow loamy and clayey soils over limestone, and usually well-drained;
- Denchworth soils are mainly stoneless, wet, clayey soils with areas usually waterlogged for long periods in winter;
- Fladbury 1 Association soils are deep, clayey alluvial soils and slowly permeable, and can be waterlogged in winter depending upon elevation; and
- Sherborne Association soils are usually permeable and well drained.

13.2.9. Soil texture is recorded in Appendix 13.1 for each sample location. In order to substantiate topsoil texture determined during the ALC survey by hand-texturing, samples of topsoil were collected and were sent to an accredited laboratory for analysis of particle size distribution (PSD).

13.2.10. Soils have a number of functions beyond biomass production, for which the ALC process is relevant. Other functions can include ecological habitat, soil carbon reserves, soil hydrology as a pathway for water flow, archaeological and cultural interest and as a source of materials (IEMA, 2022).

13.2.11. Some soils are more susceptible to damage when handled during construction. There will be limited handling and moving of soils during the construction of the Proposed Development. Some soils are however more susceptible to structural damage from machinery and vehicular activity, depending upon soil type, climate and wetness class. A Soil Management Plan will be developed, as part of the CEMP, that will identify those areas within the Solar PV Site which will map the susceptibility of soils to damage when wet, and advise on the time periods when soils are suitable for being handled or trafficked. The better quality land has soils least susceptible to damage from construction traffic.

13.2.12. Further consultation with the landowners is being undertaken to understand the productivity of the soils across the Solar PV Site along with the levels of fertilizer, pesticides and herbicides that are used to improve the productivity / yield of the soils. This evidence will be presented within the ES.

Agricultural Businesses

13.2.13. The Proposed Development has the potential for both adverse and beneficial effects on the four agricultural businesses with agricultural land within the Site. The land is predominantly in arable cropping uses, mostly cereals with arable break crops. The farm distribution and data of relevance has been collected through interviews with the operating businesses.

13.2.14. For all of the farm businesses, the land within the Site represents only a proportion of their wider agricultural holdings. No key infrastructure, such as main agricultural buildings, is affected. Agricultural uses will be able to continue, although arable uses within the PV Site will not be possible.

13.3. How have we assessed the effects relating to this topic?

13.3.1. The agricultural assessment follows the general approach to undertaking environmental impact assessments as explained in chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment of the sensitivity of receptors, magnitude of impacts and the significance of effect in relation to agricultural is described in Appendix 13.2.

13.3.2. The assessment is based on a mixture of guidance (DMRB, Natural England and Environment Agency) and, where such guidance is absent, on best practice established over time. Close regard has been given to the 2022 IEMA Guidance “A New Perspective on Land and Soil in Environmental Impact Assessments”.

Agricultural Land Quality

13.3.3. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with Planning Practice Guidance (PPG), and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects.

13.3.4. Agricultural land classification and land type is referred to in the Draft National Policy Statement for Renewable Energy Infrastructure (EN-3) at paragraphs 2.48.13 – 15, 2.50 and 2.53. It is noted that agricultural land of Grades 3b, 4 and 5 should be preferred, avoiding BMV cropland “*where possible*”. “*However, land type should not be a predominating factor in determining the suitability of the site location*”.

13.3.5. The NPPF (2021) requires, in paragraph 174 b), that the economic and other benefits of the BMV agricultural land be recognised in planning decisions. In the context of plan making, footnote 58 to paragraph 175 requires plan makers to seek to use poorer quality land in preference to that of a higher quality.

13.3.6. Across England some 42% of agricultural land is predicted to fall within the BMV category. It is not, therefore, a rare resource.

13.3.7. In this area Natural England's Predictive Best and Most Versatile Agricultural Land maps, which divide land into "high (>60% area bmv)", "medium (20 – 60% area bmv)" and "low (<20% area bmv)" likelihood categories, identify most of the Proposed Development as in the low likelihood, with medium likelihood at the southern end of the Site.

13.3.8. The ALC survey results indicate that a higher proportion than predicted falls within the BMV category.

13.3.9. The methodology (as set out in Appendix 13.2) considers the permanent sealing of land or land quality downgrading of more than 20 hectares is a major magnitude of impact, with losses of between 5 and 20ha a moderate magnitude. Land of Grades 1 and 2 is considered to be of very high sensitivity, and land of subgrade 3a of high sensitivity

Soil Integrity, Structure and Environmental Benefits

13.3.10. The positions of fixed equipment, and the routing of major cabling, have the potential to affect soils in localised locations. These effects will be assessed against the sensitivity of the soil resource for structural damage and the Solar PV Site will be mapped for sensitivity to damage from trafficking and soil movement (if needed).

13.3.11. High clay soils and medium textured soils in the wetter regions are considered to be of high sensitivity.

Agricultural Businesses

13.3.12. There are no planning policies, or other policies, to require agricultural land to be farmed, or to be farmed in a particular way (e.g. arable cropping). Evolving agri-environmental and farm support generally provide economic recompense for farming land less intensively and for providing environmental benefits.

13.3.13. Within that context, the ES will assess the effects on local agricultural businesses by considering the effects on the occupying farm businesses and the implications for the use of labour and machinery; the productivity and economic implications; and any benefits as a result of proposed sheep grazing and other land management.

Study Area

13.3.14. Consideration has been given to the Solar PV Site and Mitigation and Enhancement Areas, over which the ALC and soil survey has been carried out. The potential effects, positive or negative, over wider areas farmed by farm businesses with land within the Solar PV Site and Mitigation and Enhancement Areas has been considered, and land uses immediately adjoining the Solar PV Site areas have also been considered.

Assumptions and Limitations

13.3.15. The MAFF system of ALC was last revised in 1988 and uses a climatic dataset from before then. It is assumed that the ALC methodology will not be altered.

13.3.16. The ALC data for Rutland and Lincolnshire is based upon DEFRA Data dated May 2020.

13.4. What are the potential environmental effects?

13.4.1. This section describes the potential agricultural and soils effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development.

Construction

The potential for adverse effects on agricultural land (both on the soils and the land quality) is greatest during the construction phase. The trafficking of agricultural land by construction vehicles and machinery, the timing of work on soils and the timing and methodology of cable laying will be required to be carried out in accordance with industry good practice and methodologies tailored specifically for the soils within the Solar PV Site and Mitigation and Enhancement Areas. There will be primary and secondary construction compounds, and internal access tracks. Where these are temporary there is the potential for short-term construction impacts and soil handling and management plans (as set out in the draft outline CEMP) will be required to ensure that at the end of the construction phase these areas are restored with no or minimised impact on soil structure or land quality. This will be necessary to avoid potentially long-term, albeit localised, effects on soil structure and, in extreme cases, land quality, albeit localised.

13.4.2. There should not be a direct loss (permanent sealing or downgrading of land quality) of one or more soil functions by the installation of the PV Arrays. The construction process involves piling support poles into the soils but there is no disturbance to the land, and the land is not sealed. Against the criteria the area permanently sealed as result of internal access tracks and foundations for the Solar Stations is expected, subject to the detailed design, to be less than 5ha and accordingly a minor magnitude effect, involving land of very high down to low sensitivity. The overall effect is expected to be adverse moderate or large, depending on the inclusion of any land of Grade 2 for fixed infrastructure, which will be determined at the detailed design stage.

13.4.3. There is potential for adverse short-term effects on farm businesses and enterprises as a result of construction, such as closure or severance of field accesses at key times of the farming year. The effects are expected to include moderate adverse magnitude effects on farm businesses of medium sensitivity, which would be moderate adverse.

Operation

13.4.4. There will be areas within the Solar PV Site where the soils and agricultural land quality will be affected for the duration of the operation, such as internal tracks, inverters etc. These effects will have occurred during the construction phase.

13.4.5. The effects on soils across the Solar PV Site, other than the localised areas described above, will be limited. There will be normal ongoing management of the grassland beneath the PV Arrays and the landscape buffers, but there should be no requirement for trafficking of soils or ground disturbance relating to the solar panels, other than any periodic maintenance requirements (including replacement of panels). The impact on soils during the operational phase is therefore considered to be negligible.

13.4.6. The land management and farm enterprises will inevitably change. Continued arable use is considered very unlikely based on current machinery and farming practices. However, a significant proportion of the Mitigation and Enhancement Areas will continue to be farmed during the operation phase of the Proposed Development. There is the potential for overall benefits to soils as a result of arable soils reverting to pasture, through build-up of organic matter for example. There will also be areas (landscape buffers) managed for biodiversity where farming practices will not take place during the operational phase.

13.4.7. Overall, adverse effects on soils and land quality during operation will be limited to the areas of fixed equipment and access tracks.

13.4.8. There will be changes to farming practices within the Solar PV Site for the duration of the Proposed Development. Arable farming will be unlikely, but grassland farming and biodiversity land management will occur. These will involve land management requirements. The preliminary view is that the effects on farm businesses, which operate wider holdings beyond the areas contained within the Solar PV Site, are not anticipated to be significant.

13.4.9. The land by area and ALC grade within the Solar PV Panel area was set out in Table 3.2 above.

13.4.10. In its local context, the areas are compared to the areas of Rutland and Lincolnshire, as set out in Table 13.4. These are the agricultural land areas only.

Table 13.3: ALC Areas

ALC Grade	Solar PV Area		Rutland		Lincolnshire	
	Ha	%	Ha	%	Ha	%
1	0	0	351	0.9	75,757	13.4
2	36	6	3,250	8.8	186,752	33.0
3	534	91	32,871	88.7	296,243	52.3
3a	273	47	13,148	35.5	118,497	20.9

ALC Grade	Solar PV Area		Rutland		Lincolnshire	
BMV**	309	53	16,749	45.2	381,006	67.3
4	10	2	567	1.5	7,447	1.3
5	0	0	0	0.0	0	0.0
Total (as rounded)	580***	100	37,039	99.9	566,199	100.0

* Subgrade 3a is estimated as 40% of Grade 3 for Rutland and Lincs.

** Total of Grades 1, 2 and 3a.

*** Excludes 4ha of Urban

13.4.11. The area of BMV agricultural land within Lincolnshire and Rutland is estimated to be about 400,000ha. The total area of BMV land within the Solar PV Area is a small fraction (0.077%) of the BMV land area of Rutland and Lincolnshire. Set in this context the predicted permanent loss of less than 5ha BMV and the removal of the Solar PV Site from agricultural production is considered to be insignificant in a regional context.

13.4.12. The effects on the farm businesses are generally expected to be beneficial in terms of a secure, diversified source of income, and would last for the duration of the Proposed Development.

Decommissioning

13.4.13. Decommissioning would involve the dismantling and removal of the Proposed Development. Areas of access tracks and Solar Stations would be restored using soil retained onsite from the construction phase, which will have been retained on site in managed bunds.

13.4.14. There is the potential to damage soils and soil structure, and in extreme cases to bring about localised reduction of agricultural land quality, during the decommissioning phase. The trafficking of soils when conditions are unsuitable (e.g. soils are saturated or frozen) could damage the structure necessitating remedial activity to restore quality.

13.4.15. These effects would be mitigated by careful management of the physical activities and by timing activities to when the soils are suitable for being worked, as they were at the construction phase. Such measures would be implemented through the DEMP. With careful management the effects are capable of being minimised and potential minor magnitude of impact.

13.4.16. There is limited potential for disruption to farm businesses during the decommissioning.

13.5. How would we mitigate the environmental effects

13.5.1. At the detailed design stage, the permanent sealing of BMV will be minimised as far as reasonably practicable by locating access tracks and solar stations within Grade 3b or 4 land.

13.5.2. Good soil management practices such as avoiding trafficking or handling soils when wet, and restoring soils into trenches in the same order they came out (Defra (2009), BRE (2014), IQ (2021)) will be adhered to during the construction phase of the Proposed Development and would be implemented through a CEMP.

13.5.3. Whilst the potential impact on soils during the operational phase are expected to be minimal, measures will be set out within the OEMP to ensure that any works (maintenance of the PV Arrays and the management of the land underneath the PV Arrays) will be undertaken in a manner that prevents damage to the soil resource, so far as possible.

13.5.4. Potential short-term effects on farm businesses and enterprises as a result of construction & decommissioning, such as closure or severance of field accesses at key times of the farming year, will be mitigated by timing and liaison with landowners, and a CEMP and DEMP will be implemented to ensure effects are minimised.

13.5.5. The draft oCEMP (Appendix 5.1) and draft oDEMP (Appendix 5.3) include measures to be implemented during the construction and decommissioning phase to reduce the potential adverse effects on soils and farm businesses.

13.6. What environmental effects would remain?

13.6.1. This preliminary assessment has identified that there are no adverse effects on agricultural land quality that cannot be mitigated. The preliminary view is that through a combination of careful mitigation, management and good practice measures, which would be implemented through the CEMP (to be secured via a requirement through the DCO), at the construction phase, the agricultural land quality will not be significantly adversely affected. The overall effects to soils and agricultural land quality are not anticipated to be significant.

13.6.2. Similarly, by a combination of good practice and careful management and mitigation, which will be implemented through the DEMP (to be secured via a requirement through the DCO), the agricultural land quality should not be significantly adversely affected at the decommissioning phase, such that the agricultural land classification of the land is not affected and the resource is retained. The overall effect on soils and agricultural land quality is not anticipated to be significant.

Table 13.4: Agricultural Land Use Significance of Effects

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction								
Effect on agricultural land during construction	Adverse	BMV agricultural land	High to Very High	Minor	Moderate or large (significant)	Careful management and soil handling (CEMP)	Detailed design None	Slight (not significant)
Effect on soil quality and structure during construction	Adverse	All agricultural land	Mostly medium sensitivity	Minor	Slight (not significant)	Careful management and soil handling (CEMP)	None	Slight (not significant)
Disruption to farm businesses during construction	Adverse	Farm businesses	Medium	Minor	Slight (not significant)	Construction Management Plan (CEMP)	None	Slight (not significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Operation								
Effect on agricultural land during operation	Adverse	BMV agricultural land	High to Very High	Negligible	Slight (not significant)	Careful management (LEMP)	None	Slight (not significant)
Effect on soil quality and structure during operation	Adverse or beneficial	All agricultural land	Mostly medium sensitivity	Negligible	Slight (not significant)	Careful management (LEMP)	None	Slight (not significant)
Effects to agricultural businesses during operation	Adverse/beneficial	Farm businesses	Medium	Minor	Slight (not significant)	None	None	Slight (not significant)
Decommissioning								

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Effect on agricultural land during decommissioning	Adverse	BMV agricultural land	High or very high	Minor	Potentially moderate or large (significant)	Careful management and soil handling (DEMP)	None	Slight (not significant)
Effect on soil quality and structure during decommissioning	Adverse	All agricultural land	Mostly medium sensitivity	Minor	Slight (not significant)	Careful management and handling (DEMP)	None	Slight (not significant)
Disruption to agricultural businesses during decommissioning	Adverse	Farm businesses	Medium	Minor	Slight (not significant)	Careful management (DEMP)	None	Slight (not significant)

13.7. In-combination Effects

13.7.1. The other topics where there is potential for intra-development effects to arise alongside the identified receptors are as follows:

- Ecology and Biodiversity (Chapter 7); and
- Socio-economics (Chapter 16).

13.8. Conclusion and Next Steps

Land Quality and Soil Resources

13.8.1. Construction works associated with the access tracks, Onsite Primary Substation, Solar Stations in particular, rather than the legs of the Mounting Structure, have the potential to adversely affect soil structure in localised areas, and in localised places the loss of agricultural land. However, for the majority of the Solar PV Site, where Mounting Structures will be installed, the adoption of well-planned and executed construction practices, working when soils are suitable (i.e. when soils are not saturated or frozen) for being trafficked, these potential impacts are capable of being mitigated and avoided.

13.8.2. There should therefore be no overall significant adverse effect on the agricultural land quality of the Solar PV Site and, with carefully planned and well executed decommissioning works, the ALC resource will not be significantly adversely affected by the Proposed Development.

13.8.3. There should be no additional adverse effects on soils or land quality during the operational stage, as any need to traffic agricultural land will generally be limited to normal land and grassland management practices and maintenance.

13.8.4. Further consultation with the landowners will be undertaken in order to gather more information regarding the existing agricultural regime with regards to the amount of fertilizers, pesticides and herbicides along with the typical yields. This information will be included with the ES.

Agricultural Businesses

13.8.5. The potential to use the Solar PV Site and Mitigation and Enhancement Areas for different arable or livestock uses will be reduced as a result of the Proposed Development. However, that is neither a policy nor an environmental impact.

13.8.6. With careful planning and practice any localised effects on farm businesses can be avoided or mitigated.

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Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 14: Glint and Glare

May 2022

14.0 Glint and Glare

14.1. Introduction

14.1.1. This chapter sets out the preliminary assessment carried out to determine the potential effects generated by the Proposed Development during construction and operation in relation to Glint and Glare.

14.1.2. Potential glint and glare effects from the decommissioning phase of the Proposed Development are not considered within this chapter as the decommissioning phase is unlikely to result in glint and glare effects greater than those at operational phase. As such, decommissioning effects are scoped out of the EIA as agreed with the Planning Inspectorate (PINS) in their Scoping Opinion (dated 18th March 2022).

14.1.3. Appendix 14.1 (Solar Photovoltaic Glint and Glare Study) has assessed both the Single Axis Tracking and Fixed South Facing static panel mounting system. There is no worst-case modelling assessment based on one panel mounting system, as both mounting types provide varying impacts depending on the specific geometry of the reflection. The results presented within this chapter therefore detail the worst-case impacts taken from the results across each of the panel mounting systems.

14.2. What might be affected by the Proposed Development?

14.2.1. The Proposed Development has the potential for adverse effects on the following receptors for which specific study areas have been defined:

1. Road users – specifically drivers of motor vehicles;
2. Occupants of surrounding dwellings;
3. Railway operations and infrastructure; and
4. Aviation surrounding Royal Air Force (RAF) Wittering, RAF Cottesmore, Shacklewell Airfield and Castle Bytham Airfield.

14.2.2. The main source of irradiance in the area will be the sun, which is a more intense source of light than solar reflections. Road users, pilots and train drivers are already aware of safety implications when driving in bright sunlight.

