The Planning Inspectorate

P/2021/01117
Received
24/08/2021

Environmental Services
Central Operations
Temple Quay House
2 The Square
Bristol, BS1 6PN

Customer Services:
e-mail:

Sent by email

Your Ref:

Our Ref: EN010122-000013

Date: 23 August 2021

Dear Sir/Madam

Planning Act 2008 (as amended) and The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017(the EIA Regulations) – Regulations 10 and 11

Application by Oaklands Farm Solar Ltd (the Applicant) for an Order granting Development Consent for the Oaklands Farm Solar Project (the Proposed Development)

Scoping consultation and notification of the Applicant's contact details and duty to make available information to the Applicant if requested

The Applicant has asked the Planning Inspectorate on behalf of the Secretary of State for its opinion (a Scoping Opinion) as to the information to be provided in an Environmental Statement (ES) relating to the Proposed Development.

You can access the report accompanying the request for a Scoping Opinion via our website:

https://infrastructure.planninginspectorate.gov.uk/projects/east-midlands/oaklands-farm-solar-project/

Alternatively, you can use the following direct link:

http://infrastructure.planninginspectorate.gov.uk/document/EN010122-000014

The Planning Inspectorate has identified you as a consultation body which must be consulted before adopting its Scoping Opinion. The Planning Inspectorate would be grateful therefore if you would:

- Inform the Planning Inspectorate of the information you consider should be provided in the ES; or
- Confirm that you do not have any comments.

If you consider that you are not a consultation body as defined in the EIA Regulations please let us know.

The Planning Inspectorate on behalf of the SoS is entitled to assume under Regulation 10(11) of the EIA Regulations that you do not have any comments to make on the information to be provided in the ES, if you have not responded to this letter **by 20 September 2021**. The deadline for consultation responses is a statutory requirement and cannot be extended. Responses received after this deadline will not be included within the Scoping Opinion but will be forwarded to the Applicant for information.

In order to support the smooth facilitation of our service, we strongly advise that any responses are issued via the email identified below rather than by post.

Responses to the Planning Inspectorate regarding the Scoping Report should be sent by email to:

oaklandsfarmsolar@planninginspectorate.gov.uk

Once complete, you will be able to access the Scoping Opinion via the project pages of our website at the link above.

As the Planning Inspectorate has been notified by the Applicant that it intends to prepare an ES, we are also informing you of the Applicant's name and address:

Oaklands Farm Solar Ltd
BayWa r.e. UK
Ground Floor West Suite
Prospect House
5 Thistle Street
Edinburgh
EH2 1DF

info@oaklands-solar.co.uk

You should also be aware of your duty under Regulation 11(3) of the EIA Regulations, if so requested by the Applicant, to make available information in your possession which is considered relevant to the preparation of the ES.

If you have any queries, please do not hesitate to contact us.

Yours faithfully

Ben Jenkinson

Ben Jenkinson
EIA Advisor
on behalf of the Secretary of State

P/2021/01117
Received 24/08/2021

PINS Ref EN010122 - Oaklands Farm Solar Limited

Oaklands Farm Solar Park
Scoping Report

Final report
Prepared by LUC in association with Integrated Transport Planning, Pager Power, Yellow Sub Geo and Sustainable Acoustics
August 2021

PINS Ref EN010122 - Oaklands Farm Solar Limited

Oaklands Farm Solar Park
Scoping Report

Project Number
11477

Version	Status	Prepared	Checked	Approved	Date
1.	For client review	J. Buck	J. Rea	H. Kent	13.07.2021
2.	Final for submission	J. Buck	J. Rea	H. Kent	19.08.2021

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GIS & Visualisation

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EMS566057
OHS627041

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Chapter 1
Introduction

Project background

1.1 Oaklands Farm Solar Limited (“the Applicant”) intends to submit an application for permission to construct and operate Oaklands Farm Solar Park (“the Proposed Development”), a proposed solar photovoltaic (PV) electricity generating facility. The Proposed Development is located in South Derbyshire local authority area and close to the boundaries of East Staffordshire and Lichfield Districts, south east of Walton-on-Trent and south of Drakelow Power Station (“the Site”). The red line boundary of the Site for the Proposed Development is shown on **Figure 1.1**.

1.2 The Proposed Development comprises the construction and operation of a solar farm and associated infrastructure, including battery storage and connection to the grid. The Proposed Development falls within the definition of a 'Nationally Significant Infrastructure Project' (NSIP) under Section 14(1)(a) and 15(1) and (2) of the Planning Act 2008 ('the Act') as the construction of a generating station in England with a capacity of more than 50 megawatts (MW). It is anticipated at present that the solar park will have a combined installed capacity of approximately 200MW of which 163MW (maximum) will be generated via solar PV and 37.5MW (maximum) will be energy storage. An application for Development Consent (a Development Consent Order (DCO)) will be submitted to the Planning Inspectorate.

1.3 An indicative layout for the Proposed Development is shown on **Figures 1.2a and 1.2b**. The detailed locations of solar panels, associated infrastructure and overhead lines will be subject to iterative design through the EIA process.

1.4 The Environmental Impact Assessment (EIA) requirement for NSIPs is set out in the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the ‘EIA Regulations’). The Proposed Development falls under Part 3(a) of Schedule 2 to the EIA Regulations, being defined as *'Industrial installations for the production of electricity, steam and hot water'*. Schedule 2 development must be subject to EIA if it is 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 to the EIA Regulations.

1.5 In accordance with Regulation 8(1)(b) of the EIA Regulations, the Applicant confirms that an Environmental Statement (ES) will be provided in respect of the application for consent for the Proposed Development. This Scoping Report forms a formal request for a Scoping Opinion under Regulation 10(1) of the EIA Regulations.

1.6 The Applicant is also of the opinion that the Proposed Development does not have the potential to give rise to significant effects on the environment in other European Economic Area (EEA) Member States (Regulation 32 of the EIA Regulations). Considering the size of the development and the nature of the technology to be used, the greatest distance over which potential effects could be experienced is considered to be 5km (for landscape and visual effects). This does not extend into the jurisdiction of another EEA State. The potential effects of the development are not likely to be great enough in terms of extent, magnitude, probability, duration, or frequency to affect populations or sensitive environments in any EEA State.

1.7 In accordance with established guidance and good practice, the ES to be submitted with the application for the Proposed Development will focus on the key impacts likely to give rise to significant adverse effects. As well as identifying aspects to be considered in the EIA this Scoping Report also identifies those aspects that are not considered necessary to assess further, which can be partially or fully 'scoped out' as summarised in **Table 1.1** below[1].

Table 1.1: Issues proposed to be scoped out of the assessment

Topic	Aspect(s) to be scoped out	Justification
Landscape and Visual	Effects on landscape and visual receptors beyond 5km from the Site, where it is judged that significant effects are unlikely to occur.	Effects beyond 5km of the site are not expected to occur due to the relatively low height of solar PV as well as the containment provided by the topography associated with the Trent valley and existing vegetation.
	Effects on receptors outside of the visual envelope (ZTV) of the Development.	
	Effects on landscape character types/areas beyond 5km from the Site, where it is judged that potential significant effects are unlikely to occur.	
	Effects of decommissioning of the proposed solar farm at the end of its operational phase.	As effects will be very similar to those arising from construction.
	Effects of night time lighting during construction and operation.	The only lighting to be used on site will be alarm lights on the transformer stations that are only activated in case of theft. There may be floodlighting if night-time working is required, however this will be temporary.
Ecology	Assessment of effects on dormouse. Results of ongoing surveys may identify other aspects to be scoped out but this cannot be confirmed at this stage.	No records of dormouse were provided by Derbyshire Biological Records Centre within 2km of the Site. Low suitability of habitats onsite to support this species.
Historic Environment	Direct physical effects during operation.	Physical effects will only occur during construction.
	Direct physical effects to assets beyond the Proposed Development footprint.	There will be no construction or operational activities beyond the Proposed Development footprint that could have a direct physical effect on heritage assets.

[1] As requested in the Planning Inspectorate Advice Note 7 - EIA: Process, Preliminary Environmental Information, and Environmental Statements (version 7). Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/12/Advice-note-7.pdf

Topic	Aspect(s) to be scoped out	Justification
	Effects related to setting change for all heritage assets lying more than 2.5km from the Site.	Effects beyond this distance are not considered likely based on professional judgement.
Transport and Access	The operational phase.	Due to very low traffic levels associated with the operation of the site.
	Driver and pedestrian delay during construction.	Controlled through a Construction Environmental Management Plan and therefore significant effects are not anticipated.
	The decommissioning phase.	Effects would be the same or no greater than those during the construction phase.
Noise	Noise and vibration from maintenance and traffic during operation.	The level of maintenance required is low.
	Vibration from vehicle movements on public roads and access tracks.	Vibration is generally only noticeable where roads are poorly maintained.
	Vibration from construction.	Unlikely to be significant beyond the Site and there are no properties close enough to the Site for vibration to be perceptible.
	The decommissioning phase.	Effects would be the same or no greater than those during the construction phase.
Socio-Economics	Operational employment and associated spending effects.	No significant effects are anticipated as there are expected to only be 3 people on site per day during operation of the solar park.
	Land use and effects on best and most versatile agricultural land.	No significant environmental effects are expected because the land will not be permanently sterilised and grazing can continue around the solar panels.
Glint and Glare	Whole topic scoped out.	Mitigation has been identified that will be built into the design of the solar park. A modelling report will be submitted with the application.
Major Accidents and Disasters	Whole topic scoped out.	The solar park will be designed and maintained to adhere to health and safety standards.
Human Health	Whole topic scoped out.	Solar parks are designed and maintained to be safe and minimise any risk to human health. The site infrastructure will be designed with inbuilt control systems to avoid risks associated with electrical infrastructure.
Electric, magnetic and electromagnetic fields	Whole topic scoped out.	The Proposed Development doesn't include any equipment that is capable of exceeding International Commission on Non – Ionizing Radiation Protection Exposure guidelines.
Ground Conditions	Whole topic scoped out.	No significant effects are expected, subject to the implementation of a detailed Construction Environment Management Plan (CEMP). A Desk Top Study will be submitted with the application that will recommend appropriate mitigation measures to be incorporated within the design of the solar park, to ensure that it minimises potential risk. A desk-based Coal Mining Risk

Topic	Aspect(s) to be scoped out	Justification
		Assessment will be undertaken to understand the potential for future instability due to historic underground workings.
Hydrology	Whole topic scoped out.	No significant effects are expected for hydrology during construction, operation or decommissioning, subject to the implementation of a detailed CEMP, Flood Risk Assessment and Outline Drainage Strategy, that will ensure suitable mitigation is designed and implemented.
Telecommunications, Television Reception and Utilities	Whole topic scoped out.	Any potential effects will be avoided through careful design of the scheme.
Waste	Whole topic scoped out.	No significant effects are predicted. A Site Waste Management Plan (SWMP) will detail how waste will be dealt with.
Air Quality	Whole topic scoped out.	Good practice construction methodologies will be proposed to manage dust and emissions during construction. Low traffic movements during the operational phase will result in minimal emissions.