14.2.3. The identified receptors will experience the most noticeable source of irradiance at sunset and sunrise.

14.2.4. The following potential impacts were identified at the scoping stage for consideration in this assessment:

1. Direct impacts during construction and operation from glint and glare on:
   a) Ground-based receptors (roads and dwellings);
   b) Aviation activity associated with RAF Wittering, RAF Cottesmore, Shacklewell Airfield and Castle Bytham Airfield; and
   c) Railway operations and infrastructure (train drivers and signals).
2. There are no indirect impacts during construction and operation from glint and glare.

14.3. How have we assessed the effects relating to this topic?

14.3.1. The glint and glare assessment follows the general approach to undertaking environmental impact assessments as explained in Chapter 2 of this PEIR, albeit it has been modified to take account of industry guidelines and best practice. Our approach to the assessment for determining the effects of glint and glare upon road users, local residents, aviation and railway operations is presented within Appendix 14.1.

Legislation, Planning Policy and Guidance

14.3.2. There is no formal legislation setting out a required methodology or criteria/standards for classifying impact. However, this process has been designed in accordance with industry best-practice and Pager Powers' Glint and Glare guidance (2021).

14.3.3. The policies included within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy, which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

14.3.4. The glint and glare assessment methodology has been derived from the information provided to Pager Power 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:

1. Identify the key receptors in the study area surrounding the Proposed Development;

2. Consider direct solar reflections from the Proposed Development towards the identified receptors by undertaking geometric calculations;

3. 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;

4. Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur;

5. Consider both the solar reflection from the Proposed Development and the location of the direct sunlight with respect to the receptor's position;

6. Consider the solar reflection with respect to the published studies and guidance - including intensity calculations where appropriate; and

7. Determine whether a significant detrimental impact is expected in line Pager Power's standard process and recommended methodology, and subsequently, the requirement for mitigation.

14.3.5. Potential effects are classified based on duration, location, relative to an observer's field of view and intensity as appropriate. Receptor sensitivity and magnitude of impact is evaluated differently for different observer types, as provided in the subheadings below.

Study Area

14.3.6. A 1km study area has been defined for residential dwellings and national and regional roads including the A6121 and the B1176. A 1km assessment area is applied for road and dwelling receptors because of the relatively low-lying nature of solar panels. This is because in the majority of cases, the possibility of a solar farm being visible to a resident or road user greatly diminishes with distance, with the area most likely to have views of a solar farm being immediately adjacent to the solar panel area. An assessment area of 1km boundary is therefore considered conservative when assessing the glint and glare. This study area is based on Pager Power's experience from over 800 glint and glare assessments.

14.3.7. Where a solar development exists within 50m-100m of Network Rail infrastructure, a glint and glare assessment is required. The glint and glare assessment then considers all solar panels which are within 500m of the identified railway infrastructure. In this instance, the assessment considers sections of railway between Careby and Tallington. There is no official safeguarding guidance from Network Rail regarding the distance to assess glint and glare effects from solar panels. The wider 500m assessment area has been informed by knowledge of the typical visibility scenarios for PV Modules at any distance beyond the immediate surrounding area, past assessment experience and previous consultation with Network Rail. This assessment area is therefore deemed appropriate.

14.3.8. A 10km study area has been defined for aviation infrastructure and this includes:

1. RAF Wittering – 6.7km south of the Site;
2. RAF Cottesmore – 10km north-west of the proposed area of solar panels;
3. Shacklewell Airfield – 8.3km south-west of the proposed area of solar panels; and
4. Castle Bytham Airfield – 7.7km north of the proposed area of solar panels.

14.3.9. There is no set safeguarding distance within aviation guidance for assessing glint and glare effects. A 10km assessment area is deemed appropriate based on past assessment experience of recent solar developments (i.e. a distance within significant effects are possible) and consultation with aviation stakeholders.

Assumption and Limitations

14.3.10. Assessment assumptions and limitations are presented within the technical glint and glare report, provided at Appendix 14.1. Assumptions and limitations of note include.:

1. The glint and glare model assumes bare earth terrain, with no consideration of existing screening and proposed green infrastructure design between a reflecting solar panel area and receptor;

2. The glint and glare model assumes full sunshine during daylight hours;

3. Receptor identification is based on a review of aerial mapping and street view imagery.

Environmental Receptor – Road Users

14.3.11. Sensitivity and importance: For road user receptors, it is relevant to consider that road types can generally be categorized as:

1. 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;

2. 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;

3. Regional – Typically a 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; and

4. Local – Typically roads and lanes with the lowest traffic densities. Speed limits vary.

14.3.12. Local roads are typically considered as ‘Low’ sensitivity and Regional, National, and Major National roads are typically considered of ‘Medium’ sensitivity. This is because of typical road speeds and traffic densities.

14.3.13. Magnitude of impact: The magnitude of effect upon road user receptors is predominantly dependent on the following factors:

1. Whether a solar reflection is predicted;

2. The visibility of the reflecting solar panel area and the presence of any screening which may fully or significantly reduce visibility;

3. The distance between the receptor and the reflecting solar panel area considering the 1km study area;

4. The type of road – in the context of traffic speeds and likely densities; and

5. 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.

Environmental Receptor – Dwelling Occupants

14.3.14. Sensitivity and importance: Dwellings are typically considered to be of ‘Low’ sensitivity because they are of local importance.

14.3.15. Magnitude of impact: The magnitude of effect upon dwelling receptors is predominantly dependent on the following factors:

1. Whether a solar reflection is predicted;
2. The visibility of the reflecting solar panel area and the presence of any screening which may fully or significantly reduce visibility;
3. The distance between the receptor and the reflecting solar panel area considering the 1km study area; and
4. The duration of the predicted effects, relative to the thresholds of three months per year and 60 minutes per day. The threshold represents the point at which an impact changes from low, to moderate, to high in terms of the duration of glint and glare at different dwellings receptors. This is based on Pager Power's Glint and Glare Guidance (2021).

Environmental Receptor – Rail Operations and Infrastructure

14.3.16. 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.

14.3.17. Magnitude of impact: The magnitude of impact upon train driver receptors is predominantly dependent on the following factors:

1. Whether a solar reflection is predicted;
2. The visibility of the reflecting solar panel area and the presence of any screening which may fully or significantly reduce visibility;
3. A train driver's predicted workload including the presence of any signals;

3. 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.

Environmental Receptor – Aviation

14.3.18. 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.

14.3.19. Magnitude of impact is described under the following subheadings.

Air Traffic Control (ATC) Tower

14.3.20. The magnitude of impact upon the ATC Tower receptor is dependent on the following main factors:

1. Whether a solar reflection is predicted;
2. The type of airfield and its operations;
3. The visibility of the reflecting solar panel area and the presence of any screening which may fully or significantly reduce visibility
4. The glare intensity and duration - a reflection of greater intensities and prolonged time periods have a higher impact upon ATC Tower personnel;
5. Proportion of an observer's field of vision that is taken up by the reflecting area; and
6. 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.

Approach Paths

14.3.21. The magnitude of effect upon aircraft approaching a runway (also referred as approach paths) is dependent on the following main factors:

1. Whether a reflection is predicted;
2. The type of aerodrome and its operations;
3. The visibility of the reflecting solar panel area and the presence of any screening which may fully or significantly reduce visibility;
4. 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;
5. The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not i.e. if the solar reflection and the sun are viewed simultaneously to an observer; and
6. Existing reflecting surfaces – a solar reflection is less noticeable by pilots when there are existing reflective surfaces in the surrounding environment.

14.4. What are the potential environmental effects?

14.4.1. This section describes the potential glint and glare effects during the construction and operation of the Proposed Development as this is considered to be the worst-case scenario. The embedded mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development.

14.4.2. The impacts to road users, dwellings, railways operations and infrastructure and aviation are summarised below and provided in further detail in Appendix 14.1.

Road Users

14.4.3. The magnitude of impact upon a maximum of an approximately 100m section of the A6121 is classified as ‘medium’ due to effects occurring directly in front of a road user. The resulting significance of effect is moderate and significant.

14.4.4. The worst-case magnitude of impact upon the remaining sections of road is ‘low’ due to effects occurring within a road user’s main field of view with mitigating factors, such as the separation distance from the panel area, that will sufficiently reduce the level of impact. The resulting significance of effect is minor and not significant.

Dwellings

14.4.5. The magnitude of impact upon a maximum of two residential dwellings located close to the Proposed Development is classified as ‘medium’ due to effects being predicted to be experienced for more than three months per year but less than 60 minutes per day, and the lack of sufficient mitigating factors such as intervening planting/screening. The resulting significance of effect is moderate and significant.

14.4.6. The worst-case magnitude of impact upon the remaining dwellings is low due to effects occurring for more than three months per year but less than 60 minutes per day with mitigating factors such as visibility being limited to above the ground floor, the separation distance to the PV Arrays area, and/or the position of the sun, that will sufficiently reduce the level of impact. The resulting significance of effect is minor and not significant.

Railway Operations and Infrastructure

14.4.7. The magnitude of impact upon a maximum of approximately 750m of railway line is classified as 'medium' due to effects occurring directly in front of a train driver. The resulting significance of effect is moderate and significant.

14.4.8. The worst-case magnitude of impact upon the remaining sections of railway line is 'low' due effects occurring within a train driver's main field of view with mitigating factors, such as the separation distance from the panel area and the expected low workload of a train driver along this section of railway line, that will sufficiently reduce the level of impact. The resulting significance of effect is minor and not significant.

Aviation

14.4.9. The magnitude of impact upon RAF Wittering is 'no change' due to effects not being predicted towards the ATC Tower or approach paths. The resulting significance of effect is negligible and not significant.

14.4.10. The magnitude of impact upon Shacklewell Airfield, Castle Bytham Airfield and RAF Cottesmore is classified as 'low' due to effects being acceptable in accordance with the associated guidance and industry best practice. The resulting significance of effect is minor and not significant.

14.5. How would the environmental effects be mitigated?

14.5.1. Any predicted impacts towards the ground-based infrastructure (roads and dwellings) can likely be solved with best practice mitigation strategies – the most common being the provision of screening at the Site perimeter, as shown on Figure 6.19, to obstruct views of potentially reflecting panels. The landscape planting will be secured within the outline Landscape and Ecological Management Plan (oLEMP) which will be submitted to support the DCO Application. Where views of reflecting panels are obstructed, no effects can be experienced. Other solutions such as layout modifications can be considered but are rarely required in practice.

14.5.2. Any moderate effect upon aviation operations will have to be mitigated. Mitigation solutions would require changes to the Proposed Development characteristics and layout – this would not affect the red line boundary. Whilst formal guidance within the UK for quantifying aviation 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, 2015) as well as their duration and operational sensitivity. For tracking panels, the viability of technical mitigation solution can be explored which involves alterations to the tracking system. However, these options will affect the operation of the tracking system.

14.5.3. Based on the currently assessed layout, the Proposed Development will not require mitigation with respect to aviation impacts and will remain under review in line with the development of the design.

14.6. What environmental effects would remain?

14.6.1. If the mitigation measures identified above are implemented where significant reflection effects are predicted to be experienced, effects would be reduced to minor and non-significant at worst (see Table 14.1).

Table 14.1: Glint and Glare Significance of Effects

Activity	Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Reflections towards identified receptor at construction	Short-term	Dwellings	Low	Medium	Moderate (Significant)	LEMP	Green Infrastructure Design	Minor (Non-significant)
		Road Users	Medium	Medium	Moderate (Significant)	LEMP	Green Infrastructure Design	Minor (Non-significant)
		ATC Tower	Medium	No change	Negligible	None	None	Negligible (Non-significant)
		Approach Paths: RAF Wittering	Medium	No change	Negligible	None	None	Negligible (Non-significant)
		Approach Paths: Shacklewell Airfield, Castle	Medium	Low	Minor	None	None	Minor (Non-significant)

Activity	Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
		Bytham Airfield and RAF Cottesmore						
		Train Drivers	Medium	Medium	Moderate (Significant)	LEMP	Green Infrastructure Design	Minor (Non-significant)
Reflections towards identified receptor at operation	Long-term	Dwellings	Low	Medium	Moderate (Significant)	LEMP	Green Infrastructure Design	Minor (Non-significant)
Reflections towards identified receptor at operation		Road Users	Medium	Medium	Moderate (Significant)	LEMP	Green Infrastructure Design	Minor (Non-significant)

Activity	Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Reflections towards identified receptor at operation	Long-term	ATC Tower	Medium	No change	Negligible (Non-significant)	None	None	Negligible (Non-significant)
Reflections towards identified receptor at operation		Approach Paths: RAF Wittering	Medium	No change	Negligible	None	None	Negligible (Non-significant)
Reflections towards identified receptor at operation		Approach Paths: Shacklewell Airfield, Castle Bytham Airfield and	Medium	Low	Minor (Non-significant)	None	None	Minor (Non-significant)

Activity	Nature of Effect	Receptor	Sensitivity of Receptor	Magnitude of Change	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
		RAF Cottesmore						
Reflections towards identified receptor at operation		Train Drivers	Medium	Medium	Moderate (Significant)	LEMP	Green Infrastructure Design	Minor (Non-significant)
Reflections towards identified receptor at operation		Railway Signals	Medium	No change	Negligible (Non-significant)	None	None	Negligible (Non-significant)

14.7. In-combination Effects

14.7.1. It is predicted that there will not be any in-combination effects because glint and glare does not interact with any other impacts assessed within the ES.

14.8. Conclusion and Next Steps

14.8.1. The Proposed Development is predicted to have a ‘moderate’ significance of effect in terms of glint and glare at worst in the absence of existing screening and the green infrastructure design, as shown on Figure 6.10. 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 and secured through the oLEMP, which will be submitted to support the DCO Application, to remove or reduce any significant residual effects. The requirement for mitigation will be identified, reviewed and reported in the ES.

References

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Federal Aviation Administration Policy: Review of Solar Energy System Projects on Federally-Obligated Airports, November 2021.

Ministry of Housing, Communities and Local Government (2015). Guidance for Renewable and Low Carbon Energy (specifically regarding the consideration of solar farms, paragraph 013), 18 June 2015.

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Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 15: Climate Change

May 2022

15.0 Climate Change

15.1. Introduction

15.1.1. This chapter of the PEIR evaluates how the Proposed Development is likely to interact with a changing climate and whether any significant effects could arise during construction, operation and decommissioning.

15.2. What might be affected by the Proposed Development?

15.2.1. The following assessment areas are assessed in terms of the Development in accordance with the EIA Regulations:

- The vulnerability of the Proposed Development to climate change (e.g., increased severity and frequency of flooding);
- The impact of the Proposed Development on climate change (i.e., Greenhouse Gas (GHG) emissions); and
- A summary of significant effects on environmental receptors sensitive to climate change (e.g. effects on ecological receptors from the increased severity and frequency of droughts).

15.2.2. The vulnerability of the Proposed Development to climate change considers effects on the Proposed Development as a receptor. In contrast the other two assessments consider effects on environmental receptors as a result of the construction, operation and decommissioning of the Proposed Development.

15.3. How have we assessed the effects relating to this topic?

15.3.1. Climate Change Impact Assessment (CCIA) is a relatively new form of environmental assessment required by amended European Commission (EC) Directive 2014/52/EU, as transposed into UK law by The Infrastructure Planning (Environmental Impact Assessment) Regulations (2017) (the “EIA Regulations”).

15.3.2. This assessment comprises three parts within which different receptors are applicable. In the first part the Proposed Development is the receptor. In the second, the global climate is the receptor. Neither of these have relevant study areas. In the third, the receptors will be assessed within the individual environmental topic chapters of the Environmental Statement.

15.3.3. The assessment of effects of the GHG emissions associated with the Proposed Development on climate change is estimated through the application of peer reviewed emissions data (UK Climate Projections (UKCP)) related to the life cycle of the infrastructure associated with the Proposed Development which incorporates the construction, operational and decommissioning phases as a collective timeframe, rather than as individual phases.

Vulnerability of the Proposed Development to Climate Change

15.3.4. This section of the CCIA identifies aspects of the Proposed Development which despite embedded mitigation measures applied, are potentially vulnerable to the effects of climate change. Where identified, these vulnerabilities can then be mitigated through the application of other mitigation measures.

15.3.5. Taking into account the exposed rural and riparian nature of the Site, the following climate related parameters are considered to have the potential to impact upon the Proposed Development and the surrounding environment:

- Wind speed;
- Increased rainfall/flooding;
- Cloud cover; and
- Temperature variation.

15.3.6. Variation in other climatic factors such as storm surges and sea level rise would not have the potential to substantially affect the Proposed Development. The potential increase in storm surges and sea level rise is unlikely to impact the Proposed Development due to the elevation of the Site relative to sea levels. A standalone Flood Risk Assessment has been produced as part of the Environmental Statement which outlines that the Proposed Development is at negligible risk of flooding from tidal sources.

Influence of the Proposed Development on Climate Change

15.3.7. This section of the CCIA seeks to quantify the effect of the Proposed Development on climate change in order to undertake an assessment of the significance of the effect. The predicted GHG emissions and emissions saving of the Proposed Development will be calculated and used to undertake this assessment as part of the Environmental Statement.

15.3.8. The effect of the Proposed Development on climate change will be driven principally through the net change in emissions of GHG. The current and future baseline emissions of carbon dioxide (CO_2) from the generation of electricity by the Proposed Development has been evaluated with reference to the latest version (2021) of the Digest of UK Energy Statistics (DUKES) published annually by the Department for Business, Energy and Industrial Strategy (BEIS).

Effects on Environmental Receptors Sensitive to Climate Change

15.3.9. A number of climatic parameters are relevant to environmental receptors that have the potential to be impacted by the Proposed Development, including changes in temperature and precipitation. The sensitivity of these receptors will be taken into account in the associated technical assessments within the ES and are summarised in the following chapters:

- Landscape character;
- Protected species;
- Habitats;
- Ornithology; and
- Population.

Legislation, Policy and Guidance

15.3.10. The assessment methodology is informed by the following legislation.

- The Climate Change Act 2008. The Climate Change Act 2008 outlines the role of and need for UK government action in response to climate change. A National Adaption Programme (2013) addressed the main risks and opportunities detailed within the UK Climate Change Risk Assessment for England (2017).
- Carbon Budget Order (2009). The Carbon Budget Order set the first three carbon budgets spanning from 2008 to 2022.
- Carbon Budget Order (2016). The Carbon Budget Order set the carbon budgets for the fifth budgetary period covering 2028 to 2032.
- Carbon Budget Order (2021). The Carbon Budget Order set the carbon budgets for the sixth budgetary period covering 2033 to 2037.