1.8 Various EIA topic specialists have contributed to this Scoping Report, as detailed in **Table 1.2** below.

Table 1.2: EIA Scoping Team

Topic	Team
Landscape and Visual	LUC
Ecology	LUC
Glint and Glare	PagerPower
Cultural Heritage	LUC
Traffic and Access	Integrated Transport Planning
Ground Condition, Hydrology	Yellow Sub Geo
Noise	Sustainable Acoustics
Socio-Economics and land use	LUC
Other Issues (climate change; major accidents and disasters; human health; telecommunications, television reception and utilities; and waste)	LUC

The Applicant

1.9 Oaklands Farm Solar Limited is a wholly owned subsidiary of BayWa r.e. UK Ltd (BayWa). BayWa is a global developer of large-scale renewable energy projects. The company has delivered 625 solar projects worldwide totalling approximately 1900MW, including 31 solar projects in the UK totalling approximately 536MW. The Applicant has previously developed Vine Farm, a 46MW solar park in Cambridge, as well as Bann Road, a 45MW solar park in Northern Ireland.

Document Structure

1.10 The remainder of this document is structured as follows:

- **Chapter 2** provides information on the EIA process;
- **Chapter 3** provides a brief description of the nature and purpose of the Proposed Development; and
- **Chapters 4 - 10** outline the topic areas to be considered in the EIA and the elements that are proposed to be scoped out of EIA.

Oaklands Farm Solar Park
BayWa r.e.

LUC

Figure 1.1: Site Location

Site boundary
Local authority boundary

East Staffordshire District (B)
South Derbyshire District
Lichfield District
North West Leicestershire District

Map scale 1:50,000 @ A3

0 1 2 km

CB: EB:Packham_B LUC Fig1_1_Site_Location 16/08/2021
Source: LUC, OS, BayWa

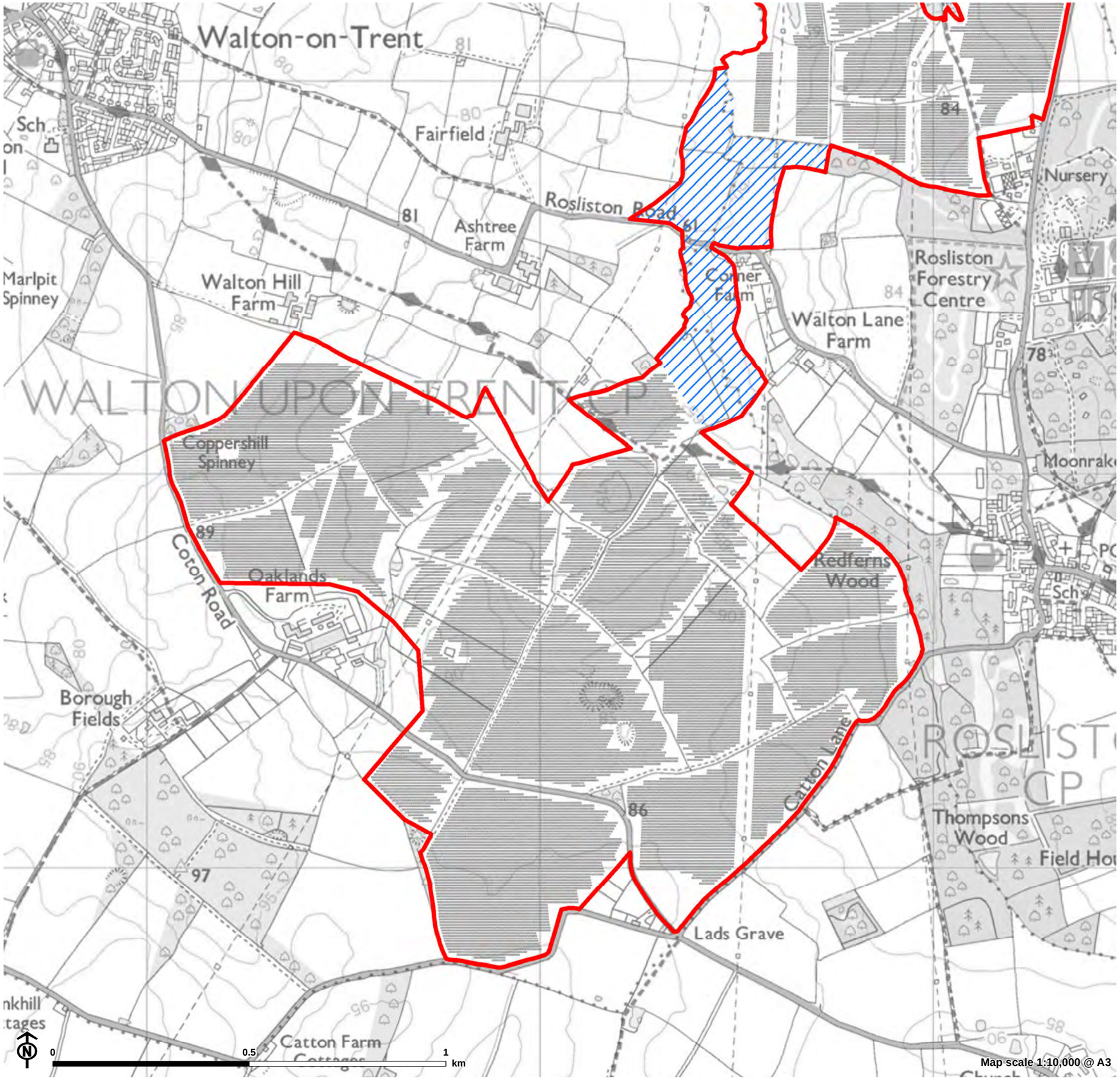
BayWa r.e.

Oaklands Farm Solar Park
BayWa r.e.

LUC

Figure 1.2a: Site Layout

Site boundary
Cable route and site access search area
Indicative solar panel layout



CB: EB:Packham_B LUC Fig1_2a_Site_Layout 19/08/2021
Source: LUC, OS, BayWa

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Oaklands Farm Solar Park
BayWa r.e.

LUC

Figure 1.2b: Site Layout

Site boundary
Cable route and site access search area
Indicative solar panel layout

Ppg Sta
Wilderness
Drakelow House
Wks
Rosliston Road
Flint
Barn Farm
Grove Wood
Warren Barn
Warren Hill
Park Farm
DRAKELOW CP
Hill Covert
Morris Croft
Walton-on-Trent
Fairfield
Ashtree Farm
Rosliston Road
Corner Farm
Rosliston Forestry Centre
Nursery
48
57
51
70
65
80
78
81
84
64
66
61

0 0.5 1 km

Map scale 1:10,000 @ A3

CB: EB:Packham_B LUC Fig1_2b_Site_Layout 19/08/2021
Source: LUC, OS, BayWa

BayWa r.e.

Chapter 2
The EIA Process and Assessment Methodology

What is EIA?

2.1 EIA is the process of systematically evaluating and presenting all the likely significant environmental effects, both beneficial and adverse, of a proposed development, to assist the determining authority in making an informed decision on an application for consent to undertake a development. It enables the significance of effects to be clearly understood, incorporating consideration of mitigation, compensation and enhancement measures. The final results of the EIA process will be presented within an ES to accompany an application for development consent for the Proposed Development.

2.2 EIA is an iterative process which takes place alongside and informs project design. As potential effects are identified, the design of the Proposed Development will be modified to reduce or avoid adverse effects and enhance positive effects where possible.

Scoping

2.3 The EIA Regulations state under Regulation 10(3) that a request for a Scoping Opinion should contain:

"(a) a plan sufficient to identify the land;

(b) a description of the proposed development, including its location and technical capacity;

(c) an explanation of the likely significant effects of the development on the environment; and

(d) such other information or representations as the person making the request may wish to provide or make."

2.4 This scoping report has been prepared in line with the EIA Regulations, as well as guidance in the Planning Inspectorate Advice Note 7: EIA[2].

2.5 The purpose of scoping is to focus the EIA on the likely significant environmental effects of a proposal. Therefore, on the basis of the work undertaken to date, desktop studies, the professional judgement of the assessment team and

[2] The Planning Inspectorate Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (version 7. Available from: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2017/12/Advice-note-7.pdf

experience from other similar projects, as well as policy, guidance and relevant good practice, each topic-based section within this report outlines:

- Potentially significant effects associated with the construction and/or operation of the Proposed Development for detailed consideration within the EIA;
- Mitigation measures likely to be required to avoid or reduce adverse effects, or anticipated to be implemented through the design process; and
- Effects considered unlikely to be significant and therefore scoped out of the EIA.

2.6 Additional objectives of this Scoping Report are:

- To establish the availability of baseline environmental data and their sources;
- To define a survey and assessment framework from which an appropriately comprehensive assessment can be produced;
- To invite comments on the proposed survey and assessment methodologies;
- To invite responses to specific topic-based questions;
- To put forward proposals and receive comments concerning the way in which the EIA findings are to be presented in the ES;
- To invite the Planning Inspectorate ("the Inspectorate") and consultees to draw the Applicant's attention to any matters that are likely to be key to any decision on the forthcoming DCO application; and
- To provide and receive additional information relevant to the Proposed Development.

2.7 It is anticipated that consultation will be undertaken with the following consultees:

- South Derbyshire District Council (SDDC);
- Derbyshire County Council (DCC);
- Natural England;
- Historic England;
- Environment Agency;
- The neighbouring authorities of Lichfield and East Staffordshire; and
- The local community.

2.8 As mentioned above, key questions are included throughout the Scoping Report to help structure the feedback from the Inspectorate and consultees and ensure realisation of the maximum value of the scoping process for all parties. A consolidated list of these questions is included in **Appendix A.**

2.9 The following topics are considered in this Scoping Report, when assessing whether any likely significant effects are expected for the Proposed Development at both the construction and operational stages:

- Landscape and Visual (chapter 4);
- Ecology (chapter 5);
- Historic Environment (chapter 6);
- Transport and Access (chapter 7);
- Noise (chapter 8);
- Socio-Economics (chapter 9);
- Glint and Glare (chapter 10);
- Hydrology (chapter 10);
- Ground Conditions (chapter 10);
- Climate Change (chapter 10);
- Major Accidents and Disasters (chapter 10);
- Human Health (chapter 10);
- Telecommunications, Television Reception and Utilities (chapter 10);
- Waste (chapter 10); and
- Air Quality (chapter 10).

Baseline Conditions

2.10 -The EIA Regulations require that the aspects of the environment which are likely to be significantly affected by a proposal should be defined within the ES.

2.11 To achieve this, it is necessary to gather information on environmental conditions in the absence of the Proposed Development (i.e. the environmental 'baseline') for each of the topics proposed for consideration as part of the EIA. This has already commenced for a number of topics in relation to the Proposed Development and will continue via a combination of consultation with stakeholders, field survey work and desk-based research, as detailed further below.

2.12 Each technical chapter of the ES will provide a detailed description of the relevant existing baseline conditions. Study areas are defined separately for each topic assessed in the EIA to reflect the likely extent of potential effects. The geographical extent of the baseline will vary depending on the nature of the environmental topic, and may include on-site and off-site baseline conditions. Details on the existing condition of areas which have been selected for each topic are included in **Chapters 4 to 10** below.