15.3.11. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG), and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

15.3.12. The PEIR assessment is informed by the following guidance.

- Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Climate Change Resilience and Adaption (2020). This guidance is an update to the 2017 edition which provides framework for the assessment of climate change within EIA.
- IEMA Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022). This guidance sets out the areas for consideration of GHG within EIA and identifies the key challenges within assessment.
- Planning Practice Guidance, Climate Change (updated 2019). This guidance outlines and advises on the suitable mitigation and adaptation measures to address the impacts of climate change within the planning process.
- Planning Practice Guidance, Renewable and Low Carbon Energy (2015). This guidance advises on suitable policies for renewable and low carbon energy.

Assumptions and Limitations

15.3.13. Climate change projections are based on global models for a range of GHG emissions scenarios and generally consider regional responses to climate change rather than local. For this assessment regional (*e.g.*

central England) and national (e.g. UK wide) data has been used to inform the assessments of climatic considerations.

15.3.14. The UK 2018 Climate Projections (UKCP18) website provides future climate projections for land and marine regions as well as observed climate data for the UK. Future predictions for regional and national climatic changes are assessed for both a near-term period, 2040 – 2069, and longer-term period, 2070 – 2099.

15.3.15. The emissions of GHG to the atmosphere associated with the construction, operation and decommissioning of the Proposed Development has been estimated based on published literature. Values for a specific development will vary compared to this, and actual values for the Proposed Development cannot be known until the Proposed Development lifespan is complete. The data used are the most appropriate; however, they are estimates only.

Significance Criteria

15.3.16. Significance combines the sensitivity of climate change receptors with the magnitude of the effect. Whilst receptors may be considered "high-value", a non-material magnitude of effect would result in any effect being considered not significant.

15.4. What are the potential environmental effects?

Vulnerability of the Proposed Development to Climate Change

15.4.1. Solar PV cells are designed to capture the sun's energy with in-built resilience to extreme climatic conditions and are purposefully located in open locations. However, solar energy developments could potentially be sensitive to significant changes in climatic variables, including atmospheric circulation, land cover changes, rainfall/flooding and temperature increases, given the riparian location of the Proposed Development. The Proposed Development could also be sensitive to the frequency of extreme wind events (e.g., storms) which could damage solar panels.

15.4.2. Studies are to be undertaken prior to the submission of the DCO and will be set out in the ES to evaluate the maximum force that the wind could have on the solar panels and will be used to inform the design of the mounting structures (such as the depth that the pole supports are buried to). These studies are taking account of the changes in extreme wind speeds expected over the next decades based off the UKCP18 Land Projections: Science Report (Met Office, 2018) to ensure that the Proposed Development is not vulnerable to increases in maximum wind speed associated with climate change. The UKCP18 Science Report identifies the projected wind speeds within the present day to 2100 period under a range of emission scenarios dependent upon the scale of the data (global, regional or local).

15.4.3. As reported in Chapter 12 (Water Resources and Ground Conditions) of the PEIR, modelling of various flooding scenarios taking into account increases in rainfall intensities associated with climate has been carried out, in consultation with the Environment Agency. As a result, the Proposed Development is located primarily within FZ 1, with all sensitive elements (substations, inverters etc.) of the Proposed Development located outside areas identified to be at risk of flooding during a 1 in 100-year rainfall event, accounting for the increases in rainfall associated with climate change. This sequential design methodology ensures that the Proposed Development is not vulnerable to increases in rainfall intensities leading to extreme flood events.

15.4.4. The value of the receptor (the Proposed Development) is high; however, following the design measures set out above, the susceptibility of the Proposed Development to climatic changes in wind speed and rainfall/flooding is very low, and the effect overall is negligible, which is non-significant.

15.4.5. Increases in temperature during summer and winter seasons may lead to an increase in the temperature of sensitive electrical infrastructure requiring greater cooling capabilities.

15.4.6. The design of the Proposed Development will respond to the magnitude of the effects, for example adapting the depth of poles required and increased cooling capabilities, which will be set out within the Environmental Statement. Following this the sensitivity of the Proposed Development as a receptor would be negligible. Hence, there is no significant effect predicted as a result of increased wind speeds, rainfall/flooding and cloud amount during the operational phase of the Development, nor from other climatic changes.

Influences of the Proposed Development on Climate Change

15.4.7. The influences of the Development on climate change are estimated through the emission or reduction in emissions of CO_2.

15.4.8. When operational, the Proposed Development will generate electricity from a renewable source and export this to the National Grid. The Proposed Development is anticipated to have an installed capacity of 350 MWp, a capacity factor estimated at 10[1]% and would be available to operate for 8,760 hours per year[2]. This means that the Proposed Development is anticipated to generate approximately 350,000 MWh of renewable electricity per year.

[1] Understood by the author to be a conservative approximation of typical solar farm capacity factors in the UK.
[2] Assumed by the author that the Proposed Development will be operational on a ‘24/7’ basis.

15.4.9. During the construction phase, the Proposed Development will require sourcing materials, manufacturing components, transporting to the Site and installation.

15.4.10. During the operational phase, the Proposed Development will not emit substantial gases to the atmosphere, and hence not adversely contribute to climate change.

15.4.11. Decommissioning of the Proposed Development will involve removing components, the reinstatement of land and transporting components away from the Site.

15.4.12. Each of these phases requires energy which involves CO_2 emissions through the production of energy consumed. The IPCC (2014) estimated emissions of CO_2 for a range of electricity generation types. For utility scale solar photovoltaic cells, it estimated an emission of 48 $kgCO_2eq/MWh$ (based on the median value from a range between 8 and 180 $kgCO_2eq/MWh$). In 2014, solar farms were expected to operate for 25 years, and the emissions data would have been based on this lifetime. This leads to a total CO_2 cost of the Proposed Development of approximately 672,000 tonnes (te) of CO_2 over an operational lifespan of 40 years.

15.4.13. The generation of electricity from the Proposed Development will displace the generation of electricity from other conventional power sources. The DUKES indicate across the mix of sources of electricity that contribute power to the grid, the average emission of CO_2 in 2020 was estimated as 182 kg/MWh. If this emission of CO_2 was avoided as a result of the Proposed Development, it would equate to a reduction of approximately 64,000 $teCO_2/y$ entering the atmosphere over the operational lifetime of the Proposed Development and adversely contributing to climate change compared to the baseline scenario.

15.4.14. The CO_2 emissions of the Proposed Development would therefore be displaced within approximately 10.5 years, and all savings beyond that would be a net benefit of the Proposed Development to reducing climate change, relative to the baseline. Over 40 years, for example, the saving is estimated at approximately 1.9 million tonnes of CO_2.

15.4.15. This is considered to be a material, but non-fundamental, beneficial change to the UK's emissions of climate-changing GHG and is therefore a moderate, positive environmental effect that is significant.

Effects of Future Climate Change Scenario on Environmental Receptors Sensitive to Climate Change

15.4.16. The potential for environmental receptors to be impacted by the Proposed Development under an altered-climate scenario will be assessed in other environmental topic chapters of the ES, where appropriate. The effects of climate change, where these are non-zero, are summarised in Table 15.1.

Table 15.1: Potential Effects of Climate Change on Environmental Receptors

Chapter	Receptor	Climate Change Effect	Effect on Receptor
Chapter 6: Landscape and Visual Impact	Landscape character	Rainfall/flooding	Rise in precipitation levels results in no change to landscape baseline during the operational phase of the Proposed Development.
		Increase in temperature	A rise in temperature could affect growth rates of vegetation.
Chapter 7: Ecology	Protected species, habitats	Increase in temperature	While a rise in temperature could affect the composition and growth rates of plant

Chapter	Receptor	Climate Change Effect	Effect on Receptor
(Including Ornithology)			communities and invertebrates, and hence protected species and habitats, the uncertainties are high and it is not clear that the effect of increased temperature on those receptors would alter the conclusions of the preliminary ecology assessment.
	Ornithology Population	Increase in temperature	While a rise in temperature could affect migration paths, the Site has not been identified as suitable for supporting wintering birds.
Chapter 12: Water Resources and Ground Conditions	Population	Increase in precipitation and flooding	Increases in fluvial flooding associated with precipitation increase caused by climate change has been assessed within the Flood Risk Assessment (Appendix 12.2). Surface water runoff will not be significantly increased due to the limited hardstanding areas and a drainage strategy will be implemented to intercept and attenuate any runoff form hardstanding areas. There is no effect on populations; the only potentially affected feature would be the Proposed Development and design

Chapter	Receptor	Climate Change Effect	Effect on Receptor
			measures have been implemented to minimise any adverse effects.
	Land Use	Increase in precipitation and flooding	Increases in the probability of flooding and rainfall intensity associated with climate change could impact agricultural land use. The Proposed Development is located out-with of modelled fluvial flood zones and is designed to prevent increases in surface water runoff, preventing significant deviation from the baseline and minimise adverse effects.

15.4.17. Given the relatively limited magnitude of change in climate parameters predicted over the operational period of the Proposed Development, the baseline for environmental receptors is anticipated to change either imperceptibly during this period and the effect of the Proposed Development on that altered baseline is negligible.

15.4.18. No additional significant effects will occur as a result of climate change during the operational phase of the Proposed Development.

15.5. How would we mitigate the environmental effects?

15.5.1. This CCIA identified that all adverse effects are of such limited nature that they are not significant and therefore no mitigation is required.

15.6. What environmental effects would remain?

15.6.1. There will be no mitigation required due to the lack of significant negative effects and as such there will be no change to the effects presented within this chapter.

15.7. In-combination Effects

15.7.1. The Proposed Development, in conjunction with other renewable energy developments, will contribute to the UK's aims to reduce carbon emissions and achieve its ambitious GHG emissions reduction targets.

15.7.2. Table 5.6 of DUKES 2021 shows renewable electricity generation (sourced from solar, wind, wave, tidal, natural flow hydro and thermal sources) represented 43.1% of total electricity generation in 2020.

15.7.3. In 2021, 13.6 % of total energy consumption came from renewable sources as detailed within Chapter 6 of DUKES 2021. The cumulative effect of the Proposed Development with other UK renewables generation is considered to be a fundamental change in the climate effects of UK energy supply, which is a major, positive, environmental effect that is significant under the EIA Regulations and will contribute to the UK's legally binding emission reduction targets.

15.8. Conclusion and Next Steps

15.8.1. As a result of design measures, the predicted future climatic baseline conditions are highly unlikely to affect the construction, operation and decommissioning of the Proposed Development. The Proposed Development will have a moderate (and significant) positive effect on carbon emission savings, and a major (and significant) positive effect when considered cumulatively with UK-wide renewable energy deployment. No significant effects additional to those already identified will occur as a result of climate change during the construction, operation or decommissioning phases of the Proposed Development.

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Mallard Pass
Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 16: Socio-economics

May 2022

16.0 Socio-economics

16.1. Introduction

16.1.1. The assessment considers the effects on the population anticipated as a result of the Proposed Development in terms of job creation and potential impact on the local tourism economy during the construction, operation and decommissioning phases. It identifies the socio-economic baseline of the study area, specifically the economy and labour force, and potential effects that could occur, both direct and indirect, within the study area and wider economy.

16.2. What might be affected by the Proposed Development?

16.2.1. The following sections profile the socio-economic conditions of the study area (Rutland County Council and South Kesteven District Council local authority areas). This socio-economic profiling provides the baseline against which any effects resulting from the Proposed Development will be measured.

Population

16.2.2. In 2020 there were an estimated 183,701 residents in Rutland (40,476) and South Kesteven (143,225) (Office for National Statistics (ONS, 2020a)). The total population of the study area increased by 7.5% between 2010 and 2020, slightly more than the England average of 7.4%.

16.2.3. The population profile of the area is older than the England average, with a larger percentage of people of retirement age and a lower percentage of 0 to 15 year olds compared to the England average.

Table 16.1: Rutland and South Kesteven Population Age Profile

Age	Study Area (Rutland and South Kesteven)	England
Ages 0 to 15	17.9%	19.2%
Aged 16 to 24	8.1%	10.5%
Aged 25 to 49	28.3%	32.6%
Aged 50 to 64	21.8%	19.2%
Ages 65+	23.9%	18.5%

Population Estimates (ONS, 2020a)

Skills

16.2.4. In 2020 48.5% of Rutland working age residents and 35.6% of South Kesteven working age residents had achieved a degree level qualification or higher (NVQ4+) (ONS, 2020b). These compare to an England average of 42.8%.

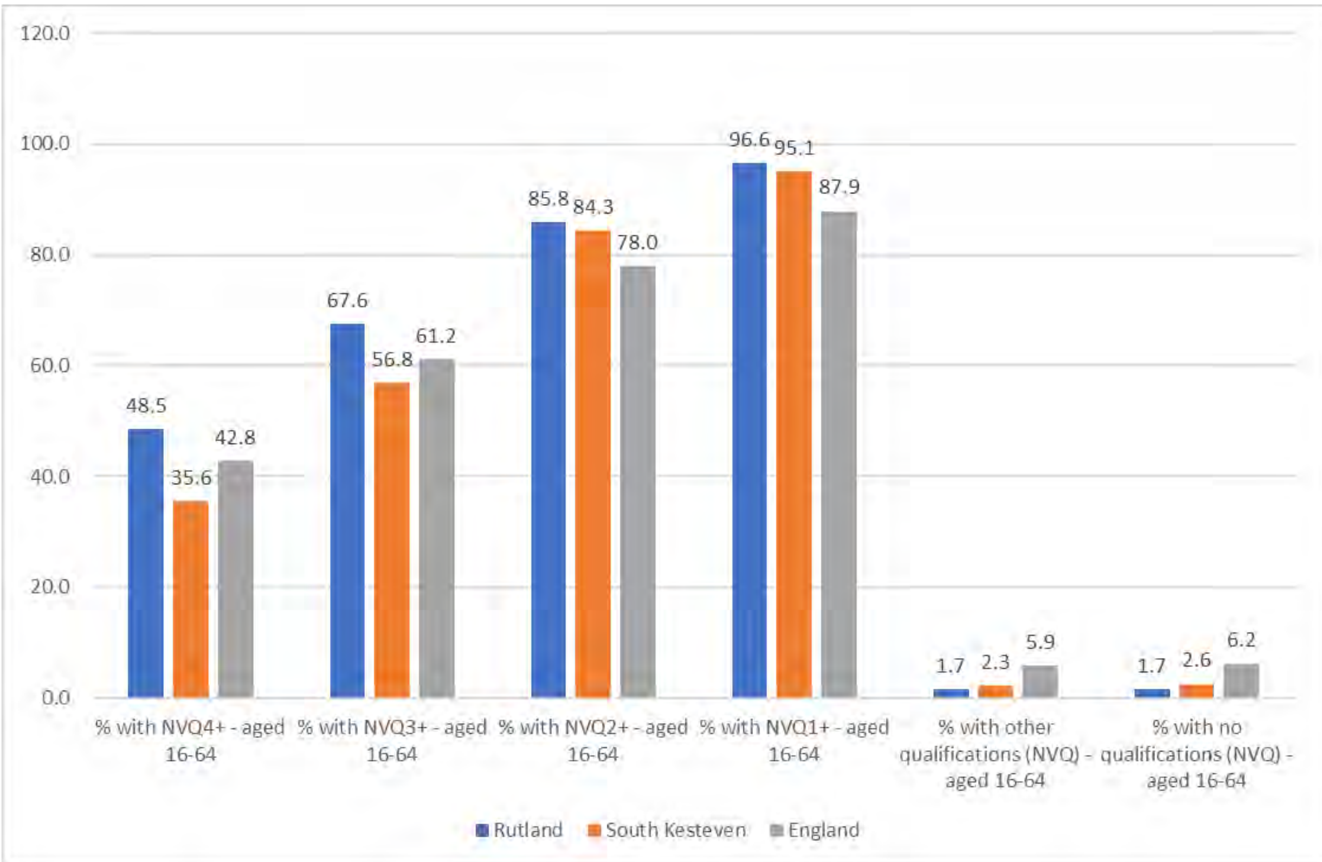

Plate 16.1: Skill Levels of Resident Working Age (16-64) Residents (ONS (2020b) Annual Population Survey)

16.2.5. In contrast, Plate 16.1 shows that attainment rates at both NVQ 2+ and NVQ 1+ were higher across the study area than across England as a whole.

16.2.6. A significantly lower percentage of Rutland (1.7%) and South Kesteven (2.6%) working age residents had not achieved any qualifications compared to England as a whole (6.2%).

Employment

16.2.7. Between October 2020 and September 2021, the economic activity rates of Rutland and South Kesteven working age residents were 76.1% and

77.0% respectively (ONS, 2020b). These were below the England average economic activity rate of 78.8%.

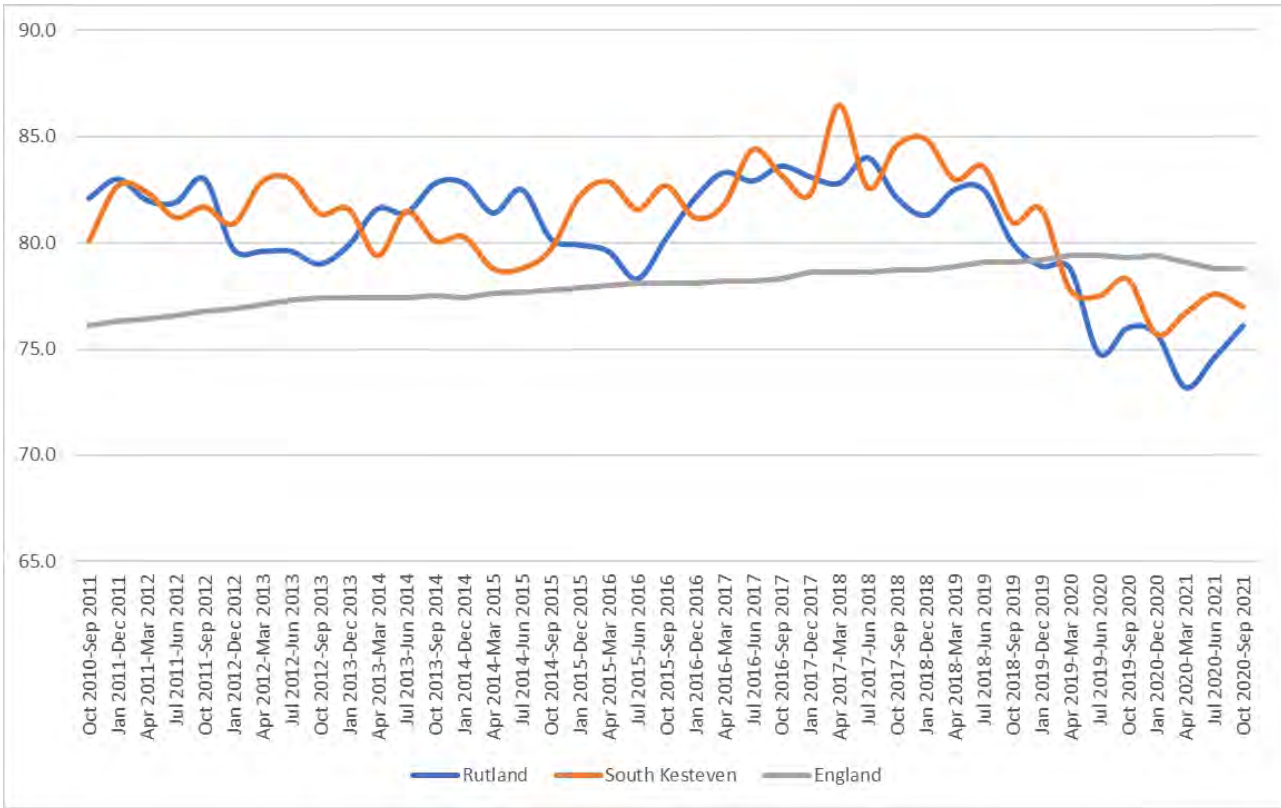

Plate 16.2: Economic Activity Rate 16 - 64 Year Olds (Office for National Statistics (ONS) (2021) Annual Population Survey)

16.2.8. However, between October 2018 and September 2019, prior to the Covid-19 pandemic, the economic activity rates for Rutland (80.0%) and South Kesteven (81.0%) were higher than the England average (79.1%).

16.2.9. Analysis of the Annual Population Survey highlights that the unemployment rates in Rutland (4.8%) and South Kesteven (2.1%) were below the England average of 5.0%.

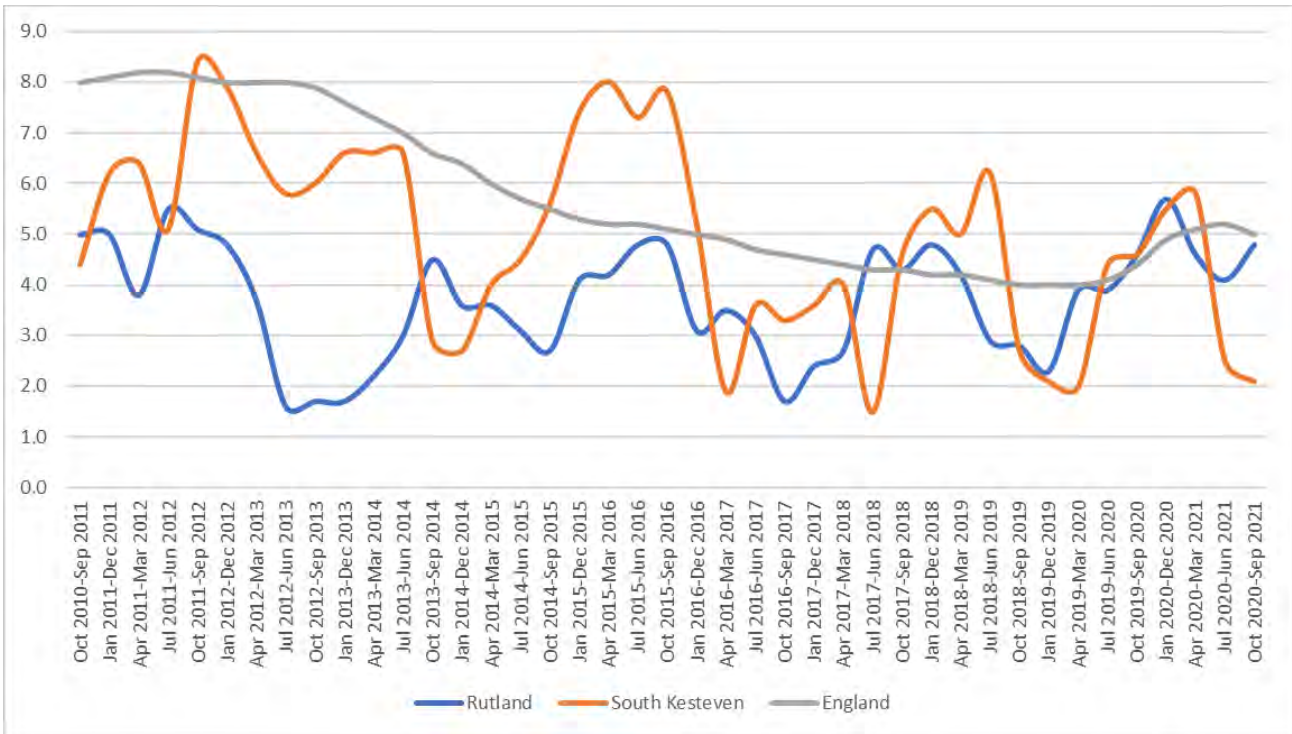

Plate 16.3: Unemployment Rate 16 - 64 Year Olds (ONS, 2021a)

Local Economy

16.2.10. In 2020 an estimated 73,000 jobs were recorded in the study area, split between 16,000 in Rutland and 57,000 in South Kesteven.

16.2.11. Approximately 36.2% of total employees in the study area were recorded as working on a part time basis. This was higher than the 31.8% of part time workers recorded across England as a whole.

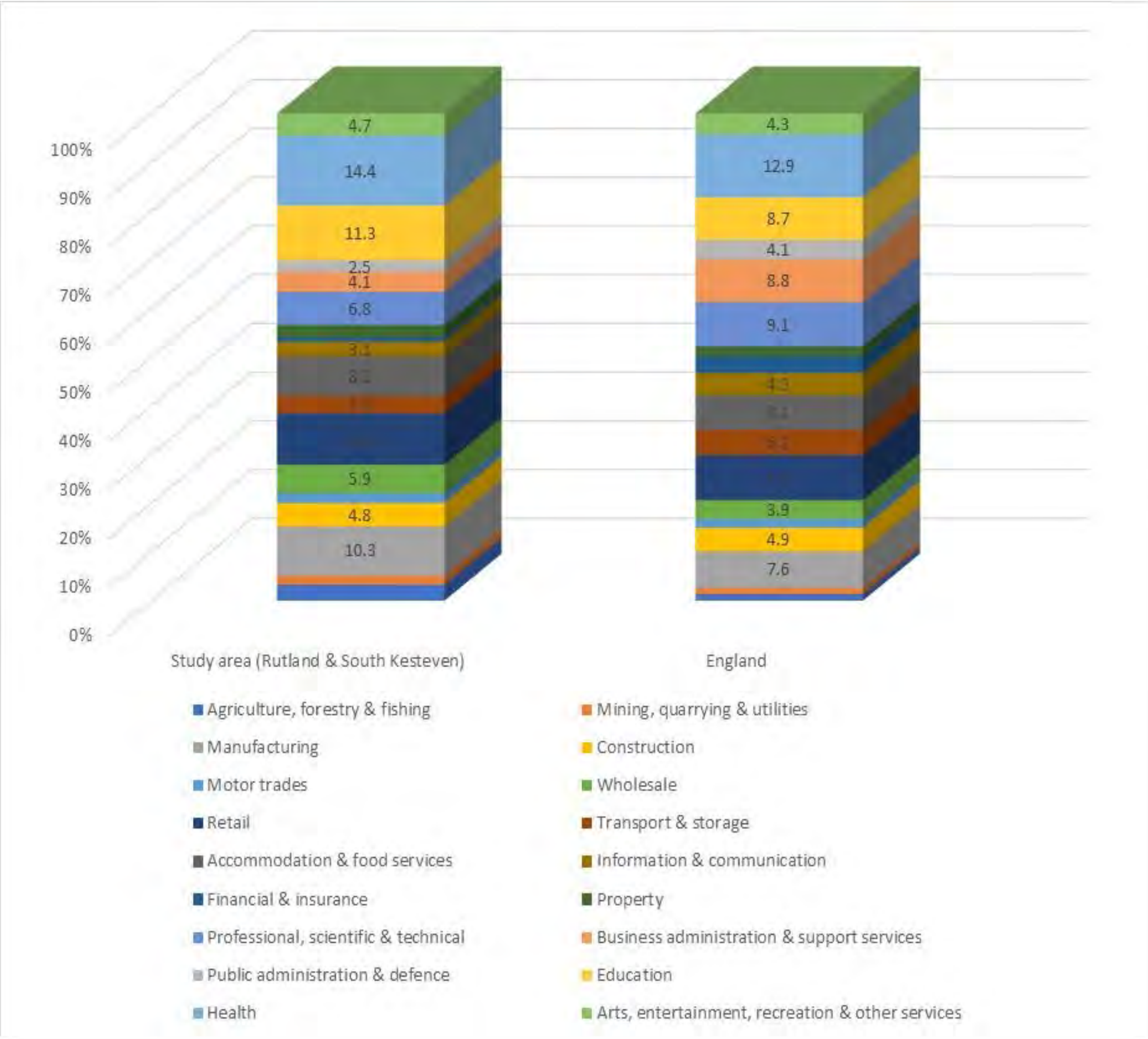

Plate 16.4: Employment by Broad Sector (ONS, 2020c)

16.2.12. Plate 16.4 presents a detailed breakdown of employment by broad industrial group in the study area, and for England as a whole. The study area has greater representation of health (14.4%), education (11.3%), manufacturing (10.3%), retail (10.6%) and accommodation and food services (8.2%) employment than nationally. However, the study area is less represented in knowledge-based economy sectors like professional, scientific and technical (6.8%), business administration and support services (4.1%), information and communications (3.1%) and finance and insurance (1.0%). There are an estimated 3,500 construction workers in the study area, representing 4.8% of total local employment.

Businesses

16.2.13. In 2021 there were 8,190 businesses in the study area. Of these, 90.2% were classified as micro-businesses employing between 0 and 9 people. At the other end of the scale, only 0.2% of businesses in the study area were classified as large (employing more than 250 people).

Table 16.2: Business Count

	Study Area (Rutland and South Kesteven)		**England**	
	Total	**%**	**Total**	**%**
Micro (0 to 9)	7,385	90.2	2,161,050	89.8
Small (10 to 49)	655	8.0	199,325	8.3
Medium-sized (50 to 249)	130	1.6	36,285	1.5
Large (250+)	15	0.2	9,305	0.4
Total	**8,190**	**100**	**2,405,965**	**100**

UK Business Counts (ONS, 2021b)

Earnings

16.2.14. Residents of Rutland received a median gross wage for full time work of £710 per week in 2020, which is greater than that recorded across South Kesteven (£583) and England (£613) (ONS, 2020d).

16.2.15. However, full time workers in Rutland (£598) and South Kesteven (£564) received less per week than nationally (£613). This is largely reflective of the employment base in Rutland and South Kesteven, which is less focussed on higher wage sectors than nationally.

Plate 16.5: Full Time Resident and Worker Earnings per Week (ONS (2020d) Annual Survey of Hours and Earnings)

Gross Value Added

16.2.16. The combined Gross Value Added (GVA) output of Rutland and South Kesteven was £3,440 million in 2019 (ONS, 2019a). This output worked out at an average of £45,867 per worker across the two local authority areas, significantly less than the £62,694 per worker across England as a whole (ONS, 2019b).

16.2.17. The combined study area GVA output for construction was £234 million in 2019. This equated to £75,484 GVA per construction worker.

Tourism

16.2.18. The tourism offer of the study area has been ascertained through interviews with RCC and Invest South Kesteven Tourism Officers and internet-based research. The value of tourism to the local economy has been determined through analysis of publicly available economic modelling reports commissioned by RCC and Invest South Kesteven.

16.2.19. The two local authority areas (RCC and SKDC) appeal to visitors as being quality rural destinations that are attractive to those seeking to participate in countryside activities and enjoy a strong local food offer.

16.2.20. Rutland received an estimated 1.89 million tourism visits in 2018 (Discover Rutland, 2018). These visits, and tourism business spend, generated approximately £135.6 million of expenditure in the Rutland economy, supporting an estimated 1,754 Full Time Equivalent (FTEs). The main draw for visitors is Rutland Water (located approximately 4.8km from the Site), the largest man-made reservoir in Europe, as well as the market towns of Oakham (located approximately 14.5km from the Site) and Uppingham (located approximately 20km from the Site), and a range of gardens, including Barnsdale Gardens (within 10km from the Site).

16.2.21. In the same year, South Kesteven received an estimated 3.38 million tourism visits (InvestSK, 2018). These visits, and tourism business spend, generated an estimated £188.7 million in the South Kesteven economy, supporting approximately 2,700 FTEs. The main attractions in South Kesteven are Burghley House (located approximately 2.5km from the Solar PV Site), Belton House (27km), Belvoir Castle (28km), Grimsthorpe Castle (9km), Easton Walled Gardens (16km), Bourne Wood (6.5km) and Grantham Canal (23km), as well as the settlements of Grantham (23km), Stamford (1.5km), Bourne (6.5km), Market Deeping (7km) and the Deepings.

16.2.22. The Tourism Officers highlighted that the closest tourism receptors to the Solar PV Site are the MacMillan Way (which runs adjacent to the Solar PV Site), Stamford, Burghley House, Tallington Lakes Leisure Park (located approximately 3.3km from the Solar PV Site), Bowthorpe Farm Park (2.3km) and Stantons Pit Nature Reserve (3km).

16.2.23. Perceived potential effects on tourism businesses would occur where there is intervisibility of the Proposed Development and the tourism receptor. On this basis, and in accordance with the study area extents followed in the Landscape and Visual chapter (Chapter 6) of the PEIR, a desktop search of accommodation providers within 2km of the Solar PV Site was undertaken in April 2022. The following accommodation providers were identified along with the approximate distance to the Solar PV Site:

- Clematis Cottages (PE9 4EE – 220m from the Solar PV Site);
- Piper House and Lodge (PE9 4EE - 650m from the Solar PV Site);
- Elderflower Cottage (PE9 4JF – 550m from the Solar PV Site);
- Stamford Holiday Cottages (PE9 4SA – 840m from the Solar PV Site);
- St.John’s Holiday Cottage (PE9 4HR – 1km from the Solar PV Site);
- The Little Barn (PE9 4NB – 850m from the Solar PV Site);
- 30 Casewick Lane (PE9 4SX – 1.7km from the Solar PV Site);
- The Barn (PE9 4SN– 2km from the Solar PV Site); and
- Stamford Farmhouse Holiday Let (PE9 4QN – 1.3km from the Solar PV Site).

16.3. How have we assessed the effects relating to this topic?

16.3.1. There is no specific guidance available, or relevant legislation, which establishes a methodology for assessing the socio-economic effects of a Solar Farm. Therefore, the approach to the socio-economic assessment is based on professional experience and best practice and is presented within Appendix 16.1. It is informed by the planning policy requirements set out within the Overarching National Policy Statement (NPS) for Energy (EN-1), National Panning Policy Framework (NPPF) and local planning policy. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide.

16.3.2. Details of the planning policy context are provided in Chapter 1 of this PEIR. With specific regard to socio-economics, NPS EN-1 (Department of Energy and Climate Change (DECC), 2011) sets, out in paragraph 5.12.3, that the assessment should consider all relevant impacts. These 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.

16.3.3. Paragraph 5.12.4 goes on to state that "*applicants should describe the existing socio-economic conditions in the areas surrounding the proposed development and should refer to how the development's socio-economic impacts correlate with local planning policies*".

16.3.4. This approach is broadly aligned with the issues identified in paragraph 5.13.3 of the Draft Overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Business, Energy and Industrial Strategy, 2021). The additional points for consideration in socio-economic assessments that are included in the Draft NPS EN-1 are:

- The contribution to the development of low carbon industries at the local and regional level as well as nationally; and
- Any indirect beneficial impacts for the region hosting the infrastructure, in particular in relation to use of local support services and supply chains.

16.3.5. At a local level, Rutland Core Strategy DPD (RCC, 2011) Policy CS20 'Energy efficiency and low carbon energy generation' sets out that "*low carbon energy generating developments will be supported where environmental, economic and social impacts can be addressed satisfactorily*". Similarly, South Kesteven Local Plan Renewable Energy Appendix 'Wind Energy Criterion 24' (SKDC, 2020) requires developments of large-scale wind developments to accurately quantify the potential employment which will be created and identify and minimise any potential direct and indirect impact on tourism and recreation. It should be noted that this requirement is not specified as required under the large-scale solar energy developments criterion.

16.3.6. The Greater Lincolnshire Local Enterprise Partnership (LEP) Local Industrial Strategy (2021) identifies Energy and the Visitor Economy as priority sectors for the area. For Energy, the vision is that 'Greater Lincolnshire will pioneer industrial decarbonisation, creating a template for other areas'. It goes on to highlight that "*we will be a test bed for technologies in clean energy generation, storage and distribution*" For the Visitor Economy, the vision is "*to develop the tourism sector, levelling up and supporting some of the more deprived parts of the region by providing higher quality and more reliable employment for workers in the sector*".

Study Area

16.3.7. The assessment of construction, operation and decommissioning phase employment creation focuses on the effects in the local authority areas of Rutland and South Kesteven. This reflects the extent of the Proposed Development, which crosses the boundary of the two local authorities and, based on professional experience, aligns with the areas that would experience the greatest effects.