Consideration of Reasonable Alternatives

2.13 It is necessary to consider reasonable alternatives for the Proposed Development, and set these out in the ES, as specified in paragraph 2 of Schedule 4 to the EIA Regulations:

"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."

2.14 This will be included in the ES.

Assessment of Effects

2.15 The assessment of potential significant effects, using a range of appropriate methodologies, will take into account the construction and operation of the Proposed Development in relation to the Site and its surroundings. At the end of the operational phase, the solar farm will either be decommissioned, or an application made for consent to extend its operational life or replace the panels.

Decommissioning will involve the removal of all above ground infrastructure, including the panels. Effects from decommissioning are generally similar to, and would be expected to be no greater than, those associated with construction. The decommissioning effects will however be considered under each topic where deemed necessary.

2.16 Study areas (including cumulative study areas) will be defined separately for each EIA topic to reflect the likely extent of potential significant effects.

2.17 The ES topic chapters will each provide a detailed assessment of potential effects (direct and indirect, positive and negative, short term or long term), identify mitigation measures, and determine the significance of the residual effects (those remaining after the mitigation measures have been implemented).

2.18 Receptor sensitivity and magnitude of change away from the baseline conditions is used to determine the resultant effect. **Table 2.1** provides the general matrix used to determine resultant effects. This may change depending on the topic, but this will be stated within the specific topic chapter of the ES.

Table 2.1: General matrix to determine effect

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

2.19 Chapters will be accompanied by technical appendices and figures where relevant. All relevant policy, guidance and data sources used will be fully referenced, as required by paragraph 10 of Schedule 4 to the EIA Regulations.

Topics Scoped In

2.20 The following topics have been scoped in and identified for further detailed assessment for the Proposed Development:

- Landscape and Visual;
- Ecology;
- Historic Environment;
- Transport and Access;
- Noise;
- Climate Change; and
- Socio-Economics.

Topics Scoped Out

2.21 The following topics are proposed to be scoped out of the ES:

- Glint and Glare;
- Major Accidents and Disasters;
- Human Health;
- Hydrology;
- Ground Conditions;
- Telecommunications, Television Reception and Utilities;
- Waste; and

- Air Quality.

2.22 These topics, and the justification for their exclusion from the EIA scope, are described in Chapter 10 of this report.

Cumulative Effects and Combined Effects

2.23 Cumulative Impact Assessment is a receptor led assessment, i.e. in order to have a cumulative impact, two projects or impacts need to affect the same receptor. Cumulative effects are the result of multiple actions on receptors or resources. There are principally two types of cumulative effect:

- Type 1: Where different environmental impacts from the same scheme (e.g. noise and air quality impacts) are acting on one receptor (Combined Effects); and
- Type 2: Where environmental impacts from more than one scheme (including the scheme that is subject to the EIA) are acting on one receptor (Cumulative Effects).

2.24 In order for a development to have an adverse cumulative impact it must first:

- have a residual impact; and/or
- result in another development's mitigation measures being less effective.

2.25 Cumulative effects are defined in paragraph 5(e) of Schedule 4 to the EIA Regulations as:

"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."

2.26 The first stage in any cumulative impact assessment is to understand the adverse residual impacts of the Proposed Development. The second stage is to identify any other developments that may affect the same receptors or affect the efficacy of each other's mitigation measures.

2.27 The scope and methodology for the cumulative assessment will be agreed with the Inspectorate. The cumulative assessment will include cumulative effects arising from both construction and operational stages.

2.28 Each technical chapter will present an assessment of the combined effects of the Proposed Development with cumulative effects coming forward alongside other schemes considered in the Cumulative Effects chapter of the ES. A full list of cumulative schemes will be included in the Cumulative Effects chapter will be agreed with South Derbyshire District Council during pre-application dialogue. A draft list for discussion is included below:

- Lullington Solar Park (application awaited);
- Haunton Solar Park (application submitted); and
- The Drakelow Park Housing Development (2,239 homes) (awaiting determination).

2.29 As part of the consultation process, consultees will be invited to comment on the list of proposed cumulative schemes and whether any others should be considered. In line with the EIA Regulations, it is acceptable to not assess schemes where there is insufficient information available within the public domain, and schemes that have not been agreed with the Inspectorate.

Mitigation and Monitoring

2.30 Paragraph 7 of Schedule 4 to the EIA Regulations notes that the ES should include:

"*A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases*".

2.31 These measures will be termed 'mitigation measures' and will be included for each topic area, where appropriate.

2.32 The EIA will identify and assess potentially significant effects prior to mitigation. Where mitigation measures are proposed, their likely effectiveness will be evaluated, and the significance of the 'residual' effect then assessed. The Applicant will commit to implementing all the mitigation measures identified in the ES by way of the DCO.

2.33 It is important to note that, given both accepted good practice during the construction and operation of schemes such as this, and the current regulatory context, there are a number of mitigation measures that are considered to be an integral part of the design/construction process, for example the use of good practice measures in relation to pollution prevention. Such measures (often referred to as 'embedded' mitigation) will be described in detail within the Project Description chapter of the ES but taken into account as part of the assessment of the likely effects of the Proposed Development. Following this, further measures that may mitigate identified effects will then be considered prior to evaluation of the likely significance of residual effects.

2.34 It can be appropriate to scope out certain potential effects from an EIA on the basis that these will be avoided by standard good practice measures.

2.35 Where appropriate, mitigation measures implemented will be monitored for effectiveness, in accordance with

Regulation 21(3) of the EIA Regulations. Proposed monitoring measures will be set out in the ES where relevant.

2.36 A Schedule of Mitigation will be included as an appendix to the ES and will provide a consolidated list of all proposed mitigation and monitoring measures identified in the EIA.

Uncertainty

2.37 The EIA process is designed to enable good decision-making based on the best possible information about the environmental effects of a proposed development. However, there may be some uncertainty as to the exact scale and nature of effects. This may arise because of limitations of the available information or as a result of the application of professional judgement. As required under paragraph 6 of Schedule 4 to the EIA Regulations, it is important that such uncertainty is explicitly recognised and that the ES includes:

"*A description of the forecasting methods or evidence used to identify and assess the effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved*."

2.38 Each topic chapter of the ES will include details of the assumptions made and limitations identified before assessing the significance of effects.

Competent Expert

2.39 As per Regulation 14 (4) of the EIA Regulations, *"in order to ensure the completeness and quality of the environmental statement, the applicant must ensure that the environmental statement is prepared by competent experts and the environmental statement must be accompanied by a statement from the applicant outlining the relevant expertise or qualifications of such experts".*

2.40 A statement of expertise will be provided in the introductory chapters of the ES for the lead EIA coordinator, and in each topic chapter for the assessment authors.

ES Introductory Chapters

2.41 In addition to its topic-specific chapters, the ES will contain a number of introductory chapters as indicated in **Appendix B**. These will include a Project Description chapter which will describe the evolution of the solar park specification and design and the relationship of the final development design to the ES: in particular, it will set out how and where design choices have been made in order to avoid potentially significant effects, thereby removing the requirement for further detailed assessment of such effects. This is discussed further in relation to particular ES topic chapters below. Chapter 3 Site Selection and Design will also meet the requirements of the EIA Regulations with regard to a description of the consideration of reasonable alternatives. In the case of a solar park, this involves the main reasons for selecting the Site along with an explanation of the design iterations made during the EIA process to respond to the relevant environmental and technical constraints on the Site and surrounding area, before arriving at the final design.

2.42 The planning policy context will be set out in the Planning Statement accompanying the application and in the interests of a proportionate ES it is not proposed to include a separate planning policy context chapter within the ES, though an overview of the relevant policy will be included in the Introduction chapter of the ES. The relevant policies/guidance for each topic area will be outlined within the topic chapters, where relevant. The following policy documents are of particular relevance to the Proposed Development:

- The National Planning Policy Framework (June 2019) and associated Planning Practice Guidance;
- South Derbyshire District Local Plan Part 1 (Adopted June 2016);
- Department for Energy and Climate Change. 2011. Overarching National Policy Statement for Energy (EN-1);
- Department for Energy and Climate Change. 2011. National Policy Statement for Renewable Energy Infrastructure (EN-3); and
- Department for Energy and Climate Change. 2011. National Policy Statement for Electricity Networks Infrastructure (EN-5).

Questions

Question 2.1: Are there are any further consultees that should be engaged with?

Question 2.2: Are there other solar farm proposals or other developments that should be considered in the cumulative assessment?

Question 2.3: Do the consultees agree the approach to consideration of various standard good practice measures (often referred to as 'embedded' mitigation) as 'pre-mitigation' is appropriate?

Chapter 3
Project and Site Description

The Site and Surrounding Area

3.1 The Site lies to the south east of Walton-on-Trent, and mainly comprises land within the Oaklands Farm and Park Farm land-holdings which are currently used for arable cropping and grazing. Land within and between the two farms along with land to the north has been identified as a suitable corridor for locating the cable required to connect the solar panels with the on-site substation and into the Drakelow National Grid Substation.

3.2 The Site is located in South Derbyshire and within close proximity to East Staffordshire and Litchfield Districts. The village of Rosliston lies on higher ground to the east, with Rosliston Forestry Centre located on a gentle hill top to the north, where there is a visitor centre with picnic facilities, fishing and walks. A Public Rights of Way (PRoW) (Pen No. 9) footpath runs through the north of Oaklands Farm, within the Site. The long distance recreational Cross Britain Way runs through the north of the Oaklands Farm site.

3.3 North of Park Farm is the former coal fired Drakelow Power Station, now decommissioned and with permission (under s36 of the Electricity Act) for a new Combined Cycle Gas Turbine Power Station, Renewable Energy Centre and Solar Park. Drakelow Power Solar Farm has been developed to the north, adjacent to the Drakelow Power Station and the River Trent.

3.4 The Site also lies in proximity to several designated and non-designated heritage assets (for more information see **Chapter 6**). The Walton-on-Trent Conservation Area lies c. 420m north-west of the Site and effects related to change in the setting of this asset will be considered within the EIA.

3.5 The land within Oaklands Farm slopes down to the east to a nameless tributary of the River Trent. Fields are bound by hedgerows, and some appear to have been amalgamated to create larger fields. Small copses of trees and ponds are a feature of this landscape, sometimes coinciding with former earthworks (marl pits), as are a small number of hedgerow trees. Two overhead power lines cross both farms, running south from Drakelow Power Station.

Project Description

Project Design

3.6 The design of the Proposed Development will evolve throughout the EIA process. Identified site specific constraints will inform the design of the layout, with infrastructure being located away from any specific designations or assets. Where appropriate feedback from consultees may also be used to inform the design. As such, certain parts of the Site may not be developed, or may be used for mitigation purposes to avoid or reduce potential significant adverse effects.

3.7 The Applicant intends to use an indicative site layout for the assessments with each topic assuming a reasonable worst case scenario on which to base their assessments.

The Proposed Development

3.8 The description of development is:

- Construction and operation of a solar farm plus energy storage with associated infrastructure and connection to the grid (maximum generating capacity is 163 megawatts (AC) of solar power, plus 37.5 megawatts of energy storage import/export capacity).

Construction

3.9 The construction phase is expected to last approximately 12 months. During the construction phase temporary construction compounds will be erected, along with temporary roadways to facilitate access to all parts of the Site.

3.10 At the scoping stage, the detailed construction plans are yet to be determined however the ES will provide details on the following:

- Construction Traffic Management Plan;
- Design of temporary construction compounds;
- Temporary roadways/tracks; and
- Site reinstatement and habitat creation to mitigate effects and provide enhancement opportunities.

Operation

3.11 The Development will comprise the following infrastructure once operational. Some indicative images are included at **Figure 3.1**.

- Solar PV modules incorporating solar panels;
- PV module mounting structures;
- Transformers;
- Inverters;
- On-site cabling;
- Over-Head Lines;
- Fencing and security measures;
- Access tracks; and
- An electrical compound including:
  - Battery storage facility;
  - Substation and single storey control building; and
  - Equipment facilitating electrical connection to National Grid Infrastructure.

3.12 At the scoping stage the detailed design has not yet been decided and it will be dependent on initial site surveys, desk-based assessments and consultation with statutory and non-statutory consultees. The detailed design of the components listed above will be outlined in the ES.

3.13 The Development will connect to the National Grid through the substation at Drakelow Power Station.

3.14 The staff required to operate and maintain the site is likely to generally comprise 1 Plant Manager and 2 Technicians. They will have a daily presence, using vans or similar maintenance vehicles. There will also need to be regular visits for specialist maintenance such as of the 132kV substation, drone thermography of arrays, panel cleaning, civils and landscaping works.

Solar PV Modules

3.15 Solar PV converts sunlight into an electrical current, specifically direct current (DC). Ground mounted solar PV modules are typically 2m long and 1m wide, with poly-crystalline cells that make up each panel. Each panel is enclosed in a module frame that are fixed to a mounting structure.

3.16 The number of modules required will depend on the specific constraints identified and the subsequent layout of the modules.

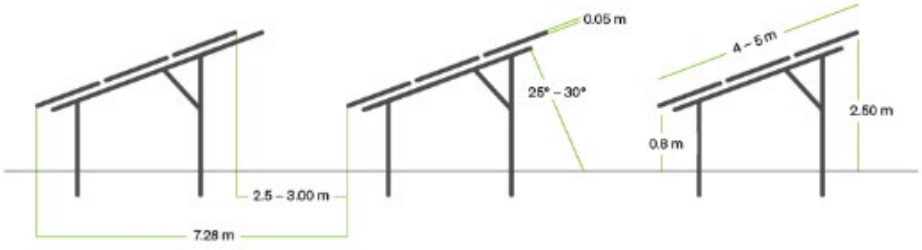
Connection to the Grid

3.17 The project will connect to the national grid at the national grid owned substation at Drakelow Power Station to the north of the site.

3.18 The solar panels will connect into the on-site substation using underground cables. The cable connection route from the on-site substation to Drakelow Substation will be located within the search area for the cable corridor identified in **Figures 1.2a and 1.2b** with the final route and design being determined through the technical design and EIA process. The connection will consist of 132kV overhead lines mounted on

wooden poles or metal towers. For technical reasons it is likely that the final short section into the Drakelow Substation will be underground.

Figure 3.1 Indicative Images of Site Infrastructure



Typical solar panels

Typical panels and fencing

Chapter 4
Landscape and Visual

Introduction

4.1 This chapter considers the potential effects of the Oaklands Farm Solar Park on landscape and visual amenity. It includes a baseline description, followed by the proposed assessment methodology to be used for the Landscape and Visual Impact Assessment (LVIA) to be completed as part of the EIA for the Proposed Development.

4.2 The primary guidance for LVIA is the Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA)[3]. The LVIA will be completed by Chartered Landscape Architects, and in accordance with relevant best practice documents including the Landscape Institute's Technical Guidance Note 02/21 Assessing landscape value outside national designations.

4.3 In accordance with GLVIA3[3], landscape and visual effects will be considered separately. The landscape assessment will consider the effects of the Proposed Development on the existing landscape character and the rural and urban elements within the study area. The visual assessment will consider the visual impact of the Proposed Development over the study area, including the magnitude of visual effect on nearby settlements, roads, recreational routes and public places of interest. The LVIA will assess the likely significant effects on relevant landscape and visual receptors.
.

4.4 An indicative Zone of Theoretical Visibility (ZTV) map has been generated for the proposed PV panels of an illustrative layout (assumed to be 2.7m high) and is shown on **Figure 4.1**. This has been used to inform elements of the proposed LVIA scope such as the indicative viewpoint list (see **Figure 4.1**). However, further ZTV maps will be undertaken as the design of the Proposed Development evolves, with the detailed scope of the LVIA to be adjusted accordingly in further consultation with the Inspectorate and other relevant stakeholders (see 'Consultation' below).

4.5 This chapter has been prepared by LUC.

[3] Landscape Institute and the Institute of Environmental Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment.* 3rd Edition

Existing Conditions

Information Sources

4.6 The following sources of information have been reviewed during the desk-based research for this Scoping Report:

- Natural England's National Character Areas (NCAs);
- Derbyshire County Council's 'The Landscape Character of Derbyshire' (published 2003, updated 2013);
- Derbyshire County Council's 'Areas of Multiple Environmental Sensitivity' (published 2013); and
- Ordnance Survey Maps and aerial photographs.

Designated Landscapes

4.7 There are no national or local landscape designations within the Site or study area (see paragraph 4.13 for further details of the study area). Effects on designated landscapes will not be considered in the LVIA. The Site does however lie within the National Forest[4], and although not a statutory designation, this will nevertheless be considered including any relevant policies relating to it.

Landscape Character

4.8 Natural England's National Character Areas (NCAs) form the broadest scale of landscape character assessment in England. The Site lies within the Mease / Sense Lowlands NCA (72), described as *"a gently rolling agricultural landscape with scattered villages and occasional country houses."* At a local level the site is located within the Village Estate Farmlands Landscape Character Type (LCT). This is a landscape characterised for its broad scale, gently sloping lowland landscape, mixed farming, medium to large regular fields (with mainly hawthorn hedgerows), broadleaf plantations, tree lined pastoral stream corridors, winding country lanes and small nucleated hilltop villages.

4.9 DCC have utilised their landscape character assessment to provide a strategic overview of the environmental sensitivity of the county outside of the Peak District National Park through their assessment of 'Areas of Multiple Environmental Sensitivity' (AMES). These are broad areas of landscape that have been identified as being sensitive to a range of environmental datasets. The Landscape Character of Derbyshire assessment has been used as a spatial framework for reviewing data relating to biodiversity, historic environment and visual unity (which is an overall measure of the 'intactness' of the landscape relating primarily to field enclosure pattern, trees and woodland). The assessment indicates that the Site does not lie within the 'Primary Sensitivity' or 'Secondary Sensitivity' categories and is therefore defined as a 'least sensitive' area to change.

Proposed Surveys and Assessment Methodology

Legislation, Policy and Guidance

4.10 The following policy and guidance documents will inform the approach to the design and assessment of the Proposed Development:

- GLVIA3[3]; and
- Management guidelines within Derbyshire County Council's 'The Landscape Character of Derbyshire' (published 2003, updated 2013).
- Department for Energy and Climate Change. 2011. Overarching National Policy Statement for Energy (EN-1).
- Department for Energy and Climate Change. 2011. National Policy Statement for Renewable Energy Infrastructure (EN-3).
- Department for Energy and Climate Change. 2011. National Policy Statement for Electricity Networks Infrastructure (EN-5).
- The National Planning Policy Framework (July 2021).

4.11 South Derbyshire District Local Plan Part 1 (Adopted June 2016).The LVIA will draw upon and make reference to the above guidance.

4.12 There are no overarching guidance documents for siting and designing solar PV development within the landscape. However, several local authorities throughout England have commissioned landscape sensitivity studies or separate guidance notes for their respective areas, with a focus specifically on solar development. Some of these assessments contain useful design guidance which will be referred to during the project including the Devon Landscape Policy Group Advice Note No. 2: Accommodating Wind and Solar PV Developments in Devon's Landscape (2013).[5]

Proposed Study Area

4.13 The proposed study area for the LVIA will be informed by the likely extent of landscape and visual impact (which will be identified through further desk based work including analysis of ZTV plans and field work) However, from

[4] https://www.nationalforest.org/

[5] https://www.devon.gov.uk/planning/planning-policies/landscape/landscape-policy-and-guidance

experience of similar projects, it is anticipated that this will not exceed a radius of up to 5km from the Site (and with a detailed study area of 2.5km radius). The LVIA will focus on potentially significant effects within this radius, which in practice are not expected to occur beyond 5km due to the relatively low height of solar PV development as well as the containment provided by the topography associated with the Trent valley and existing vegetation.

Landscape Effects

4.14 Landscape receptors to be considered in the LVIA will include:

- Landscape elements and features within the Site; and
- Landscape character types and/or areas, as identified in published Landscape Character Assessments (LCA).

4.15 Predicted changes in both the physical landscape and landscape character will be identified in the LVIA. Effects will be considered in terms of the magnitude of change (taking account of size, scale, geographical extent, duration and reversibility of the change) to the landscape, including its key characteristics as set out in published landscape character assessments. The sensitivity of the landscape will also be taken into account, acknowledging its underlying susceptibility, and the value placed on the landscape by society. The LVIA will consider the landscape effects of the Proposed Development arising during the construction phase and operational phase (at both year 1 and year 10 to account for proposed mitigation and enhancement measures).

4.16 Significant effects on landscape character are more likely to occur in areas which have a strong landscape or visual relationship with the landscape of the Site. Each character type/area within 5km will be considered in terms of its relationship to the Site and the extent of the ZTV, to determine whether an assessment of effects is required.

Visual Effects

4.17 Visual receptors to be considered in the LVIA will include:

- People within settlements;
- People travelling on the surrounding road network;
- People using walking routes; and
- People visiting areas of interest such as visitor attractions and viewpoints.

4.18 The assessment will consider effects on towns and villages within approximately 5km of the Site, including the nearby settlements of Walton-on-Trent, Rosliston and Coton in the Elms.

4.19 It will also consider effects on roads within the study area, where theoretical visibility is indicated by the ZTV including the minor road network surrounding the Site.

4.20 The visual effects experienced by users of popular walking routes within the study area will also be considered, where theoretical visibility is indicated. The Cross Britain Way Long Distance Footpath crosses momentarily through the Site from north-west to south-east. The National Forest Way (Long Distance Footpath) runs approximately 1.5km to the west and east of the Site. Local routes within 5km of the Site will also be considered.

4.21 Visual effects are experienced by people at different locations around the study area, at static locations (for example settlements or viewpoints) and transitional locations (such as sequential views from routes). Visual receptors are the people who will be affected by changes in views at these places, and they are usually grouped by what they are doing at those places (for example residents, motorists, recreational users and visitors to attractions).