16.3.8. The assessment of the construction, operation and decommissioning phases on the tourism economy is also focussed on the Rutland and South Kesteven local authority areas. However, as perceived potential effects on tourism businesses would occur where there is intervisibility of the Proposed Development and the tourism receptor, specific reference is made to tourism receptors within a 2km radius of the Solar PV Site. This aligns with the study area extents that have been selected for the Landscape and Visual chapter (Chapter 6) of the PEIR.

Assumption and Limitations

16.3.9. The assessment of the significance of effects has been carried out against a benchmark of current socio-economic baseline conditions prevailing around the Proposed Development. As with any dataset, these conditions may be subject to change over time, which may influence the findings of the assessment. Most notably, the COVID-19 pandemic will have had an influence on the local economy, particularly in terms of visitor numbers to the area. To address this, data trends have been analysed and pre-pandemic data has been referred to where it is considered more representative of long-term trends that could continue in future years.

16.4. What are the potential environmental effects?

16.4.1. This section describes the potential socio-economic effects during the construction, operation and decommissioning of the Proposed Development. The embedded mitigation measures as described within Chapter 5 of this PEIR, have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development.

Construction Phase

Employment

16.4.2. Economic benefits will arise from the provision of temporary jobs over the anticipated 24-month construction phase of the Proposed Development.

16.4.3. The Applicant estimates that an average of 150 full time equivalent (FTE) gross direct temporary jobs will be employed onsite over the 24-month construction phase.

Leakage and Displacement

16.4.4. Taking account of professional assumptions over levels of leakage1 (50%) and displacement2 (25%), it can be estimated that 56 of the 150

[1] Leakage effects are the benefits to those living outside the study area
[2] Displacement measures the extent to which benefits of a development are offset by reductions in output or employment elsewhere

FTE jobs could be taken by residents of the study area. These 56 jobs would be net additional benefits to the study area over the 24-month duration of the construction phase.

16.4.5. An Outline Skills, Supply Chain and Employment Plan will be prepared and submitted with the DCO Application with the purpose of upskilling local residents so that they are ready to access the job opportunities created by the Proposed Development as and when they arise, whilst also enabling local suppliers to access contract opportunities.

Multiplier Effect

16.4.6. Research undertaken by the Centre of Economics and Business Research on the economic impact of large-scale solar developments concluded that every one direct FTE generates a 2.33 multiplier effect in the wider economy (Centre for Economics and Business Research, 2014). Based on this multiplier it can be estimated that the construction phase will support 75 FTE net additional direct, indirect and induced jobs in the wider economy over 24-months.

16.4.7. Set against the baseline indicator for employment, the effect across the study area is therefore assessed as minor beneficial, and non-significant.

Gross Value Added

16.4.8. Based on the average GVA per construction worker average for the study area of £75,484, it can be estimated that the GVA generation of the construction workers will be £11.3 million, of which £4.2 million will be added to the study area.

16.4.9. Set against the baseline indicator for GVA, the effect across the study area is therefore assessed as minor beneficial, and non-significant.

Tourism

16.4.10. The construction phase is likely to have a minimal, localised effect on the tourism economy.

16.4.11. A relatively small number of construction workers will likely take up bed spaces offered by local accommodation providers in the study area. A high-level desked based assessment of accommodation providers (April 2022) has revealed that there is a relatively good supply of bed spaces in the rural areas and towns near the Site to accommodate the workers, whilst not negatively impacting the requirements of visitors to the area. The spend of construction workers will be of particular benefit to accommodation providers during the winter months of the year when, based on experience elsewhere where local authorities have collected data, occupancy levels generally fall.

16.4.12. The Amenity and Recreation Assessment (Appendix 6.5) concludes that, during the construction phase, visibility, noise and vibration, construction traffic and air quality effects would have a moderate effect on users of the MacMillan Way and Byway E123, and a slight or minimal effect on the other PRoW within or in the vicinity of the Site.

16.4.13. Taking this into account, overall, it is considered that the construction phase will have a negligible adverse effect on the local tourism economy, which is not significant.

Operation Phase

Employment

16.4.14. This section considers the employment effects of the operational phase of the Proposed Development.

16.4.15. Economic benefits will arise from the provision of monitoring and maintenance jobs supported over the operational period.

16.4.16. Operational employment effects are expressed as gross jobs and net additional jobs, taking into account deadweight, leakage, displacement and multipliers.

Deadweight

16.4.17. Deadweight refers to the outcomes which would have occurred without intervention.

16.4.18. Interviews are being undertaken with the owners of the farm businesses with land within the Site. These will help to determine the impact of constructing a Solar Farm on business viability and employment levels. The results of which will be reported in the ES.

16.4.19. Prior to completion of interviews, based on experience of assessing the impacts of recent Solar Farms elsewhere, it is predicted that the transition to livestock management and mowing across the Solar PV Site will have a labour requirement. Some temporary contracts relating to the harvesting of arable crops will be lost; however, the employment impacts associated with this are anticipated to be minimal as contractors will have been given notice to find alternative commissions. As only temporary activities will likely be affected it is estimated that a combined deadweight employment impact of one permanent job will be lost which is considered to be not significant. This will be reviewed following the completion of the interviews with the landowners within the Site and reported within the ES.

Net Operational Employment

16.4.20. It is estimated that four FTE gross jobs will be employed onsite to monitor the Proposed Development during the operation phase. In addition, up to 20 workers per day will be required onsite at certain times to undertake maintenance and cleaning of panels and landscape management. For calculation purposes it is estimated that the total number of jobs supported will be the equivalent of approximately 10 FTEs.

16.4.21. Taking account of deadweight (-1 FTE), leakage (50%), displacement (25%) and a 2.33 multiplier effect, it is estimated that the Proposed Development will result in a net employment gain of 4.5 FTEs over the operational phase of the Proposed Development.

16.4.22. Set against the baseline indicator for employment, the scale of impact across the study area is therefore assessed as negligible beneficial and non-significant.

<u>Gross Value Added</u>

16.4.23. Based on the average GVA of £45,867 per head in the study area, it is estimated that the 4.5 FTE gross jobs supported during the operation phase of the Proposed Development will generate £154,800 per annum in the study area economy.

16.4.24. Set against the baseline indicator for GVA, the scale of impact across the study area is therefore assessed as negligible beneficial and non-significant.

Tourism

16.4.25. The Solar PV Site is currently made up of agricultural fields that are crossed by a network of PRoW, which are primarily used by local residents, and the MacMillan Way regional recreational route. Potential negative impacts on tourism receptors could arise if there are clear and close views from them onto the Proposed Development.

16.4.26. The closest tourism receptors to the Site are Grade II* Listed Burghley House and Gardens, the historic centre of Stamford, Tallington Lakes

Leisure Park, Bowthorpe Farm Park and Stantons Pit Nature Reserve. There are also a number of tourism accommodation providers located within 2km of the Solar PV Site.

16.4.27. The Landscape and Visual chapter of the PEIR (Chapter 6) concludes that only the parts of the PRoW network within the Solar PV Site, as well as Essendine and the immediate surroundings to the north of the Solar PV Site, would experience moderate effects from visual impact during the short-term construction and medium to long-term operation stages of the Proposed Development. All other surrounding areas, including those areas that include tourism receptors, would experience slight to minor visual effects within the 2km LVIA study area due to distances from the Solar PV Site, lack of visibility resulting from topography, combined with intervening built form and vegetation, along with proposed setbacks of the PV Arrays and mitigation to be delivered via the Landscape and Ecological Management Plan (LEMP) which will be secured via a DCO requirement.

16.4.28. The Amenity and Recreation Assessment (Appendix 6.5) concludes that during the operational phase of the Proposed Development, it is considered that visibility, glint and glare and noise effects will reduce amenity and recreation effects for users of the MacMillan Way and Byway E123 to moderate/low, whilst users of the rest of the PRoW in the area will only experience slight minimal or minimal effects.

16.4.29. In addition, the Cultural Heritage and Archaeology chapter of the PEIR (Chapter 8) provides a preliminary assessment of the form of the Proposed Development on the setting of heritage assets in the study area. It concludes that the form of the Proposed Development and the distance between it and identified heritage assets, including Burghley House, suggests that no material views or experiences of them would be changed and certainly not affected.

16.4.30. Therefore, any effects are likely to be localised and there is no evidence to suggest that effects on the recreational and visual amenity would significantly reduce tourist visits to the study area.

16.4.31. This conclusion is supported by a growing body of research that suggests that visitors are generally ambivalent to the presence of large-scale renewables when making holiday/leisure decisions. Research undertaken by the South West Research Company in 2013 was informed by over 1,000 visitor interviews at six locations across Cornwall. Cornwall, at the time, had 172MW of installed solar capacity (RegenSW, 2013). The research found that 80% of people questioned were in favour of renewable energy (74% and 75% for wind and solar, respectively). Only 35% of visitors were aware of solar farms, 22% were positive and just 7% had a negative response. When asked whether the presence of wind and solar farms would affect their decision to visit Cornwall again in the future, 94% replied that it would have no impact, 2% stated that they would be less likely to visit, and 4% said that they would be more likely to visit. The study authors concluded that visitors considered Cornwall to be a more positive place as a result of the presence of renewable energy.

16.4.32. Based on the conclusions of the Landscape and Visual chapter of the PEIR (Chapter 6), Amenity and Recreation Assessment (Appendix 6.5), the Cultural Heritage and Archaeology chapter of the PEIR (Chapter 8), and the results of visitor surveys on perceptions of solar farms, it is considered that the presence of the Proposed Development would only have a negligible adverse effect on the local tourism economy of the study area during the operation phase, which is not significant.

Decommissioning Phase

16.4.33. At the end of its operating life, the Proposed Development would be decommissioned and all above-ground infrastructure removed.

16.4.34. The estimated duration of the decommissioning phase is expected to be between six to 12 months and it is anticipated that the employment and tourism effects over this period will be similar to the construction phase. The effects have not therefore been considered further.

16.5. How would we mitigate the environmental effects?

16.5.1. There are no identified significant negative effects associated with the Proposed Development. As a result of this, no other additional mitigation measures, over and above those stated in the other technical chapters are required to avoid or minimise the socio-economic effects of the Proposed Development.

16.6. What environmental effects would remain?

16.6.1. As no specific mitigation measures are proposed, the residual effects remain the same as those identified for the construction, operation and decommissioning phases in Section 16.4.

16.6.2. A summary of effects and residual effects discussed in this chapter is included in Table 16.3 for the construction and operation phases.

Table 16.3: Socio-economics Significance of Effects

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction								
Employment generation during construction phase	Beneficial, Temporary	Local economy (Rutland and South Kesteven)	Medium	Low beneficial	Minor beneficial	None	None	Minor beneficial (Non significant)
GVA during construction phase	Beneficial, Temporary	Local economy (Rutland and South Kesteven)	Medium	Low beneficial	Minor beneficial	None	None	Minor beneficial (Non significant)
Tourism	Adverse, Temporary	Local economy (Rutland and South Kesteven)	Medium	Negligible adverse	Negligible adverse	None	None	Negligible adverse (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Operation								
Employment generation during operation phase	Beneficial, long term	Local economy (Rutland and South Kesteven)	Medium	Negligible beneficial	Negligible beneficial	None	None	Negligible beneficial (Non-significant)
GVA during operation phase	Beneficial, long term	Local economy (Rutland and South Kesteven)	Medium	Negligible beneficial	Negligible beneficial	None	None	Negligible beneficial (Non-significant)
Tourism	Adverse Long term	Local economy (Rutland and Kesteven)	Medium	Negligible adverse	Negligible adverse	None	None	Negligible adverse (Non-significant)
Decommissioning								

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Employment generation during decommissioning phase	Beneficial, Temporary	Local economy (Rutland and South Kesteven)	Medium	Low beneficial	Minor beneficial	None	None	Minor beneficial (Non-significant)
GVA during decommissioning phase	Beneficial, Temporary	Local economy (Rutland and South Kesteven)	Medium	Low beneficial	Minor beneficial	None	None	Minor beneficial (Non-significant)
Tourism	Adverse, Temporary	Local economy (Rutland and South Kesteven)	Medium	Negligible adverse	Negligible adverse	None	None	Negligible adverse (Non-significant)

16.7. In-combination Effects

16.7.1. The other topics where there is potential for intra-development effects to arise alongside the identified socio-economic receptors are as follows:

- Landscape and Visual (Chapter 6);
- Amenity and Recreation (Appendix 6.5); and
- Cultural Heritage and Archaeology (Chapter 8).

16.7.2. There is a close association between the assessment of tourism effects and those related to Landscape and Visual, Amenity and Recreation and Cultural Heritage and Archaeology. Similar receptor groups or features (e.g. heritage based visitor attractions and PRoW) may be used in these assessments.

16.7.3. Each of these topics are assessed separately but the results of each are taken together to inform the design of the Proposed Development and have led to the mitigation interventions embedded within the layout of the Proposed Development as described in Chapter 5 of the PEIR.

16.8. Conclusion and Next Steps

16.8.1. The construction phase of the Proposed Development will deliver minor benefits to the local economy in terms of employment generation and GVA. There could also be negligible adverse effects on the local tourism economy, although these are likely to be limited to the Solar PV Site and immediate surroundings.

16.8.2. The same conclusions apply to the operation phase, although the employment and GVA generation effects will be less than those recorded during the construction phase.

16.8.3. The decommissioning phase effects on the local economy will be similar to the construction phase, although the effects will be shorter term.

16.8.4. The Socio-economics chapter of the ES will be informed by additional interviews with key stakeholders and more ingrained analysis of potential effects on key receptors.

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Chapter 17: Arboriculture

May 2022

17.0 Arboriculture

17.1. Introduction

17.1.1. This chapter considers the potential effects generated by the Proposed Development during construction, operation and decommissioning in relation to Arboriculture.

17.1.2. It has been agreed with the Planning Inspectorate (PINS) to scope out the arboricultural impacts from the ES and provide a standalone Arboricultural Impact Assessment (AIA). This chapter has been included within the PEIR to provide an overview of the methodology and the potential (non-significant) effects that could arise as a result of the Proposed Development.

17.2. What might be affected by the Proposed Development?

17.2.1. The Arboricultural survey is being undertaken in April and May 2022, and the results are being processed; however, a preliminary visual assessment of the Site, shows that it primarily comprises agricultural land, with the majority of trees forming clusters around the Site boundaries or boundaries are formed by hedgerow specimens. There are a limited number of field trees and some larger blocks of woodland plantations across the Site. According to the Magic Maps data resource, ancient woodland is located offsite adjacent to the Site. Because of this, the study area incorporates land 30m beyond the boundary to ensure that appropriate protective buffer zones are incorporated in the Proposed Development.

17.2.2. The baseline surveys have commenced but have not yet been finalised, and the full details of the survey will be included within the ES. The survey is a detailed onsite inspection whereby the trees will be quantified in terms of age, size, condition and longevity will be undertaken.

17.2.3. The primary impacts on trees are liable to occur from the following requirements for the Proposed Development:

- Permanent access routes;
- Temporary construction phase access routes;
- Permanent parking facilities;
- Temporary construction phase parking facilities;
- Temporary Site buildings and compounds;
- Area affected by construction works (above and below ground);
- Installation of services;
- Storage of materials;
- Car parking; and
- Future maintenance requirements (of both the site and onsite trees).

17.3. How have we assessed the effects relating to this topic?

17.3.1. The AIA methodology is described below although it should be noted that it has been agreed with PINS to scope out the impacts on arboriculture from the ES and that a standalone Aboricultural Impact Assessment (AIA) will be submitted with the DCO Application.

Legislation and Planning Policy

17.3.2. The following legislation has been taken into account in the assessment of effects:

- National Planning Policy Framework (NPPF) Sections 174 b) and 180 c) (Ministry of Housing Communities and Local Government 2021).

17.3.3. The policies within the National Policy Statement for Energy (NPS EN-1), the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) and the Electricity Networks Infrastructure (EN-5), along with National Planning Policy Framework (NPPF), Planning Practice Guidance, and local planning policy which have all been taken into account in the assessment of effects and the development of mitigation measures to reduce effects. The Draft NPS EN-1, published by the BEIS in September 2021, makes specific reference to the generation of solar energy. The Draft NPS EN-3, published by the BEIS in September 2021, introduces a new section (Section 2.47) on solar photovoltaic generation, recognising that Solar Farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. The ES and DCO Application will provide further information on the relevant policies and guidance and how they have influenced the Proposed Development.

17.3.4. The baseline survey of the study area will be completed in accordance with British Standard (BS) 5837:2012 *'Trees in relation to design, demolition and construction. Recommendations'*.

17.3.5. The study area includes all trees within the Solar PV Site and Mitigation and Enhancement Areas , and also those outside that are considered to be within the influencing distance – i.e. stems located a maximum of 30m beyond the Site boundary. This is based on guidance from the Forestry Commission and Natural England 'Ancient woodland, ancient trees and veteran trees: advice for making planning decisions: buffer zone recommendations' which states that "*the proposal should have a buffer zone of at least 15m from the boundary of the woodland to avoid root damage*" (Natural England and Forestry Commission, 2022). Given that woodland edge trees can have wide spreading canopies that may extend 10m or more from the stem, the 30m ensures compliance with Forestry Commission and Natural England guidance.

17.3.6. The impact of the Proposed Development to trees will be determined by calculating the sphere of influence to and from the trees in accordance with BS 5837:2012. This provides guidance for characterising the present and future growth potential of trees (both above and below ground growth) by combining calculations from known measurements with interpretative skills from experienced arboriculturalists. Once this is completed, the tree data is overlaid with the parameters of the Proposed Development and an Arboricultural Impact Assessment (AIA) is produced.

17.4. What are the potential environmental effects?

17.4.1. The primary potential environmental effect is the possible requirement for tree felling and tree surgery to facilitate the construction of the Proposed Development. This has not been quantified as the AIA is yet to be completed although it should be noted that the existing woodlands, trees and hedgerows will be retained within the Solar PV Site and offsets to existing trees and hedgerows has been embedded into the design as described within Chapter 5 of this PEIR.

17.4.2. There is potential for accidental damage to be caused to trees during the construction and decommissioning processes if adequate tree protection measures are not rigorously enforced during periods of activity. Measures to protect trees from accidental damage during the construction and decommissioning phases of the Proposed Development have been set out within the draft outline Construction Environmental Management Plan (CEMP) (Appendix 5.1) and the draft outline Decommissioning Management Plan (DEMP) (Appendix 5.3).