4.22 GLVIA3[3] states that the nature of visual receptors, commonly referred to as their sensitivity, should be assessed in terms of the susceptibility of the receptor to change in views/visual amenity and the value attached to particular views. The nature of the effect should be assessed in terms of the size and scale, geographical extent, duration and reversibility of the effect. These aspects will all be considered to form a judgement regarding the overall significance of effect. The LVIA will consider the visual effects of the Proposed Development arising during the construction phase and operational phase (at both year 1 and year 10 to account for proposed mitigation and enhancement measures).

4.23 Viewpoint locations have been selected to provide a representative range of viewing distances and viewing experiences, including views from settlements, points of interest and sequential views along routes. The ZTV shown on **Figure 4.1** has provided a starting point in the selection of viewpoints. However, the ZTV does not take into consideration the visual screening that will be provided by existing vegetation and built form so has not been fully relied upon for the preliminary selection of viewpoints. Further desk-based work has been undertaken including an analysis of Ordnance Survey maps and aerial imagery to assist with this. The ZTV also does not show the theoretical visibility of the proposed sub-station and overhead line grid connection as the locations of this supporting infrastructure are yet to be determined. However, as the project progresses, landscape and visual matters will be an important consideration to help inform suitable locations. The substation and overhead line grid connection will be included within further iterations of the ZTV.

4.24 A preliminary list of proposed viewpoints to be considered for the assessment is set out in **Table 4.1** and

shown in **Figure 4.1**. The final selection of viewpoints will be informed by field work and consultation and agreed with the host authority. Assessment of the visual effects of the Development will be based on analysis of the ZTVs, field studies and examination of visualisations.

Table 4.1: Preliminary LVIA Viewpoints - to be refined through fieldwork and consultation

Viewpoint No.	Name	Easting	Northing	Approximate Distance to Site	Reason for Selection
1	Coton Road	422801	316247	Within the site	Represents views experienced by motorists travelling along the local road network.
2	Cross Britain Way	423333	317068	Within the site	Represents views experienced by users of the long-distance footpath.
3	Footpath south of Hill Covert	424026	318148	On site boundary	Represents views experienced by users of the local public right of way network.
4	Footpath north of Hill Covert	423806	318642	160m	Represents views experienced by users of the local public right of way network. Likely to experience view of proposed grid connection from this viewpoint.
5	Cross Britain Way (near Walton Hill Farm)	422542	317496	200m	Represents views experienced by users of the long-distance footpath.
6	Permissive path by Rosliston Forestry Centre	423938	317548	200m	Represents views experienced by users of the permissive path near to this visitor attraction.
7[6]	Footpath on the edge of Rosliston (7a) or The Chase, Rosliston (7b)	424141 or 424096	316910 or 316871	200m or 270m	Represents views experienced by people at the north-western edge of Rosliston, and users of the local public right of way network. or Represents views experienced by people at the north-western edge of Rosliston
8	Rosliston Road (near Rosliston)	424054	317081	330m	Represents views experienced by motorists travelling along the local road network, travelling to/from Rosliston.
9	Church Street (near Coton in the Elms)	423965	315541	690m	Represents views experienced by motorists travelling along the local road network, travelling to/from Coton in the Elms.
10	Cauldwell Road / Bridleway to Manor Farm	426561	316812	2.5km	Represents views experienced by motorists travelling along the local road network / users of the local public right of way network.

[6] Two options have been provided for this viewpoint. 7a is the preferred option but it is unknown at the time of writing if the site is visible above Redferns Wood. Visibility of the site from 7b has been confirmed.

Viewpoint No.	Name	Easting	Northing	Approximate Distance to Site	Reason for Selection
11	National Forest Way (at Park Farm)	426766	315252	3km	Represents views experienced by users of the long-distance footpath.
12	Footpath near Barton-under-Needwood	419318	318873	3.2km	Represents views experienced by users of the local public right of way network near Barton-under-Needwood.
13	Footpath near Stapenhill	427162	321860	4.6km	Represents views experienced by users of the local public right of way network near Stapenhill.

Residential Visual Amenity

4.25 Effects upon residential visual amenity become a matter of public rather than private interest when properties or groups of properties become widely regarded as unattractive places to live. With regard to developments other than wind energy proposals, the Landscape Institute's *Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 2/19* states that *"…other development types including potentially very large but lower profile structures and developments such as road schemes and housing are unlikely to require RVAA, except potentially of properties in very close proximity (50-250m) to the development"*. Potential views experienced by nearby properties will be a key consideration for the design of the Proposed Development including the siting of PV panels, substation and the overhead line grid connection. However, it is anticipated that a Residential Visual Amenity Assessment (RVAA) will not be required for a development of this scale and nature. This will be reviewed once the design of the layout has evolved.

Field Study

4.26 To inform the design and assessment of the Proposed Development, field work will include a visit to the study area to assess the likely effects on landscape character; as well as the visual effects from the series of representative viewpoints identified. The Site will be surveyed to understand the constraints which will need to influence the layout design, as well as the opportunities for embedding mitigation into the development proposals. Field work will also provide the opportunity to take the photography in preparation for the production of wireframes and photomontages.

Consultation

4.27 Consultation with SDDC and DCC has already begun on the detailed approach to the assessment of effects on landscape and visual amenity. This has included discussions about the methodology that will be used for undertaking the LVIA as well as the selection of viewpoints for the visual assessment. Subsequent to adoption of a scoping opinion by the Inspectorate, the Applicant will consult SDDC and DCC further including on other aspects such as information regarding developments to be considered in the cumulative assessment. The methodology will be finalised following this consultation process. In addition, the National Forest and Natural England will also be consulted.

Potential Significant Effects of the Proposed Development

4.28 Taking account of the findings of the work undertaken to date whilst still adopting a precautionary approach at this preliminary stage, the potential landscape, visual and cumulative effects that will be assessed in the LVIA are described below.

Landscape Effects

4.29 The following list summarises the potential landscape effects of the Proposed Development during construction and operation:

- Direct effects on the landscape character of the Site; and
- Direct and indirect effects on landscape character types/areas within the study area (anticipated to be 5km – see paragraph 4.13).

Visual Effects

4.30 The following list summarises the potential visual effects of the Proposed Development during construction and operation:

- Visual effects on local residents within 2.5km including from the settlements of Walton-on-Trent, Rosliston and Coton in the Elms;
- Visual effects on road users travelling along the minor road network surrounding the Site including Coton Road, Rosliston Road, Walton Road and Church Street; and
- Visual effects on recreational receptors (e.g. users of The Cross Britain Way, National Forest Way, local footpaths/ bridleways within the study area (anticipated to be 5km – see paragraph 4.13)..

Cumulative Effects

4.31 Cumulative landscape and visual effects are not likely to be a key determining issue for the Proposed Development as there are few other consented or proposed schemes within 5km of the Site. However, this will be carefully assessed as part of the EIA. A key known development within the study area that will be considered as part of the cumulative assessment is located at the former (and decommissioned) coal fired Drakelow Power Station, which lies to the north of the Site. Here there is permission for a new Combined Cycle Gas Turbine Power Station, Renewable Energy Centre and Solar Park.

4.32 Assembly of information regarding cumulative schemes and their status can be onerous, requiring consultation of multiple planning registers and other sources. Information provided by consultees concerning any other developments of relevance, would therefore be welcomed.

Effects Scoped Out

4.33 On the basis of the work undertaken to date to prepare this chapter, the professional judgement of the assessment team and experience from similar projects and consultation responses, it is proposed that the following effects can be scoped out:

- Effects on landscape and visual receptors beyond 5km from the Site, where it is judged that significant effects are unlikely to occur;
- Effects on receptors outside of the visual envelope (ZTV) of the Development;
- Effects on landscape character types/areas beyond 5km from the Site, where it is judged that potential significant effects are unlikely to occur;
- Effects of decommissioning of the proposed solar farm at the end of its operational phase as effects will be very similar to those arising from construction;
- Effects on private residential dwellings as part of a RVAA (although this will be reviewed as the design of the Proposed Development evolves); and
- Effects of night time lighting during construction and operation, as the only lighting to be used on site will be alarm lights on the transformer stations that are only activated in case of theft, and potential temporary floodlighting if night-time working is required.

Approach to Mitigation

4.34 An iterative approach will be adopted during the design and development of the Proposed Development, enabling an understanding of the baseline environment and the early identification of potential effects to help develop the best possible scheme. This approach will help to inform the most suitable siting of PV panels, substation, other ancillary infrastructure and the overhead line grid connection.

4.35 A Landscape Strategy plan will supplement the LVIA, illustrating the landscape proposals that will be designed into the scheme and any additional measures to mitigate the effects of the Proposed Development including:

- Landscape protection and enhancement during the preconstruction, construction, operational and restoration periods (following the decommissioning of the Proposed Development);
- Required retention and enhancement of existing hedges and trees, noting that hedgerows characterise the field boundaries across the Site, and there will be opportunity to restore sections of these that have become degraded;
- Location and types of new planting (as required) to further reduce the landscape and visual effects, for example the planting of vegetation around the Proposed Development (with reference to the suitable Woodland and Hedgerow Species mixes set out in the management guidelines of the Village Estate Farmlands LCT); and
- Details of how the site would be optimised for continued use as farmland.

4.36 The potential mitigation opportunities for reducing effects upon nearby properties will also be a consideration and explored further. This may include providing suitable offsets from property boundaries as well tree and hedgerow planting to filter views (particularly from the upper stories of dwellings which overlook the site).

4.37 The LVIA will conclude by determining the significance of residual effects on the landscape resource, character and visual amenity with the mitigation measures implemented.

Questions

Question 4.1: Do consultees consider the size of the 5km radius study area to be appropriate?

Question 4.2: Are there any other relevant parties (in addition to SDCC, DCC, the National Forest and Natural England) who should be included within the post-scoping consultation process for the LVIA?

Question 4.3: Is the proposed approach and scope for the assessment of effects on landscape character considered to be appropriate?

Question 4.4: Do consultees consider that the proposed viewpoints are appropriate to inform the visual assessment, and that the suggested presentation of visualisations is proportionate?

Question 4.5: Do consultees consider the effects proposed to be scoped out appropriate?

Question 4.6: Do consultees consider the proposed approach to mitigation appropriate?

Oaklands Farm Solar Park
Baywa r.e. UK

LUC

Figure 4.1: Bareground Zone of Theoretical Visibility and Viewpoints

- Site Boundary
- 2.5km Site Boundary Buffer
- 5km Study Area
- Indicative PV Panels
- Indicative Substation Locations
- Cable route and site access search area
- Public Rights of Way

Bareground ZTV to Maximum Panel Height (2.7m)

- Up to 25% visible
- Up to 50% visible
- Up to 75% visible
- Up to 100% visible
- Viewpoints
  - 1: Coton Road
  - 2: Cross Britain Way
  - 3: Footpath south of Hill Covert
  - 4: Footpath north of Hill Covert
  - 5: Cross Britain Way (near Walton Hill Farm)
  - 6: Permissive path by Rosliston Forestry Centre
  - 7a: Footpath on the edge of Rosliston
  - 7b: The Chase, Rosliston
  - 8: Rosliston Road (near Rosliston)
  - 9: Church Street (near Coton in the Elms)
  - 10: Cauldwell Road / Bridleway to Manor Farm
  - 11: National Forest Way (at Park Farm)
  - 12: Footpath near Barton-under-Needwood
  - 13: Footpath near Stapenhill

Note: The ZTV is calculated to maximum panel height of 2.7m from a viewing height of 2m above ground level.

The terrain model assumes bare ground and is derived from OS Terrain 50 height data.

Earth curvature and atmospheric refraction have been taken into account. The ZTV was calculated using ArcMap 10.5.1 software.

BayWa r.e.

Map scale 1:45,000 @ A3

CB: EB:Packham_B LUC Fig4_1_Bareground_ZTV_Viewpoints 19/08/2021
Source: OS, LUC, BayWa r.e.

Chapter 5
Ecology

Introduction

5.1 This chapter considers the potential effects of the Proposed Development in relation to Ecology, and the method by which their significance will be assessed. This includes the legislative and policy background underpinning the assessment, proposed methods, baseline conditions, potential ecological impacts to be assessed, the approach to mitigation and enhancements and proposed consultation.

5.2 This chapter has been prepared by LUC.

Existing Conditions

Information Sources

5.3 The following sources of information have been reviewed to inform the proposed approach and reasoning detailed within this Scoping Report:

- Arcus, (2020), Preliminary Ecological Appraisal: Oaklands Solar Farm and Grid Connection Route prepared on behalf of BayWa r.e. UK Limited (see **Appendix C**);
- Arcus, (2020), Breeding Bird Survey Report: Oaklands Solar Farm prepared on behalf of BayWa r.e. UK Limited (see **Appendix D**);
- Biological Records from Derbyshire Biological Records Centre (DBRC);
- Multi-Agency Geographical Information for the Countryside[7] (MAGIC);
- Ordnance Survey (OS) mapping; and
- Aerial Photography.

5.4 In addition to the above, LUC has undertaken an Extended Phase 1 Habitat Survey, Great Crested Newt Surveys (including Habitat Suitability Index and eDNA survey), Bat Roost Potential assessment and Breeding Bird Survey at

[7] Defra. Magic Map. [Online]. Defra, Hampshire. Accessed May and June 2021.Available at: https://magic.defra.gov.uk/

Park Farm. The findings and methods of these surveys are provided below and will be used to inform the EIA.

Proposed Surveys and Assessment Methodology

Legislation, Policy and Guidance

5.5 The following legislation and policy will inform the approach to the design and assessment of the Proposed Development:

- The Wildlife and Countryside Act of 1981;
- The Countryside and Rights of Way Act (CRoW Act), 2000;
- The Natural Environment and Rural Communities Act 2006 (NERC Act);
- The Conservation of Habitats and Species Regulations 2017;
- The Protections of Badgers Act 1992;
- Hedgerow Regulations 1997;
- The National Planning Policy Framework (June 2019);
- South Derbyshire District Local Plan Part 1 (Adopted June 2016);
- Department for Energy and Climate Change. 2011. Overarching National Policy Statement for Energy (EN-1);
- Department for Energy and Climate Change. 2011. National Policy Statement for Renewable Energy Infrastructure (EN-3); and
- Department for Energy and Climate Change. 2011. National Policy Statement for Electricity Networks Infrastructure (EN-5).

5.6 Detail of specific guidance to be applied in the assessment is presented below in the methods section.

Proposed Study Area

5.7 The proposed study area that will be adopted in the assessment varies for each ecological feature depending on their sensitivity to environmental change. The proposed study area for each ecological feature is defined in **Table 5.1** below. This is in line with best practice guidance[8]. As the assessment progresses, any relevant features beyond the proposed study areas that are considered to be functionally connected to the Site, and that could be affected by the Proposed Development, will be considered.

Table 5.1: Proposed study area

Desk Based Review	
Ecological Feature	Proposed Study Area
European Statutory Designated Sites	The Site, plus a 5km buffer.
Statutory Designated Sites	The Site, plus a 5km buffer
Non-statutory Designated Sites	The Site, plus a 2km buffer.
Protected Species Data	The Site, plus a 2km buffer.
Field Surveys	
Ecological Feature	Proposed Study Area
Habitats	The Site.
Bats	The Site.
Great Crested Newt	The Site, plus a 500m buffer.
Reptiles	The Site
Badger	The Site, plus a 50m buffer.
Otter	The Site, plus a 200m buffer.
Water vole	The Site, plus a 50m buffer.
Birds	The Site, plus a 500m buffer.

Desk Study and Field Surveys

Desk Study

5.8 To provide additional background, and to highlight likely features or species groups of interest, a desk study of available biological records will be undertaken. The study will identify sites designated for their nature conservation value, and existing records of protected or notable species of relevance to the Site.

5.9 A search of the following resources will be undertaken, within a 2km radius from the boundary of the Site.

[8] CIEEM (2018), Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal and Marine. Chartered Institute for Ecology and Environmental Management, Winchester

- Biological Records from Derbyshire Biological Records Centre (DBRC);
- Multi-Agency Geographical Information for the Countryside[7] (MAGIC);
- OS mapping; and
- Aerial photography.

5.10 The absence of a species from biological records cannot be taken to represent actual absence. Species distribution patterns should be interpreted with caution as they may reflect survey/reporting effort rather than actual distribution.

5.11 This desk study will be supported by information collected as part of the Preliminary Ecological Appraisal prepared by Arcus[9].

Field Surveys

5.12 The Ecological Impact Assessment (EcIA) will be informed by a series of technical field studies that comply with relevant field survey best practice methods. Each of the surveys will be completed by competent ecologists following current best practice methods. All surveys will be completed within appropriate seasonal windows.

5.13 The following surveys have been undertaken or are proposed to inform the EcIA.

Table 5.2: Baseline Surveys

Survey	Overview	Date
Extended Phase 1 Habitat Survey	A site visit to map habitats within the Site and assess preliminary interest of the Site in relation to protected and notable species. The survey followed best practice guidelines[10],[11]. Relevant BNG Assessment data was also captured.	Oaklands Farm: Completed in May and June 2020. Park Farm: Completed in April 2021.
Hedgerow Survey	A number of species-rich hedgerows were present in the southern part of the site at Oaklands Farm. A detailed survey of hedgerows likely to be adversely affected will be undertaken in line with best practice guidelines[12]. Hedgerows within the Park Farm site are of poor quality as confirmed by the Phase 1 Habitat Survey and therefore no further specific hedgerow assessment is required.	Oaklands Farm: To be completed in 2021. Park Farm: Not required as there are no species-rich hedgerows present.
Bats - Roost Assessment	An initial ground-based assessment of the suitability of buildings and trees within the Site, and which have the potential to be affected either directly or indirectly, to support bat roosts was undertaken. The survey followed BCT guidelines[13].	Oaklands Farm: Completed in May and June 2020. Park Farm: Completed in April 2021.

[9] Arcus, (2020), Preliminary Ecological Appraisal: Oaklands Solar Farm and Grid Connection Route prepared on behalf of BayWa r.e. UK Limited
[10] CIEEM (2017), Guidelines for Preliminary Ecological Appraisal, 2nd Edition. Chartered Institute of Ecology and Environmental Management, Winchester.
[11] Joint Nature Conservation Committee (2010). Handbook for Phase 1 habitat survey - a technique for environmental audit. JNCC, Peterborough.
[12] Department for Environment, Food and Rural Affairs (2007). Hedgerow Survey Handbook: A standard procedure for local surveys in the UK. 2nd Edition. Defra, London.
[13] Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd ed.). The Bat Conservation Trust, London.

Survey	Overview	Date
Bats - Emergence/Re-entry Surveys	Trees with moderate or high suitability to support a bat roosts, and which will be affected by the proposed development (for example in proximity to construction works or access routes), will be subject to additional surveys to determine the presence or absence of bat roosts as well as characterise the bat roost(s) if present. The survey will follow BCT guidelines[13]. Avoidance of lighting and sensitive scheme design is expected to avoid impacts to potential roosts.	Completed between June and August 2021.
Bats - Transect Activity Survey	Due to the low quality of affected habitats; the absence of lighting; the nature of the scheme; and the low potential for significant effects, three separate transect activity surveys at dusk and/or dawn are proposed throughout the bat active period. The purpose of these surveys will be to assess the assemblage of bats using the Site for commuting and foraging. The survey will follow BCT guidelines[13].	Oaklands and Park Farm: Proposed on three separate occasions between May and September 2021.
Bats - Static Activity Survey	Static bat detectors to collect five nights of data each to determine the relative commuting and foraging importance of the linear features within the Site for bats. The survey will follow BCT guidelines[13].	Oaklands and Park Farm: Proposed on three separate occasions between May and September 2021.
Great Crested Newt Survey (GCN)	A Habitat Suitability Index[14] and eDNA sample surveys were undertaken to assess the presence of GCN within the Site. The survey followed best practice guidelines[15].	Oaklands Farm: Completed in May and June 2021. Park Farm: Completed in April 2021
Badger Survey	Searches for setts, foraging, and pathways survey were informed by Mammal Society guidelines[16] and setts characterised as set out in Andrews 2013[17]. Particular focus on linear features and woodland edges in proximity to access routes and construction areas.	Oaklands Farm: Completed in May and June 2020 Park Farm: Completed in spring/summer 2021.
Breeding Bird Survey	The breeding bird survey was completed, recording and mapping any bird species present. This was	Oaklands Farm: Completed between April and June 2020.

[14] Oldham R.S, et al. (2000). Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus). Herpetological Journal 10 (4), 143-155.
[15] Biggs J. et al (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Appendix 5. Technical advice note for field and laboratory sampling of great crested newt (Triturus cristatus) environmental DNA. Freshwater Habitats Trust, Oxford.
[16] Harris, S., Cresswell, P. and Jefferies, D. (1991) Surveying Badgers, The Mammal Society, London.
[17] Andrews R. (2013). The classification of badger Meles setts in the UK: A review and Guidance for surveyors. In Practice, Winchester [82] 27-31.

Survey	Overview	Date
	undertaken in line with best practice guidelines[18]. A reduced version of this survey was completed in relation to the Oaklands Farm in the south and was deemed appropriate given the simplicity of the lowland farmland habitats present in this section of the Site. A total of three breeding bird survey visits will be completed for Park Farm in light of the simplicity of the habitat features and relative to the potential level of impact.	Park Farm: Completed between May and August 2021.
Water Vole and Otter Survey	A site walkover will be undertaken along the banks of the watercourse immediately adjacent to Park Farm and will include the recording and mapping of signs of these species. This will be undertaken in line with best practice guidelines[19][20].	Oaklands Farm: No further survey proposed as the proposed development layout and construction area is not located in proximity to habitat suitable for supporting these species. Park Farm: Completed in 2021.
Reptiles Survey	Reptile surveys will be undertaken in the southern section of the Site at Oaklands Farm where suitable habitat (taller areas of less intensively managed/grazed grasslands) occurs. This will involve seven site visits that will record the presence or absence of any species present. This will be undertaken in line with best practice guidance[21]. Increased survey effort to determine population size is not proposed because the majority of the Site is unsuitable for supporting reptiles and the potential for mitigation and enhancement for reptiles as part of the proposed development is high.	Oaklands Farm: July to September inclusive 2021.