17.4.3. During operation there is potential for adverse effects on trees due to management activities to maintain the operational performance of the Proposed Development (e.g. tree management to avoid shading on the PV Panels). The management of trees (as well as other landscape elements) will be undertaken in accordance with a Landscape Environmental Management Plan (LEMP), which will be secured through the DCO. The LEMP will be implemented by qualified arboriculturists where required to avoid adverse effects on trees during the operational phase. A draft outline LEMP is included at Appendix 5.2.

17.5. How would we mitigate the environmental effects?

17.5.1. Given the location and distribution of trees across the Solar PV Site and the recognition of the importance of trees within the design team, the need for construction facilitation tree works will be very low, primarily limited to providing access where no other workable alternative exists. This will all be fully informed and fully detailed by the baseline survey. From this, practical arboricultural constraints are identified to inform the design and tree related conflicts between construction and tree growth space are minimised. The layout of the PV Arrays, fencing and access tracks will then be refined where possible within the Site. Subsequent to this the AIA will be completed in strict accordance with BS 5837:2012.

17.5.2. An AIA will be submitted in support of the DCO Application which will consider the scale, condition and safe useful life expectancy of trees in their current setting. It will determine the likely impacts of the Proposed Development including such matters as necessary such as tree removals, surgery and predictable future maintenance programmes. The AIA is undertaken in parallel with the design process to ensure arboricultural impacts are minimised, and tree protection measures are maximised to secure their unharmed retention during the construction, operation and decommissioning periods of the Proposed Development. This is achieved by itemising in detail the impact on trees and providing specific guidance on tree protection measures during the construction phase.

17.5.3. Prior to construction commencing, an Arboricultural Method Statement & Tree Protection Plan (AMS/TPP) detailing tree protection measures will be produced. This is also a requirement of BS 5837:2012 and will form part of the CEMP which will be secured through the DCO. The purpose of the AMS/TPP is to provide exact detail of the approved tree works, along with precise specifications for tree protection measures that would typically include the following:

- Arboricultural supervision;
- Protective fencing;
- Ground/root protection;
- Location of Site offices, compounds and parking;
- Onsite storage of spoil and building materials;
- Programmes of works;
- Installation of services;
- Installation of hardstanding;
- Changes of levels;
- Onsite responsibilities;
- "Toolbox" talks; and
- Reporting and monitoring procedures.

17.5.4. During the operational phase of the Proposed Development, tree management activities will be undertaken in accordance with a LEMP, which will be secured via requirement through the DCO.

17.6. What environmental effects would remain?

17.6.1. Provided that all measures identified in the AIA, subsequent AMS/TPP and LEMP are fully complied with, there are no reasonably foreseeable significant long-term environmental effects from an arboricultural perspective as a result of the construction, operation and decommissioning of the Proposed Development (see Table 17.1).

Table 17.1: Arboriculture Significance of Effects

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
Construction								
Impact to trees due to construction activities	Adverse, short-term if not (i) carefully designed out and (ii) carefully controlled during implementation of construction	Trees	High	Potential for medium impact if not controlled	Potential for moderate effect	AIA AMS/TPP	None	Minor (Non-significant)
Operation								
Management to maintain the operational	Adverse, long-term	Trees	High	Negligible	Negligible	oLEMP	None	None, (Non-significant)

Activity	Nature of Effect	Receptor	Value of Receptor	Magnitude of Impact	Significance of Effect	Embedded Mitigation Measures	Additional Mitigation Measures	Residual Effect Significance
performance of the Proposed Development (e.g. avoiding shading of the PV array)								
Decommissioning								
Impact to trees due to decommissioning activities	Adverse, short-term if carefully controlled during implementation of construction	Trees	High	Potential for medium impact if not controlled	Potential for moderate effect	AIA AMS/TPP	None	Minor (Non-significant)

17.7. In-combination Effects

17.7.1. The other topics where there is potential for intra-development effects to arise alongside the identified Arboricultural receptors are as follows:

- Landscape and Visual (Chapter 6); and
- Ecology and Biodiversity (Chapter 7).

17.7.2. The results of the AIA will inform the in-combination effects of the two environmental assessments listed above and will be presented within the ES.

17.8. Conclusion and Next Steps

17.8.1. The expectation is that the impact on trees will be very low. This is based on an understanding of where the trees are located, an appreciation of the relatively limited physical construction that the Proposed Development requires in close proximity to trees/hedgerows, and the collaborative approach of the design team to find the most workable solution from an arboricultural perspective. Furthermore, detailed tree protection measures will be designed and implemented at the construction phase and also applied during the decommissioning phase in full accordance with the AMS/TPP which will form part of the CEMP to be secured through the DCO. During operation, the measures set out within the LEMP to be secured through the DCO would avoid any adverse effects on trees associated with their management to maintain the operational performance of the Proposed Development. There are no reasonably foreseeable significant effects on trees resulting from the construction, operational and decommissioning phases of the Proposed Development.

17.8.2. The next step is to complete the AIA following the completion of the baseline tree survey.

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Chapter 18: Risk of Major Accidents and/or Disasters

May 2022

18.0 Risk of Major Accidents and/or Disasters

18.1. Introduction

18.1.1. This chapter considers the potential effects generated by the Proposed Development during construction, operation and decommissioning in relation to the Risk of Major Accidents and Disasters.

18.1.2. It was agreed with the Planning Inspectorate in the Scoping Opinion that a standalone Major Accidents and Disasters chapter is not required for inclusion in the Environmental Statement. Since the receipt of the Scoping Opinion, a BESS is no longer a part of the Proposed Development and therefore there is no need to consider risk of battery fire/explosion within the PEIR or ES. This PEIR chapter has been prepared to demonstrate that likely significant effects relating to the Risk of Major Accidents and Disasters are not anticipated and as such a standalone chapter in the ES is not necessary.

18.2. How have we considered the risk of major accidents and/or disasters?

18.2.1. The EIA Regulations do not include the definition of major accidents and/or disasters. For the purposes of the assessment, the following three definitions and accidents and disasters have been used within the context of the Proposed Development:

- The Control of Major Accidents Hazard (COMAH) Regulations, 2015, defines a major accident as "*an occurrence such as a major emission, fire, or explosion resulting from uncontrolled development, leading to serious danger to human health or the environment (whether immediate or delayed) inside or outside the establishment, an involving one or more dangerous substances*".
- The International Federation of Red Cross & Red Crescent Societies Disaster and Crises Management Guidance provides a useful

definition for disaster, which is "*a sudden calamitous event that seriously disrupts the functioning of a community or society and causes human, material, and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Though often caused by nature, disasters can have human origins*"; and

- The Oxford English Dictionary defines an accident as "*an unfortunate incident that happens unexpectedly and unintentionally, typically resulting in damage or injury*".

Identifying Risks for Major Accidents and/or Disasters

18.2.2. To help identify major accidents and/or disasters which are relevant to the Proposed Development, the following guidance documents have been referred to:

- Cabinet Office National Risk register of Civil Emergencies 2017 edition which provides an updated government assessment of the likelihood and potential impact of a range of different civil emergency risks (including naturally and accidentally occurring hazards and malicious threats) that may directly affect the UK over the next 5 years; and
- MH Government: Emergency Response and Recovery which establishes good practice based on lessons identified from responding to and recovering from emergencies, both in the UK and internationally.

18.2.3. The Proposed Development does not introduce any construction or operational uses or procedures that are considered to have a risk of major accident or disasters that could affect existing or future sensitive receptors, which are not considered through existing regulatory regimes. Examples of such regimes include:

- Building Regulations, NHS England Emergency Preparedness, Resilience and Response Framework, Health and Safety at Work Act 1974, Safety at Work Regulations 1999, CDM Regulations 2015, Railway Operator Regulatory Requirements, 999 emergency service response procedure and call/response procedure to report utility system failures.

18.3. Potential for Major Accidents and/or Disasters

18.3.1. The paragraphs below provide a brief description of potential major accidents and/or disasters, which are considered relevant to the Proposed Development in the absence of embedded mitigation within the Proposed Development.

Transport Accidents

18.3.2. The Proposed Development will increase the amount of traffic on the public highway during the construction, operational and decommissioning phases. The Transport Assessment and Access and Highways chapter of the ES will consider the highway safety and potential effect on accidents arising as a result of the Proposed Development. As detailed in Chapter 9 of the PEIR, it is considered that the construction phase of the Proposed Development would have a non-significant impact with regards to accidents and safety on the highway network.

18.3.3. Effects from glint and glare to road, rail and aircraft users are considered in the Glint and Glare Chapter 14 of the ES and mitigation measures have been identified and incorporated into the design of the Proposed Development, where necessary. It is not anticipated that these effects will be significant.

18.3.4. Therefore, a separate chapter of the ES, covering risk of transport accidents is not considered necessary as agreed with the Planning Inspectorate in the Scoping Opinion.

Flooding

18.3.5. Both the vulnerability of the Proposed Development to flooding, and its potential to exacerbating flooding will be assessed in the Flood Risk Assessment (FRA) and the Water Resources and Ground Conditions Chapter 12 of the ES to ensure that the Proposed Development is safe from water ingress for its lifetime in the event of flooding, without increasing flood risk elsewhere. The preliminary findings set out in Chapter 12 of this PEIR, conclude that the risk of the Proposed Development flooding (including an allowance for climate change) from all potential sources of flooding is negligible and non-significant. As such, a separate ES chapter covering risk from flooding accidents is not considered necessary as agreed with the Planning Inspectorate in the Scoping Opinion.

Fire

18.3.6. Health and Safety on site would be managed by the contractor during construction and decommissioning to mitigate the risk of fire in line with legislative safety requirements such as the Regulatory Reform (Fire Safety) Order 2005 and the CDM Regulations 2015. The oCEMP includes measures that prohibit the burning of waste material onsite. The Proposed Development therefore is not expected to have a significant effect on the environment due to the risk of a major accident occurring as a result of fire during construction and decommissioning.

18.3.7. The operational phase of the Proposed Development would involve routine maintenance and servicing of equipment to ensure the safe operation of equipment. Fire equipment and notices will also be provided onsite for the availability of personnel and would be regularly inspected and serviced in accordance with Regulatory Reform (Fire Safety) Order 2005. The ES will include details on the measures incorporated into the design to minimise any potential impact of Proposed Development resulting from a fire. No significant effects are anticipated following implementation of mitigation measures.

18.3.8. As such, a separate ES chapter covering risk from fire accidents is not considered necessary as agreed with the Planning Inspectorate in the Scoping Opinion.

COMAH Sites

18.3.9. The Heys Group Stamford Storage site is located 150m from the western boundary of Field number 27. It is an Upper Tier COMAH site as it stores hazardous chemicals prior to distribution. The main types of major accident scenarios are:

- Liquid release - liquid flowing on-site and off-site to sewer, freshwater, estuarine waters, coastal waters, land or groundwater. Damage to people and the environment. Environmental pollution and contamination of drinking water supplies.
- Release of contaminated fire water containing dangerous substances - to sewer, freshwater, estuarine waters, coastal waters, land or groundwater.
- Toxic gas or smoke - a gas cloud or smoke plume (includes ecotoxic smoke) containing dangerous substances.

18.3.10. The COMAH site has prepared an internal emergency plan to deal with major accidents and has liaised with the emergency services in order to deal with major accidents and to minimise their effects.

18.3.11. Advice about the action to take in the event of a major accident will be given by local radio/TV station. If a major accident occurs members of the public who may be affected will be warned by an intermittent tone from the site siren. Members of the public who may be affected should remain indoors until they hear the all-clear signal or receive instructions from the police.

18.3.12. The CEMP and DEMP will provide details of the site and the emergency response required in the event of an accident. This will involve stopping works, evacuating personnel from the affected area and consulting emergency services for advice. In the event that soils, vegetation and watercourses were contaminated during an accident the Environment Agency and geo-environmental specialists would be consulted to inform any changes to the LEMP.

18.4. Other Considerations

Electromagnetic Fields

18.4.1. The Grid Connection Cable and Primary Onsite Substation, which form a part of the Proposed Development, exceed 132kV and therefore have the potential to cause electromagnetic fields with potential for adverse effects on human health. The Grid Connection Cable will be buried underground at a suitable depth and the Primary Onsite Substation will be set back from Uffington Lane and designed in accordance with relevant guidance (DECC Power Lines: Demonstrating compliance with EMF public exposure guidelines, A Voluntary Code of Practice 2012). As an example, the Primary Onsite Substation could be surrounded by a metal fence that will reduce electromagnetic fields. Further information will be provided within the ES, with design principles secured via a requirement through the DCO. Therefore, electromagnetic fields are unlikely to have any adverse effects on residential receptors.

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Chapter 19: Cumulative Effects

May 2022

19.0 Cumulative Effects

19.1. Introduction

19.1.1. This chapter discusses the potential for cumulative effects as a result of the Proposed Development.

19.1.2. Cumulative effects are assessed under two types of relationships:

1) Intra-project effects: combined effect of individual development - for example, noise, dust and visual on one particular assessment; and

2) Inter-relationship: several developments with insignificant impacts individually but which together represent a significant cumulative effect.

19.1.3. The list of cumulative schemes considered in the inter-relationship effects are presented within Appendix 19.1. Intra-project effects are described in further detail within Appendix 19.2.

19.2. Legislative and Planning Context

19.2.1. The EIA Regulations make explicit reference to the requirement for an assessment of the effect interactions between types of effect, and states that the EIA should contain:

"*A description of the aspects of the environment likely to be significantly affected by the Development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors"* (Schedule 4 Part 4).

Schedule 4 Part 5 also requires "*a description of the likely significant effects of the development on the environment resulting from, inter alia … the cumulation of effects with other existing and/or approved projects,* *taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources …*"

19.2.2. No further guidance or requirement beyond the need for the requirement for an assessment of the interrelationships between types of effect is provided.

19.2.3. Schedule 4 Part 1 of the EIA Regulations requires:

"*a description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects of the development, resulting from:*

- *The existence of the development;*
- *The use of natural resources;*
- *The emission of pollutants, the creation of nuisances and the elimination of waste; and*
- *The description by the applicant of the forecasting methods used to assess the effects on the environment."*

19.2.4. The Overarching National Policy Statement (NPS) for Energy EN-1 (Department of Energy and Climate Change (DECC), 2011) states that "*when considering cumulative effects, the ES should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence*."

19.2.5. The cumulative effects assessment presented in this chapter is preliminary relying on environmental information reported by third-party developers for their schemes. The available information varies between schemes, and therefore there is a high degree of uncertainty in the cumulative effects reported. In addition, the review of the available information and assessments are at an early stage. Therefore, the effects presented in this section are preliminary and will be refined through further assessment work and reported in the ES.

19.3. Approach to Assessment

Intra-project Effects: Impact Interactions

19.3.1. Within each of the environmental chapters within this PEIR a preliminary assessment of the potential for intra-project effects has been undertaken. This preliminary assessment will be further developed and each topic chapter within the ES will provide a summary of impact interactions, setting out how the particular topic area has considered and assessed secondary effects arising as a result of direct impacts from other environmental chapters. Rather than assessing this separately, secondary effects are often considered within the main assessment owing to the integrated nature of the EIA process, where this is the case, this will be explained within each of the environmental topic chapters of the PEIR and the ES. Intra-project effects are considered in further detail at Appendix 19.2 of this PEIR.

Inter-project Effects: Cumulative Impacts

19.3.2. The EIA Regulations require the EIA to consider cumulative effects, i.e. the cumulative effect of the Proposed Development being carried out alongside other existing and/or approved developments. The EIA will include an assessment of the potential effects of the Proposed Development in the context of other local developments and, therefore, the cumulative effects that may result from the Proposed Development and these other developments on the same receptor.

19.3.3. The EIA will consider the cumulative effects of the Proposed Development in combination with the environmental effects of other existing and/or approved developments on sensitive receptors identified through the EIA process. The scope of cumulative assessment includes identification of a long list of development within the appropriate Zone of Influence (ZoI) for each topic discipline, which will form the basis of the search area for the cumulative effects assessment. The cumulative effects assessment will draw upon the method as set out within Advice Note Seventeen (Cumulative Effects Assessment), as published by PINS in August 2019.

Primary Identification of Key Developments

19.3.4. For the purposes of the Site search of potential projects to establish the long list, major developments will be defined as any development or infrastructure projects falling within the definitions set out in Schedule 1 or Schedule 2 of the EIA Regulations.

19.3.5. In accordance with PINS' Advice Note Seventeen (2019) projects to be considered in the identification of the long list will include the following categories, presented in Table 19.1. The criteria are used to indicate the certainty that can be applied to each other existing and/or approved development. The criteria are assigned in tiers which reflect the degree of certainty which can be assigned to each scheme. The categories descend from Tier 1 (most certain) to Tier 3 (least certain).

Table 19.1: Identifying and assigning certainty to cumulative developments (PINS Advice Note Seventeen, 2019)

Tier	Status of Scheme
Tier 1	• Under construction; • Permitted application(s), whether under the PA2008 or other regimes, but not yet implemented; and • Submitted application(s) whether under the PA2008 or other regimes but not yet determined.
Tier 2	Projects on PINS' Programme of Projects where a scoping report has been submitted.
Tier 3	• Projects on PINS' Programme of Projects where a scoping report has not been submitted. • Identified in the relevant Development Plan (and emerging Development Plans – with appropriate weight being given as they move closer to adoption) recognising that there will be limited information available on the relevant proposals; and • Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals, where such development is reasonably likely to come forward

Approach to Cumulative Site Search

19.3.6. The cumulative effects assessment adopts a four-staged approach, as set out in the following subheadings.

Stage 1: Establishing the Long List

19.3.7. The long list of other existing and/or approved development will be established using the tiered approach as provided in Table 19.1 above. The Zone of Influence (ZoI) for each topic discipline has been identified which forms the basis of the search area for the cumulative effects assessment. This long list will be kept under continual review up until the point of determination of the application to ensure that the information within the ES is up to date at the point of decision.