5.14 The EcIA will subsequently scope in the following ecological features:

- Statutory and non-statutory designated sites;
- Habitats of conservation concern[22];
- Protected species recorded during the surveys described above.

Proposed Assessment Methodology of Likely Significant Effects for the EcIA

5.15 The following methodology for the assessment is proposed:

- All ecological reporting and assessment will follow CIEEM guidelines[10], as well as the British Standard on Biodiversity[23]. The primary document on which the methodology for the assessment of likely significant effects in the ecology ES chapter will be based is the

[18] Marchant, J. (1983) Common Birds Census Instructions. British Trust for Ornithology, Thetford
[19] Strachan, R. and Moorhouse, T. (2006). Water Vole Conservation Handbook. Second Edition. Wildlife Conservation Research Unit, Oxford.
[20] Chanin, P. (2003). Monitoring the Otter Lutra. Conserving Natura 2000 Rivers Monitoring Series No.10. English Nature, Peterborough.
[21] Froglife (1999). Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halesworth.
[22] Including habitats currently offered legislative protection or are included in national or local nature conservation policy.
[23] BSI (2013). BS 42020:2013: Biodiversity – code of practice for planning and development. British Standards Institution, Bristol.

Guidelines for Ecological Impact Assessment in the UK and Ireland[8].

- The Ecological Importance (as defined by CIEEM) of any given proposed study area relates to its habitat assemblages and species populations and their importance to wider ecological processes. The Ecological Importance of the proposed study area is determined for each of its component habitats and species and may vary from receptor to receptor subject to their varying sensitivities. The guidelines recommend that Ecological Importance should be determined within a defined geographical context. The levels of geographical value adopted in this assessment are described in **Table 5.3** below.

Table 5.3: Ecological Importance: Geographical Context

International	A Study Area is considered of International Ecological Importance when it supports: ■ An internationally designated site or candidate site (Special Protection Area (SPA), potential Special Protection Area, Special Area of Conservation (SAC), candidate Special Area of Conservation, potential Special Area of Conservation, Ramsar site, Biogenetic Reserve) or an area which Natural England (NE) has determined meets the published selection criteria for such designations, irrespective of whether or not it has yet been notified. ■ A viable area of a habitat type listed in Annex 1 of the Habitats Directive (as defined in The Conservation of Habitats and Species Regulations 2017), or smaller areas of such habitat which is essential to maintain the viability of that ecological resource on an international level. ■ >1% of the European Resource of an internationally important species, i.e. those listed in Annex 1, 2 or 4 of the Habitats Directive.	Europe
National	A Study Area is considered of National Ecological Importance when it supports: ■ A nationally designated site (Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Marine Nature Reserve (MNR)) or a discrete area which NE has determined meets the published selection criteria for national designation irrespective of whether or not it has yet been notified. ■ A viable area of a Habitat of Principal Importance for Conservation, or smaller areas of such habitat which is essential to maintain the viability of that ecological resource at a national level. ■ A viable area of Ancient Semi-Natural or Ancient Replanted Woodland as defined by Natural England. ■ >1% of the National Resource of a regularly occurring population of a nationally important species, i.e. a Species of Principal Importance for Conservation and/or species listed on Schedules 1, 5 (S9 (1, 4a, 4b)) or 8 to the Wildlife and Countryside Act 1981. ■ A regularly occurring and viable population of a UK Red Data Book species where the Study Area is essential to maintain the viability of that ecological resource at a national level.	UK
County	A Study Area is considered of County Ecological Importance when it supports: ■ County sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, e.g. Local Nature Reserves, County Wildlife Sites.	Derbyshire

	■ Viable areas of legally protected habitat/habitat identified in County Biodiversity Action Plan (BAP), or smaller areas of such habitats that are essential to maintaining the viability of the resource at a county scale. ■ Any regularly occurring population of an internationally/nationally important species or a species in a relevant County BAP which is important for the maintenance of the regional meta-population. ■ Networks of species-rich hedgerows where the Study Area is essential to maintain the viability of this network at a county level.	
District	A Study Area is considered of District Ecological Importance when it supports: ■ District sites and other sites which the designating authority has determined meet the published ecological selection criteria for designation, e.g. Sites of Nature Conservation Importance, Local Wildlife Sites. ■ Viable areas of legally protected habitat/habitat identified in a Local BAP or smaller areas of such habitats which are essential to maintaining the viability of the resource at a district level. ■ Any regularly occurring population of an internationally/nationally important species or a species in a Local BAP which is important for the maintenance of the viability of the feature at a district level. ■ Networks of habitat which contribute to ecological connectivity at a district level.	South Derbyshire
Local	A Study Area is considered of Local Ecological Importance when it supports: ■ Commonplace and widespread semi-natural habitats, e.g. scrub, poor semi-improved grassland, coniferous plantation woodland, intensive arable farmland etc. which, despite their ubiquity, contribute to the ecological function of the local area (habitat networks etc); ■ Very small, but viable, populations of internationally/ nationally important species, or species in a relevant Local BAP, important for the maintenance of the local meta-population. ■ Networks of linear features, including species-poor hedgerows where the Study Area is essential to maintain the viability of such a network at a local level	Within a 5km radius of the Site
Site	A Study Area is considered of Site Ecological Importance when it supports: ■ Habitats of limited ecological Importance, e.g. amenity grassland, but which contribute to the overall function of the application site's ecological function.	The Site

Proposed Assessment Methodology of the Impact Assessment

5.16 All potential impacts will be assessed against standard parameters as set out within the CIEEM guidance and through professional judgement. Via this approach, a scientific and repeatable method is applied whereby all aspects of a potential impact are considered. Impacts will be clearly identified as either adverse or beneficial.

5.17 Impacts will be considered for each scoped-in ecological feature, with reference to the following parameters (where relevant):

- **Beneficial or adverse**, determined in accordance with nature conservation objectives and policy;
- **Extent**, which is the spatial or geographical area of which the impact/effect may occur under a suitably representative range of conditions;

- **Magnitude**, which refers to size, amount, intensity and volume and should be quantified (if possible) and expressed in absolute or relative terms;
- **Duration**, which should be referred to in relation to ecological characteristics (where applicable) as well as human timeframes;
- **Frequency and Timing**, which is the number of times an activity occurs and where applicable should be referred to in relation to ecological characteristics (including life cycles); and
- **Reversibility**, an irreversible effect is one from which from which recovery is not possible within a reasonable timescale, or there is no reasonable change of action being taken to reverse it.

5.18 A degree of confidence is assigned to assess the likelihood of an impact occurring. The following scale (as defined within the CIEEM guidance) is referred to:

- **Certain/near certain**: probability estimated at >95%.
- **Probable**: probability estimated at 50 – 95%.
- **Unlikely**: probability estimated at 5 – 49%.
- **Extremely unlikely**: probability estimated at <5.

5.19 Based on these parameters, an impact is then considered to be either significant or not significant and likely to be either beneficial or adverse. An impact is considered to be significant if it has the potential to affect the integrity of a habitat or the conservation status of a species. Technical definitions of integrity and conservation status follow the CIEEM guidance.

5.20 With respect to ecology, best practice guidance advises that significance should not be defined as 'high', 'moderate' or 'low' due to the complexities of ecological processes. Therefore, all impacts defined as 'significant' are considered to be significant in the context of the EIA Regulations.

Consultation

5.21 Following the completion of surveys at the Site, LUC will look to consult further with South Derbyshire District Council and their ecological advisors to discuss appropriate avoidance, mitigation and enhancement measures. In particular, we would look to consult with the Local Planning Authority in relation to Biodiversity Net Gain. Consultation would only be required with Natural England should any of the surveys identify the presence of European Protected Species to be affected by proposals and as such require licencing and mitigation measures.

Baseline Conditions

Statutory Designated Sites

5.22 The River Mease SAC and SSSI was recorded 4.4km to the south of the Site. No further statutory designated sites were recorded within a 5km buffer of the Site.

5.23 The potential for the proposals to result in Likely Significant Effects on the River Mease SAC will be fully considered as part of the EcIA process. The EcIA will include sufficient information for the competent authority to discharge their duty in concluding whether the development will result in adverse effects on the integrity of River Mease SAC. The ES will specify embedded mitigation and avoidance measures during construction and operation which will ensure that contaminated run-off will not enter watercourses, and therefore adverse effects on the River Mease SAC will be avoided.

5.24 The Applicant will also undertake a shadow Habitat Regulations Assessment (HRA) as a separate requirement to EIA. .

5.25 Relevant HRA documentation will be provided with the DCO application, to provide sufficient information to the competent authority in relation to their duty to conclude whether the Proposed Development will result in adverse effects on the integrity of internationally designated sites. A draft Shadow HRA Report will be issued to Natural England for consultation in advance.

Non-statutory designated sites

5.26 A total of 14 Local Wildlife Sites (LWS) and four potential LWS were recorded within 2km of the Site with the nearest sites recorded 0.1km to the south-east at Rosliston Forestry Centre – Hedgerow LWS and 0.3km to the north at Grove Wood LWS, which was recorded within the cable route corridor.

Habitats

5.27 The Site supported a range of habitats, including the following main habitat types: arable fields, improved grassland, semi-improved neutral grassland, ponds, species-rich and species-poor hedgerow, scrub, woodland and bare ground.

Invasive species

5.28 Biological records provided by DBRC identified invasive species within the Site.

5.29 During the Extended Phase 1 Habitat Survey, Japanese knotweed was recorded adjacent to the Site to the north.

Protected and Notable Species

Bats

5.30 Biological records provided by Derbyshire Biological Records Centre (DBRC) have identified a total of four bat species within 2km of the Site. This included common pipistrelle *Pipistrellus*, pipistrelle *Pipistrellus* sp, noctule *Nyctalus noctula*, brown long-eared *Plecotus auritus*, Daubenton's bat *Myotis daubentonii* and unidentified bat.

5.31 The majority of the Site comprises species-poor shortl grazed improved pastures and arable fields of low suitability for bats. Habitats of increased value relate to linear field boundaries, watercourses and woodlands.

5.32 The Site supports a number of trees identified as having bat roost potential. In addition, the mosaic of habitats present within and in the vicinity of the Site, including hedgerows, woodlands and waterbodies, provided suitable opportunities for bat species to forage and commute.

5.33 Bat roost assessments took place in April, May and June 2021, whilst bat emergence/re-entry surveys were completed between June and August 2021.

Great Crested Newt (GCN)

5.34 Biological records provided by DBRC have identified GCN within 2km of the Site.

5.35 The Site supports suitable opportunities for GCN to forage and shelter, particularly within habitat present in the southern portion of the Site.

5.36 A number of ponds were recorded within 250m of the Site and which were subject to eDNA survey. All ponds were recorded as negative for GCN and as such no ponds were considered to support breeding ponds for this species. Surveys were completed between April and June 2021.

Reptiles

5.37 Biological records provided by DBRC have identified three reptile species within 2km of the Site. This included grass snake, adder and common lizard.

5.38 The Site, particularly to the south at Oaklands Farm, supports suitable habitat for reptiles to forage, shelter, bask and disperse into the wider area. Habitats included scrub, bare ground, grassland and log piles.