19.3.8. The ZoI for each environmental topic area has been identified based on the extent of likely effects as identified as the study area in each of the individual topic chapters (Chapters 6 - 17) of this PEIR. The ZoI has been identified in line with industry specific guidance along with professional judgement and knowledge of the local area relevant to each environmental topic area. The identified ZoIs are presented in Table 19.2 below.

Table 19.2: Zone of Influence Identified for the Cumulative Effects Assessment

Topic	Zone of Influence (ZoI)
Landscape and Visual Impact	Landscape and visual receptors: 2km
Ecology and Biodiversity	Internationally designated sites: 10km Nationally designated sites: 2km Locally designated sites: 2km Protected species records: 2km Surveys – most surveys limited to Site boundary and immediate vicinity but will extend to 500m for great crested newt (GCN) ponds and winter bird survey will include adjacent fields.

Topic	Zone of Influence (ZoI)
Access and Highways	Extent of the local road network (LRN) affected by the construction and decommissioning phases, as well as any identified sensitive receptors. The three potential access routes from the strategic road network (SRN) to the Site will be considered.
Noise and Vibration	500m from the proposed solar PV Site, and 800m from the Onsite Primary Substation.
Air Quality	5km from the Site boundary
Water Resources and Ground Conditions	Hydrological and hydrogeological receptors within a 5km radius from the Site, based on the hydrological and hydrogeological connectivity of water bodies located downstream of the Proposed Development.
Agricultural Land Use	The Site and adjoining agricultural land, where relevant.
Glint & Glare	Other solar PV projects within 1km of an assessed ground-based receptor may be relevant from a cumulative impact perspective.
Climate Change Impact Assessment	In-Combination Climate Change Impact (ICCI): dependant on related individual topics (e.g. flood risk) Climate Change Resilience: Site Boundary Greenhouse Gas emissions: GHG emissions from the Proposed Development and contribution to national GHG targets.
Socio-economics	Rutland County Council and South Kesteven District Council

Stage 2: Establishing the Short List

19.3.9. Stage 2 of the cumulative effects assessment approach involves reviewing and applying a threshold criteria to the long list, in order to establish a short list of other existing and/or approved developments, to ensure that the cumulative assessment is proportionate. The criteria ensures that only other existing and/or approved development, which is likely to result in significant cumulative effects, is taken forward to the assessment stage. The threshold criteria used considers the following factors:

- Temporal scope;
- Scale and nature of the development;
- Other factors such as, nature and capacity of the receiving environment, source-pathway-receptor approach; and
- Professional judgement.

19.3.10. Appendix 19.1 presents the identified long list of existing and/or approved developments within the search area and sets out the threshold criteria applied to identify the preliminary short list of existing and/or approved developments for each environmental topic.

19.3.11. The short list of reasonably foreseeable existing and/or approved developments and tier, in accordance with PINS' Advice Note Seventeen, identified for the cumulative effects assessment is provided in Table 19.3 below. Further details of the existing and/or approved developments are provided in Appendix 19.1.

Table 19.3: Short List of Existing and/or Approved Development

Planning Reference	Description	Tier
2019/0433/FUL	Big Pit Quarry Bidwell Lane Clipsham Rutland: Southern extension to Clipsham Quarry (primarily to release blockstone reserves); restoration of the southern extension through the importation of restoration material; continuation of aggregate extraction including flooring and walling stone along	1

Planning Reference	Description	Tier
	with Lincolnshire Limestone within the existing quarry; and erection of stone working facility to be operated ancillary to the continued blockstone extraction and processing operations.	
2020/0297/MIN	North Western extension to Greetham Quarry including the extraction of Limestone and building stone and importation of suitable inert material.	1
2021/0170/MAO	Outline planning application for 30 residential dwellings (Class C3), with all matters reserved except for access.	1
2021/0171/MAO	Outline planning permission with all matters reserved except access for a maximum of 94,000m2 of Class B8 and Class B2 and E(g) and ancillary business and service space (Class E).	1
2021/0379/MAF	New warehouse (Class B8 Storage/Distribution).	1
2020/1480/MAF	Erection of 60 leisure lodges for occupation on a non-continuous basis, renovation and conversion of existing barns to form a leisure suite including gym, swimming pool and ancillary spaces including staff accommodation, renovation and alteration of the existing Clubhouse, erection of a new maintenance facility, alterations to the grounds including changes to the golf course and construction of lakes for leisure and ecological purposes, and ancillary works including alterations to the access drive, provision of a visitor check-in kiosk, alterations to car parking, creation of a circular walk, alteration and extension of the noise bund, and consequential landscape works.	1

Planning Reference	Description	Tier
S19/2160	Outline planning application in respect of up to 81 dwellings across Plots A and B with all matters reserved except for accesses off Station Road.	1
A47 Wansford to Sutton	Upgrading of approximately 2.6km of single carriageway on the A47 between Wansford and Sutton and associated works to enable the Proposed Scheme to connect into the strategic road network.	2
East Northants Resource Management Facility Western Extension	Extension in the area and timescales for the operation of the site including an extension to the west of the existing site and increasing the throughput of the waste treatment and recovery facility.	2
Land at Six Hundreds Farm (Heckington Fen)	Proposed ground mounted solar photovoltaic (PV) electricity generation and energy storage facility (the "Energy Park") with an approximate capacity of 500 megawatts (MW) with a further 200 - 400MW of energy storage capacity on an area of agricultural land	2
Little Crow	Construction, installation, operation and decommissioning of a ground mounted solar park with a maximum design capacity of up to 150MWp (megawatts peak) and up to 90 Megawatts of battery based electricity storage 2facility. There will also be electrical connection infrastructure and the point of connection into the local electricity grid is directly to the 132KV electricity overhead pylon which already runs through the development site.	2
Gate Burton	Installation of solar photovoltaic (PV) generating panels and on-site energy storage facilities across a proposed site in Lincolnshire (hereafter referred to as the 'Site') together with grid connection infrastructure (hereafter referred to as	2

Planning Reference	Description	Tier
	the 'Grid Connection Corridor Options'). The Scheme would allow for the generation, storage and export of up to500 megawatts (MW) electrical generation capacity.	
West Burton	The Scheme consists of four electricity generating stations each with a capacity of over 50 megawatts (MW) comprising of ground mounted solar arrays; and 'Associated Development' comprising of energy storage, grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance of the Scheme.	2
Cottam Solar Park	The Scheme consists of three electricity generating stations each with a capacity of over 50 megawatts (MW) comprising of ground mounted solar arrays; and 'Associated Development' comprising of energy storage, grid connection infrastructure and other infrastructure integral to the construction, operation and maintenance of the Scheme.	2
Allocation W1 of RCC Site Allocations and Policies DPD 2014	Cottesmore, Burley Road: Small scale preliminary treatment facilities	3
Allocation W2 of RCC Site Allocations and Policies DPD 2014	Greetham, Wood Lane: Small scale preliminary treatment facilities	3
Allocation MCS Policy 5 of RCC Minerals Core Strategy and Development	Limestone primarily for Aggregate Purposes	3

Planning Reference	Description	Tier
Control Policies 2010		
Allocation MCS Policy 4 of RCC Minerals Core Strategy and Development Control Policies 2010	Limestone and clay primarily for Cement Purposes	3
Allocation STM1-H1 of South Kesteven Local Plan 2020	Stamford North SKLP257, 258, 240 1,300 units at 30dph	3
Allocation STM2-H2 of South Kesteven Local Plan 2020	Stamford East SKLP300,318 162 units at 30dph	3
Allocation DEP2-H2 of South Kesteven Local Plan 2020	Land off Linchfield Road SKLP 680 units at 30dph	3
Allocation M033 of Peterborough City Council Minerals and Waste Local Plan 2021	Mineral Extraction: Sand and Gravel 33ha	3

19.3.12. Where schemes have been discounted, they will continue to be monitored to ensure that any changes to those schemes are identified and their omission from the short list is reassessed. For example, in the instance that schemes have been discounted because the application failed to obtain planning consent.

19.3.13. The long list and the short list have not yet been finalised and views are actively being invited on schemes that should be added to the long list for consideration. Any other schemes that are identified, will be considered in the long list and a decision will be taken using the assessment criteria and professional judgement applied to determine whether the scheme(s) will be included in the short list.

19.3.14. Any new projects added to the short list will be assessed in the ES. The long list and short list will be finalised in advance of submission of the DCO Application.

Stage 3: Information Gathering

19.3.15. The next stage of the cumulative effects assessment process is to gather environmental information for the short listed existing and/or approved development, where available, including details of:

- Proposed design;
- Location;
- Programme (construction, operation and decommissioning);
- Baseline data; and
- Effects arising from such other developments.

19.3.16. A preliminary review of the short-listed cumulative schemes has been undertaken and where necessary, further information will be gathered and reported in the ES.

Stage 4: Assessment

19.3.17. The assessment of likely cumulative effects will be undertaken to an appropriate level of detail commensurate with the information available on other existing and/or approved developments and will set out measures envisaged to reduce or avoid any identified significant adverse cumulative effects and, where appropriate, any proposed monitoring arrangements.

Preliminary Cumulative Assessment

19.3.18. The following subheadings provide high level conclusions of the potential cumulative effects, based on the short list of cumulative schemes presented in Appendix 19.1. The cumulative schemes are currently being agreed with RCC, SKDC and LCC, and as such the cumulative schemes and potential effects will be reviewed following statutory consultation and fully addressed in the ES.

Assumptions and Limitations

19.3.19. In accordance with PINS' Advice Note Seventeen (2019), the criteria for identifying key developments are assigned in tiers, which reflect the degree of certainty which can be assigned to each scheme. The categories descend from Tier 1 (most certain) to Tier 3 (least certain).

19.3.20. The decrease in certainty responds to the level of information available for each of the potential cumulative schemes and, as such, preliminary cumulative effects assessments can only be made where such information is available.

19.3.21. The cumulative assessment is based upon information that is publicly available

19.3.22. The cumulative assessment will therefore consider further information on potential cumulative schemes as it becomes available and will be reported in the ES.

Landscape and Visual

19.3.23. The Proposed Development is not widely visible in long distance views during the construction, operation and decommissioning phases of the

Proposed Development, and therefore it is considered unlikely that the cumulative assessment would result in significant cumulative visual effects. Given the Prosed Development's relative limited visibility, the impacts to landscape character would also be limited and are either of such small scale or distance from cumulative schemes that significant cumulative impacts on landscape character above those identified within this PEIR are not anticipated.

Ecology and Biodiversity

19.3.24. A review of the long list was undertaken to identify cumulative schemes that fall within the ecological ZOI and have potential for spatial and temporal overlaps with the Proposed Development. Where potential spatial and, or temporal overlap of ecological receptors was thought to occur, the specific ecological receptors that fall within any area of overlap were considered. It is considered that there are no cumulative schemes that have the potential to interact cumulatively with the effects of the Proposed Development identified in Chapter 7 of this PEIR owing to either the scale of the impact of that particular scheme or affected receptors at a particular site. Therefore, the main potential for ecological impacts during construction, operation and decommissioning of the Proposed Development is considered within the Site itself. Other cumulative schemes are not likely to contribute to the effects on ecological receptors identified in Chapter 7 and therefore the no additional significant cumulative effects are envisaged at this stage.

Cultural Heritage and Archaeology

19.3.25. The expected impacts on buried archaeological remains would be within the Proposed Development, and as such there would be no cumulative effects from other cumulative developments during the construction, operation and decommissioning phases of the Proposed Development. Given the intervening distance, limited intervisibility (due to existing vegetation and built development) and nature of the cumulative schemes (utilising previously developed land) that are identified in the long list, it is expected that there would be no cumulative effects resulting from changes to the setting of buried archaeological remains, historic buildings or historic landscapes within the ZoI. Further details on this matter can be found in Chapter 8 of this PEIR. In conclusion, therefore, no significant cumulative effects upon the cultural heritage resource (either archaeological or built heritage) are expected.

Access and Highways

19.3.26. There are three cumulative schemes identified within the long list that have the potential to give rise to potential cumulative effects in relation to access and highways and have been included within the short list for further consideration at this stage.

19.3.27. Despite falling below the EIA Threshold, cumulative scheme 2021/0379/MAF, has been considered from a Transport and Access perspective as it is located within close proximity the Site and is likely to use the same road network. However it is unlikely to give significant rise to additional construction cumulative effects as the construction phases are unlikely to overlap because the cumulative scheme was consented in June 2021 and is expected to be constructed before the Proposed Development or the permission will have likely lapsed. The overlap of the cumulative development is only during the operational phase, when the effects of Proposed Development are negligible. Therefore, no additional significant cumulative effects upon access and highways are envisaged at this stage.

19.3.28. Cumulative scheme 2019/0433/FUL, whilst the construction phase overlaps with that of the Proposed Development, is likely to generate negligible transport effects as there is no uplift in traffic flows from the existing operation. The ES prepared for cumulative scheme

2019/0433/FUL refers to a minor increase in staff due to restoration; however, this would not overlap with the construction phase of the Proposed Development. Therefore, no additional significant cumulative effects upon access and highways are envisaged at this stage.

19.3.29. Allocation STM1-H1 of the South Kesteven Local Plan (2020) for the development of 1,300 units is unlikely to give rise to significant cumulative effects as construction phases are not likely to overlap. Should the operational phases of the scheme and the Proposed Development coincide, access and highways effects of Proposed Development are identified to be negligible. As the scheme is an allocation this will be accounted for within TEMPRO, so has likely already been factored into the traffic numbers considered within the traffic modelling considered for the Proposed Development. Therefore, no additional significant cumulative effects upon access and highways are envisaged at this stage.

Noise and Vibration

19.3.30. There are two cumulative schemes identified within the long list that have the potential to give rise to potential cumulative effects in relation to noise and vibration and have been included within the short list for further consideration at this stage.

19.3.31. Scheme 2021/0379/MAF, located within 200m of the Site, is unlikely to give rise to significant cumulative noise effects given that warehouse uses already exist in the area, that the nearest noise-sensitive receptors are exposed to generally elevated baseline noise levels from traffic noise along Essendine Road and that the Proposed Development is unlikely to contribute to a significant cumulative noise effect to these receptors.

19.3.32. Allocation STM1-H1 of the South Kesteven Local Plan (2020) for the development of 1,300 units will introduce new noise-sensitive receptors but they are unlikely to be affected by the Proposed Development, given separation distance from the Solar PV Site of approximately 1km or more. Any new sources of noise introduced as part of this scheme would have localised effects which would not interact cumulatively with those of the Proposed Development. However, there is no live application associated with this allocation and therefore no available information. As such this scheme is not considered further in the cumulative effects assessment, if further information becomes available prior to the submission of the DCO Application, this cumulative scheme will be considered within the ES. As such, no additional significant cumulative effects upon noise and vibration are envisaged at this stage.

Air Quality

19.3.33. Review of the long list of cumulative schemes had identified that the only potential impacts with regard to air quality, which could lead to a cumulative effect, would be from traffic generated by scheme 2019/0433/FUL as the construction phases would overlap. This cumulative scheme has therefore been included within the short list for further consideration at this stage.

19.3.34. The Transport Statement prepared for the cumulative scheme concluded that there would be very limited impacts, generated by the extended operations of the scheme, on the highway network, as such it is not anticipated that there would be any additional significant cumulative air quality effects upon air quality at this stage.

19.3.35. Additionally, any scheme construction occurring at the same time as the construction phase of the Proposed Development will be required to undertake its own dust risk assessment and implement mitigation measures to ensure that there are no offsite impacts. As such no additional significant cumulative effects upon air quality are envisaged at this stage.

Water Resources and Ground Conditions

19.3.36. There are five cumulative schemes identified within the long list that have the potential to give rise to potential cumulative effects in relation to and have been included within the short list for further consideration at this stage.

19.3.37. Scheme 2020/1480/MAF, scheme S19/2160 and scheme 2019/0433/FUL are located in the same catchment as the Proposed Development. As such there is the potential for cumulative effects to occur during the construction, operation and decommissioning phases of Proposed Development.

19.3.38. Where there is potential for overlap between construction of cumulative schemes within the same catchment and construction of this Proposed Development, there is the potential for short term, temporary construction related pollutants generated from both the Proposed Development and cumulative schemes to impact on watercourses in the study area. However, provided that standard and good practice mitigation is implemented on the construction sites through their respective CEMPs and as per the conditions of the relevant planning permission, environmental permits and licences, the cumulative risk can be effectively managed and there would not be a significant increase in the risks to any waterbodies. As such, there would not be any additional significant cumulative effects.

19.3.39. At this stage it is assumed that drainage strategies for all cumulative developments would be produced with reference to the relevant policies and guidance documents outlined in Chapter 12 of this PEIR. The Proposed Development assessed in this PEIR will similarly be designed to ensure no long-term deterioration in water quality or increase in flooding. Attenuation and treatment will be provided for runoff from the Proposed Development prior to discharge to waterbodies or ground. As such, provided that all the mitigation measures are implemented for all schemes, then the cumulative impacts from the Proposed Development and any cumulative schemes are not anticipated to produce any additional significant cumulative effects. This will be assessed in greater detail within the ES.

19.3.40. Allocation MCS Policy 4 of the RCC Minerals Core Strategy and Development Control Policies (2010) was identified as having a potential cumulative effect with the Proposed Development due to activities such as the excavation for cement works, which could result in cumulative effects of chemical pollution or sedimentation to downstream receptors. However, there is no live application associated with this allocation and therefore no available information. As such this scheme is not considered further in the cumulative effects assessment, if further information becomes available prior to the submission of the DCO Application, this cumulative scheme will be considered within the ES.

19.3.41. Allocation STM1-H1 of the South Kesteven Local Plan (2020) for the development of 1,300 unit, is located within the same waterbody catchment as the Proposed Development and therefore potential cumulative effects could occur. However, there is no live application associated with this allocation and therefore no available information. As such this scheme is not considered further in the cumulative effects assessment, if further information becomes available prior to the submission of the DCO Application, this cumulative scheme will be considered within the ES.

19.3.42. No other cumulative schemes identified would result in likely significant cumulative effects.

Agricultural Land Use

19.3.43. The majority of the cumulative schemes identified within the long list comprise permanent, irreversible development of land (agricultural or otherwise) on the edges of settlements. For cumulative sites which are allocated through local policy, or where planning consent has been granted, the resultant loss of any BMV land has been accepted in planning terms and therefore considered as part of the baseline environment. Therefore, allocated or approved cumulative schemes are not considered further in the cumulative effects assessment on BMV agricultural land. Other smaller-scale permanent cumulative schemes identified in the long list are of a scale that a significant cumulative loss of BMV land in the context of the BMV land available in Rutland and Lincolnshire is not anticipated.

19.3.44. As such, cumulative effects from the use of BMV land is restricted to the NSIP solar developments, as identified in the long list of cumulative schemes and have been included within the short list for further consideration at this stage, specifically:

- Land at Six Hundreds Farm;
- Little Crow (which has been granted planning consent and involved the use of 37ha of BMV land);
- Gate Burton;
- West Burton; and
- Cottam.

19.3.45. For each of the cumulative NSIP solar developments listed above, the resultant use of BMV land has been identified, where such information is available. There is no estimate published for the Gate Burton scheme, and the West Burton and Cottam schemes have published percentage results based on reconnaissance level surveys. The combined total area of BMV land of the Proposed Development and the cumulative NSIP solar developments, based on the limited data currently available, would equate to approximately 740ha. The BMV resource in Rutland and Lincolnshire, based on the old provisional maps, and crudely estimating 40% of Grade 3 to be subgrade 3a, as calculated in Chapter 13 (Agricultural Land Use) of this PEIR, suggests that approximately 400,000ha is BMV land. In that context, the cumulative developments and the Proposed Development will involve the use of less than 0.2% of the regional BMV resource.

19.3.46. Furthermore, solar developments are recognised to be largely reversible and, overall, there is limited permanent loss of BMV land. In the context of the use of BMV land within the wider area, a significant cumulative impact from the use of BMV land is not anticipated.

Glint and Glare

19.3.47. Cumulative glint and glare effects can occur from any solar PV panels that are installed within the Solar PV Site. However, as not all panels will be installed simultaneously, the length and intensity of any solar reflections during construction phase will be less than or equal to the operational phase. As such, effects during construction will be less than or equal to effects during operation and cumulative effects are limited to the operational phase.

19.3.48. Cumulative effects are predicted to be possible for other solar developments that are consented, under construction or operational, where receptors are shared. There are no cumulative solar schemes identified in the long list within 1km of the Site (the ZoI for Glint and Glare).

19.3.49. The glint and glare assessment, included at Chapter 14 of this PEIR, identified that with the introduction of the additional mitigation, such as the provision of screening as secured by the Landscape Ecological Management Plan (LEMP), no receptors will experience significant glint and glare effects as a result of the Proposed Development. Additionally, it is anticipated that any cumulative solar schemes will be designed to ensure that there will be effective screening to prevent glint and glare effects from the individual schemes. Therefore, no significant cumulative effects upon from glint and glare are envisaged at this stage.

Climate Change

19.3.50. Most development results in greenhouse gas (GHG) emissions and consequently all developments therefore have the potential to result in a cumulative effect on GHG emissions. As such it is not possible to define a study area for the assessment of cumulative effects on GHG emissions nor to undertake a cumulative effects assessment, as the identified receptor is the global climate and effects are therefore not geographically constrained.

19.3.51. Also, as the assessment methodology uses the relevant UK National Carbon Budgets as a proxy for the global climate, this wider perspective is already covered by default. Undertaking a cumulative effects assessment would therefore result in double counting as the GHG emissions from the cumulative schemes also falling within the UK carbon budgets. Consequently, consideration of the effects of the Proposed Development together with other developments on GHG emissions has been scoped out of this cumulative assessment.

19.3.52. Furthermore, the overall significance of the Proposed Development is moderate beneficial and therefore it is not considered necessary to consider the effect of the Proposed Development along with other cumulative developments. The Proposed Development would not be contributing to any significant adverse cumulative effects if any were identified on a UK or global scale, and indeed the Proposed

Development would be contributing towards reducing the magnitude of any national or global adverse cumulative effects.

Socio-economics

19.3.53. Where there is an overlap of the construction phases of the Proposed Development and the schemes identified in the long list, this will generate additional construction related employment and linked gross value added (GVA) in the RCC and SKDC areas and wider economy. However, the scale of the construction employment and linked GVA cannot be readily quantified, based on the information submitted with each scheme. Based on professional judgement, it is considered that the overall cumulative effect of the schemes coming forward would result in a temporary moderate beneficial effect during construction, which is considered significant.

19.3.54. During the construction phase, the overall effect of cumulative schemes on the local tourism economy is likely to remain as temporary minor adverse / negligible and non-significant, as there are no major cumulative developments close to the Proposed Development and the key tourism receptors identified in Chapter 16 of this PEIR. As such, there would not be any additional significant cumulative effects upon the local tourism economy.

19.3.55. The overall operational cumulative effect on the local tourism economy is likely to remain as temporary minor adverse / negligible as there are no major developments close to the Proposed Development.

19.3.56. If all the cumulative developments are delivered there will be some additional operational employment generated from the upcoming employment premises, tourism developments and quarry extensions. Most cumulative schemes, however, will not generate considerable operational employment due to their nature as infrastructure or as residential development projects. Therefore, the overall combined cumulative effect from the generation of employment and associated GVA during operation is likely to remain as negligible, which is not considered to be significant.

19.3.57. Given the intervening distance and nature of the cumulative schemes identified, it is expected that there would be no additional cumulative effects on users of PRoW and residential amenity to those already identified for the Proposed Development in isolation.

Arboriculture

19.3.58. The Proposed Development has been designed to retain existing trees and hedgerows, with minimal breaks for new access routes and/or cable crossings. The effects on the arboriculture resources at the Site are limited to the Site itself. Given the intervening distance between the Proposed Development and associated effects, there would not be any additional significant cumulative effects.

19.4. Assumptions and Limitations

19.4.1. The list of cumulative developments considered in the EIA will be kept under continual review up until the point of determination of the DCO Application to ensure that the information within the ES is up to date at the point of decision.

19.4.2. The temporal overlap between the phases of the Proposed Development and cumulative schemes will be reviewed and confirmed within the ES.

19.4.3. The ZoI has been based on the study areas of the individual specialist topics (Chapters 6 -17 of this PEIR), this will be reviewed and confirmed within the ES.

19.4.4. The cumulative assessment has for the PEIR, been assessed on a topic by topic basis rather than scheme by scheme as presented in Appendix

2 of PINS' Advice Note Seventeen. It is proposed a similar approach will be undertaken for the ES.

19.5. Conclusions and Next Steps

19.5.1. The long list and short list of developments will be agreed with RCC, SKDC and LCC before the assessment is undertaken and reported within the ES. The long list will be kept under continual review up until the point of determination of the DCO Application to ensure that the information within the ES is up to date at the point of decision.

19.5.2. Where schemes have been discounted, they will continue to be monitored to ensure that any changes to those schemes are identified and their omission from the short list is reassessed. Where new projects are added to the short list, these will be assessed in the ES.

19.5.3. The next stage of the cumulative effects assessment will be to gather further information on the short listed developments, where required following feedback from statutory consultation, to inform the cumulative assessment to be presented within the ES. The cumulative assessment methodology and findings will be reported in full within the ES.

19.5.4. The long list and short list will be finalised approximately four months in advance of submission of the DCO Application.

References

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Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 20: Summary

May 2022

20.0 Summary

20.1. Summary of Effects and Mitigation

20.1.1. The effects presented within this chapter are preliminary and further certainty of the potential environmental effects as a result of the Proposed Development will be gained as the EIA process progresses alongside the development of the project design. The design of the Proposed Development is an iterative process and will continue to develop with consultation with statutory and non-statutory consultees. The final design parameters will be considered in detail by environmental chapter authors and the results of the assessments will be reported in the individual topic chapters of the ES.

20.1.2. Mitigation measures are identified and described in further detail within the individual topic chapters (Chapters 6 – 18) of this PEIR. These tertiary mitigation measures have been incorporated into the Proposed Development and/or control documents, as agreed with the project team and stakeholders (where necessary), to control residual effects.

20.1.3. The following management plans have been developed and provided as Appendices to this PEIR:

- Outline Construction Environmental Management Plan (oCEMP);
- Outline Construction Traffic Management Plan (oCTMP);
- Outline Framework Landscape Ecological Management Plan (oLEMP); and
- Outline Decommissioning Environmental Management Plan (oDEMP).

20.1.4. The following management plans will be developed and prepared to be submitted to support the DCO Application:

- Outline Construction Environmental Management Plan (oCEMP);
- Outline Construction Traffic Management Plan (oCTMP) and Framework Travel Plan;
- Outline Operational Environmental Management Plan including a outline Landscape Ecological Management Plan (oLEMP);
- Outline Decommissioning Environmental Management Plan (oDEMP);
- Outline Excavated Materials Management Plan;
- Outline Skills, Supply Chain and Employment Management Plan.

20.1.5. Table 20.1 presents the potential significant environmental effects of the Proposed Development, proposed mitigation measures and the residual effects for each of the environmental topics assessed within this PEIR.

20.1.6. Prior to mitigation, significant effects are predicted in relation to:

- Landscape and Visual;
- Noise and Vibration;
- Agricultural Land Use;
- Glint and Glare; and
- Climate Change (beneficial).

20.1.7. Prior to the implementation of mitigation, significant effects are not predicted in relation to the following topics and these are therefore not discussed further in this chapter:

- Ecology and Biodiversity

- Cultural Heritage and Archaeology;
- Access and Highways;
- Air Quality;
- Water Resources and Ground Conditions;
- Socio-economics;
- Arboriculture; and
- Major Accidents and Disasters.

20.1.8. There is scope to mitigate most of the predicted significant effects and the majority, are therefore not significant following mitigation. Table 20.1 sets out the proposed mitigation and highlights where the preliminary assessment has identified significant residual effects.

Table 20.1: Summary of Effects and Mitigation

Environmental Effect	Significance of Effect	Mitigation Measure	Type of Mitigation: Avoidance, Reduction, Compensation, Remediation, Enhancement	Significance of Residual Effect
Landscape and Visual Impact				
Construction & Operation impacts to Rutland Plateau (Dii) Clay Woodlands LCA - within the Site	Major - Moderate (adverse)	CEMP & LEMP	Reduction	Major - Moderate (significant)
Construction & Operation impacts to Kesteven Uplands LCA within Site	Major - Moderate (adverse)	CEMP & LEMP	Reduction	Major - Moderate (significant)
Construction and Operational impacts on Receptor Group 1	Major - Moderate (adverse)	CEMP & LEMP	Reduction	Major - Moderate (significant)
Noise and Vibration				

Environmental Effect	Significance of Effect	Mitigation Measure	Type of Mitigation: Avoidance, Reduction, Compensation, Remediation, Enhancement	Significance of Residual Effect
Construction Noise (HDD work)	Moderate (adverse)	CEMP	Reduction	Minor (non-significant)
Operational Noise	Moderate to Major (adverse)	OEMP	Reduction	Minor (non-significant)
Agricultural Land Use				
Effect on agricultural land during construction	Moderate or Large (adverse)	Detailed Design CEMP	Avoidance and Reduction	Slight (non-significant)
Effect on agricultural land during decommissioning	Moderate or Large (adverse)	DEMP	Reduction	Slight (non-significant)
Glint and Glare				

Environmental Effect	**Significance of Effect**	**Mitigation Measure**	**Type of Mitigation: Avoidance, Reduction, Compensation, Remediation, Enhancement**	**Significance of Residual Effect**
Reflections towards dwellings, road users and train drivers	Moderate (adverse)	Green Infrastructure design and LEMP	Avoidance	Minor (non-significant)
Climate Change				
Impact on Climate Change (CO_2 emissions)	Moderate (beneficial)	None	N/A	Moderate (beneficial) (significant)

Mallard Pass

Solar Farm

Mallard Pass Solar Farm

Preliminary Environmental Information Report

Volume 1: Main Text

Chapter 21: Next Steps

May 2022

21.0 Next Steps

21.1. Preliminary Findings of the PEIR

21.1.1. This Preliminary Environmental Information Report (PEIR) presents and discusses the preliminary assessment of the likely significant environmental effects of Mallard Pass Solar Farm, a proposed Solar Farm which would allow for the generation and export of electricity exceeding 50 megawatts (MW) at land providing the Proposed Development on the Site. It is intended to provide consultees with sufficient information to allow them to reach an informed view for the purposes of the consultation.

21.1.2. The project parameters, as described in Chapter 5 of this PEIR, are indicative at this stage in process as they may change in response to stakeholder feedback and ongoing design and environmental assessments. The use of the Rochdale Envelope approach has been adopted within this PEIR to maintain flexibility in the design and layout of the Proposed Development and present a likely worst-case assessment of potential environmental effects.

21.1.3. In order to determine the potential for significant effects and identify suitable mitigation measures, the project parameters, as set out in Chapter 5 of this PEIR, have been assessed within the environmental topic chapters of this PEIR.

21.1.4. The design of the Proposed Development is an iterative process and will continue to develop with consultation with statutory and non-statutory consultees. The final design parameters will be considered in detail by environmental chapter authors and the results of the assessments will be reported in the individual topic chapters of the ES.

21.2. Mitigation and Residual Effects

21.2.1. Mitigation measures have been developed through the project and embedded into the design and layout of the Proposed Development. The embedded mitigation (or primary mitigation), have for example informed the extents of the Solar PV and height of the PV Arrays as described in Chapter 5 of this PEIR. Embedded mitigation measures are not described as 'mitigation' within the Chapter 5 of this PEIR and they are an intrinsic part of the description of development.

21.2.2. Embedded mitigation measures include retention of existing hedgerows, woodland, ditches, ponds and field margins within the layout of the PV Arrays, with the exception of small breaks and/or crossings required for new access tracks, security fencing and cable routes. Any breaks or crossing will be designed to use existing agricultural gateways/tracks between the fields and the width of any new breaks will be kept to a minimum.

21.2.3. Minimum offsets/buffers from the PV Arrays have been incorporated within the extents of the Solar PV Site, with the exception of where access tracks, security fencing and/or cable routes are required to cross the Mitigation and Enhancement Areas. These offsets/buffers have been established based on best practice and guidance and will be used to deliver additional planting of diverse habitats to either increase habitat connectivity and structural diversity through combinations of hedgerow, scrub, grass / wildflower planting.

21.2.4. The buffers/offsets are a minimum and may be increased to deliver further mitigation or enhancements and/or respond to root protection areas where required.

21.2.5. The embedded mitigation measures have been considered as part of the preliminary assessment, when considering the potential effects of the Proposed Development.

21.2.6. In addition to embedded design mitigation measures, the preliminary assessments have identified the need for tertiary mitigation measures to avoid, prevent or reduce and, if possible, offset likely significant adverse effects..

21.2.7. These tertiary mitigation measures have been incorporated into the Proposed Development and/or control documents, as agreed with the project team and stakeholders (where necessary), to control residual effects. These will be fully described in the ES along with how they are proposed to be secured within the DCO Application. The following management plans have been developed and provided as Appendices to this PEIR:

- Outline Construction Environmental Management Plan (oCEMP);
- Outline Construction Traffic Management Plan (oCTMP);
- Outline Landscape Ecological Management Plan (oLEMP); and
- Outline Decommissioning Environmental Management Plan (oDEMP)

21.2.8. The structure and mitigation measures set out in these documents are being developed as part of an iterative process and therefore will be developed throughout the EIA process in response to the findings of the assessments as well as stakeholder feedback.

21.2.9. In addition to the management plans listed in paragraph 21.2.7 the following management plans will be prepared and submitted with the DCO Application:

- Outline Operational Environmental Management Plan;
- Outline Excavated Materials Management Plan;
- Outline Skills, Supply Chain and Employment Plan;
- Framework Travel Plan to be combined with the OTMP; and
- Outline Soils Management Plan to be incorporated into the oCEMP and oDEMP.

21.2.10. The final details and specific responsibilities for mitigation and/or monitoring will be confirmed in the final documents, which will be secured as a requirement of the DCO.

21.2.11. The next stage of the EIA process will be to refine the design of the Proposed Development, along with our assessments of potential environmental effects and further develop mitigation measures to reduce any identified adverse effects where possible. Specifically, the project team will be seeking to undertake the following, which will be reported and assessed within the ES:

- Undertake further photography of agreed viewpoint locations and consult with the relevant local planning authorities with regards to the need for further photomontages to inform the LVIA within the ES.
- Seek access to offsite ponds to establish the presence of great crested newts through additional ecological surveys.
- Further consultation with stakeholders to establish the need and scope of targeted field evaluation (trial trenching) to explore the extent and value of any surviving remains in consultation with relevant heritage stakeholders.
- Further assessment of the impacts to settings of historic landscapes and heritage assets based on preliminary findings.

- Further consultation with relevant stakeholders on construction routes, access points, mitigation measures and whether any further baseline surveys are required.
- Further noise modelling and consideration of potential impacts on recreational users in the area.
- Further consultation with relevant stakeholders to identify potential impacts upon private and public water supply.
- Interviews with the land-owners to identify potential impacts to farm business and gather further information on how the arable land within the Solar PV Site is managed.
- Review the proposed green infrastructure strategy to reduce impacts of glint and glare.
- Review the potential impacts to trees through completion of the baseline tree survey and Arboricultural Impact Assessment (AIA).

21.3. Consultation

21.3.1. The Planning Act 2008 requires applicants for DCOs to carry out formal (statutory) pre-application consultation on their proposals. The PEIR has been prepared to accompany formal consultation under Sections 42, 47 and 48 of the Planning Act 2008, the requirements of such are described in further detail in Chapter 1 (Introduction) of this PEIR.

21.3.2. The views of consultation bodies and the local community serve to focus the environmental studies and to identify specific issues that require further investigation, as well as to inform aspects of the design of the Proposed Development.

21.3.3. Following statutory consultation on this PEIR and consideration of the feedback received, the design of the Proposed Development will be further refined and this PEIR will be developed into an ES to be submitted as part of a suite of DCO Application materials.

21.3.4. The ES will set out the issues that have been raised through consultation and how these have been considered and addressed. A Design and Access Statement will be submitted with the DCO Application and will provide details of the design evolution of the Proposed Development. The pre-application consultation undertaken by the Applicant will also be documented within the Consultation Report that will form part of the DCO Application.