5.39 Further ongoing surveys will identify the Ecological Importance of the Site for reptile species between July and September 2021

Water vole

5.43 Biological records provided by DBRC have identified water vole within 2km of the Site.

5.44 The Site itself is considered to provide limited opportunities for water vole with onsite ditches largely being small in size and disconnected to the wider area. However, there is potential for the watercourse adjacent to the Site to the west to provide opportunities for this species for forage and shelter.

5.45 Surveys were completed at Park Farm in spring/summer 2021. No further survey is proposed as the proposed development layout and construction area at Oaklands Farm is not located in proximity to habitat suitable for supporting these species.

Otter

5.46 Biological records provided by DBRC have identified otter within 2km of the Site.

5.47 The Site itself is not considered to provide suitable habitat for this species. However, there is potential for the watercourse adjacent to the Site to the west to provide opportunities for this species for forage and shelter.

5.48 .Surveys were completed at Park Farm in spring/summer 2021. No further survey is proposed as the proposed development layout and construction area at Oaklands Farm is not located in proximity to habitat suitable for supporting these species

Birds

5.49 The Site supports suitable habitat for a range of farmland bird species. Breeding bird surveys of the southern portion of the Site at Oaklands Farm identified total of 56 bird species, include 22 species of conservation concern. The Site was considered to have limited potential for Schedule 1 bird species with the Site having greater potential for bird species of conservation concern, for example ground nesting bird species, such as lapwing. Further surveys were completed for Park Farm between May and August 2021.

Dormouse

5.50 No records of dormouse were provided by DBRC within 2km of the Site. Current distribution of this species in the UK[24] indicates that this species is largely absent from Derbyshire and confirmed presence is restricted to recent reintroduction sites in the north of the County.

5.51 Furthermore, the habitats affected are of very low suitability for supporting this species, with hedgerows subject to high levels of disturbance, being harshly managed, such as from regular flailing, and defunct in nature, with a lack of density or diversity.

5.52 This species typically relies on well-established and connected mature hedgerows and ancient woodland with a diverse range of shrub species for which the Site does not provide. Dormouse are proposed to be scoped out on the basis that there is no potential for significant effects to occur to this species.

Potential Significant Effects of the Proposed Development

Construction

5.53 Potential impacts resulting from construction that need to be considered as part of the EcIA include:

- Direct Habitat Loss;
- Severance;
- Mortality;
- Physical disturbance;
- Noise and lighting disturbance; and
- Contamination.

Operation

5.54 Potential impacts resulting from construction that need to be considered as part of the EcIA include:

- Physical disturbance;
- Noise and lighting disturbance; and
- Changes in habitat management.

Cumulative Effects

5.55 Best practice CIEEM EcIA guidelines explain that cumulative effects can result from individually insignificant but collectively significant actions taking place over a period of time or concentrated in a location. Cumulative effects are particularly important in EcIA as ecological features may be already exposed to background levels of threat or pressure and may be close to critical thresholds where further impact could cause irreversible decline. Cumulative effects can also make habitats and species more vulnerable or sensitive to change.

5.56 This assessment will identify and assess the potential for cumulative effects of proposed schemes within 5km of the Site. The assessment will identify and assess the potential for additive/incremental effects and associated/connect effects.

Effects Scoped Out

5.57 On the basis of the work undertaken to date, the professional judgement of the assessment team and experience from similar projects, it is proposed that all broad impact types will be considered as detailed above. This will be informed by the findings of the further ongoing surveys that will be completed this year in 2021. The assessment will not include Dormouse as set out in paragraph 5.52.

Approach to Mitigation

5.58 Where potential significant effects are identified, mitigation measures will be identified to reduce their significance. The standard mitigation hierarchy applies, whereby the following sequential measures will be considered:

- **Avoidance:** the effect is avoided by removing its pathway, e.g. by avoiding lighting, and designing access infrastructure to align with existing gaps, gates and access track;
- **Mitigation:** measures are taken to reduce the significance of the effect, e.g. vegetation clearance undertaken outside the bird nesting season to avoid disturbance and mortality effects; and
- **Compensation:** where the effect cannot be reduced, alternative action is taken elsewhere within the site boundary or offsite.

5.59 Using the assessment method described above, significant effects will be re-assessed on the basis that mitigation measures will be applied, and a residual significance identified. An important part of this step is the identification of the likely success, or confidence in, the proposed mitigation measure.

[24] Accessed: June 2021.https://ptes.org/campaigns/dormice/about-hazel-dormice/hazel-dormice-range-and-distribution-in-the-uk/

Questions

Question 5.1: Do the consultees agree with the survey scope and methods that are being deployed to inform this project?

Question 5.2: Do the consultees support the proposed applications of the CIEEM EcIA best practice methods[8] detailed above?

Question 5.3: Do the consultees hold any further relevant data sets that may inform the assessment?

Chapter 6
Historic Environment

Introduction

6.1 This chapter sets out the proposed approach to the assessment of potential effects on the historic environment during construction and operation of the Proposed Development.

6.2 In line with policy definitions of the historic environment,[25] this chapter uses the following definition of the historic environment:

"*All aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora*."[26]

6.3 The historic environment is composed of heritage assets: buildings, monuments, sites, places, areas or landscapes that as are identified as having heritage interest, or significance.[27] Heritage significance derives not only from a heritage asset's physical presence, but also from its setting. The NPPF defines setting as: "*The surroundings in which a heritage asset is experienced."*[28] Importantly, its extent is not fixed and may change. Moreover, elements of an asset's setting may make a positive or negative contribution to the significance of an asset, or the ability to understand or appreciate that significance; or may not contribute at all.[29]

Existing Conditions

Information Sources

6.4 The following sources of information have been reviewed during the desk-based research for this Scoping Report:

- The National Heritage List for England (NHLE).
- DCC Historic Environment Record (HER) data.[30]

[25] NPS EN 1 and National Planning Policy Framework (NPPF).
[26] Annex 2: Glossary, National Planning Policy Framework, Department for Communities and Local Government, 2019 p. 67
[27] Annex 2: Glossary, National Planning Policy Framework, Department for Communities and Local Government, 2019 p. 67
[28] Annex 2: Glossary, National Planning Policy Framework, Department for Communities and Local Government, 2019 p. 71
[29] Annex 2: Glossary, National Planning Policy Framework, Department for Communities and Local Government, 2019 p. 71
[30] DCC HER reference CDR11692

- Staffordshire County Council (SCC) Historic Environment Record (HER), accessed via Heritage Gateway.[31]
- Local council online information sources, including conservation area appraisals and local lists.
- Historic and current Ordnance Survey (OS) mapping available via online sources.
- Aerial photography and LiDAR data, available from online sources including Google Earth.

6.5 Consultation with the LVIA topic specialists undertaking scoping indicates that for the historic environment significant visual effects related to the Proposed Development are likely to be confined to within 2.5 km of the site. Accordingly, a 2.5km radius study area, taken from the site boundary, has been used for data gathering on heritage assets at scoping. Designated heritage assets and DCC HER entries[32] within the study area are shown on **Figure 6.1**. Assets and HER entries mentioned in the text are labelled on the figure.

The Site

6.6 There are no designated heritage assets within the Site.

6.7 Although the immediate surroundings of the Site appear to indicate exploitation of the area from earlier prehistory to the medieval period, there are only three DCC HER entries within the site itself and these consist of:

- An enclosure (DCC HER ref. MDR7113) known from cropmarks and ascribed an "unknown medieval date" in the HER entry. This cropmark is visible, to an extent, on recent digital aerial photography and does not align with the axes of fields recorded in this area on early historic mapping which are of probable medieval date. It is more likely that it is of later prehistoric to Romano-British date and may represent an element of a field system.
- Two flint cores, one Late Mesolithic/Early Neolithic, the other Late Neolithic/Early Bronze Age (DCC HER ref. MDR7801), found during fieldwalking in 1997.
- Cropmarks of field boundaries interpreted as postmedieval in date (DCC HER ref. MDR7120).

Wider area

6.8 The Site is on the undulating watershed between the valleys of the Rivers Trent and Mease and ground level is only c. 20 to 40m higher than the adjacent floodplain of the Trent. The Trent floodplain has extensive prehistoric landscapes, including ritual elements, many of which have been discovered and then removed through quarrying e.g. around Catholme and Alrewas. There are far fewer records of past human activity away from the floodplain. The nature of land cover away from the floodplain (i.e. some permanent pasture) may, in part, explain lower levels of records but the high level of archaeological scrutiny which the Trent floodplain has had may also explain this.

Designated heritage assets

6.9 The following designated heritage assets lie within 2.5km of the Site:

- Three scheduled monuments.
- 34 listed buildings.
- Walton-on-Trent conservation area.

6.10 The scheduled monuments are located to the west of the Proposed Development and represent a prehistoric domestic, funerary and ceremonial landscape. This includes a monument complex containing very rare timber circle and hengiform[33] monuments (NHLE ref: 1019109), the remains of a barrow cemetery (NHLE ref: 1006076), and an univallate hillfort (NHLE ref: 1017742).

Non-designated heritage assets

6.11 As stated above, whilst it is possible that the relative paucity of HER entries may reflect a lack of previous attention, some fieldwork is known to have occurred within the site. This does not appear to have resulted in the discovery of any archaeological heritage assets. Geophysical survey appears to have been undertaken on a 50 m wide transect through the centre of the site in 2007. The southeasternmost field and western end of the site was subject to a 'ploughed field survey'[34] in late 1980s. A large swathe of the west of the site

[31] Available at: https://www.heritagegateway.org.uk/gateway/. An HER data request has been lodged with SCC councils however no data was received from them prior to preparation of this scoping chapter.
[32] HER Monument and Portable Antiquities Scheme records are shown on the figure. Monument records span known heritage assets, findspots of artefacts, potential or suspected features without clear associated physical evidence (e.g. a medieval moot (meeting) point known from documentary evidence) and features which are known to have been destroyed and are no longer extant (e.g. an archaeological site that has been fully excavated and was sited in land that has since been quarried).
[33] Defined as "A small, circular Late Neolithic/Early Bronze Age enclosure which bears a morphological resemblance to henges, but may belong to another category of circular earthwork-defined monuments, or is enclosed by something other than a bank and ditch" by the Forum for Information Standards on Heritage (FISH) 2021 *Monument Type Thesaurus*. http://www.heritage-standards.org.uk/wp-content/uploads/2021/02/Mon_alpha.pdf
[34] Essentially a survey whereby an archaeologist walks across a ploughed field and records the presence of artefactual remains or other indicators (e.g. changes in soil colour, building material) which may indicate the presence of archaeological remains.

was subject to fieldwalking in the late 1990s (DCC HER ref. EDR1750).

6.12 There are several extensive flint and artefact scatters recorded in the immediate vicinity of the site and these indicate human activity from earlier prehistory to the medieval period.

6.13 Portable Antiquities Scheme (PAS)[35] records held by the HER indicate a high concentration of artefacts coming from the area between Oaklands Farm and Donkhill Farm, c. 1.9 km southwest of the Site (**Figure 6.1**). This includes a Bronze Age ring, Iron Age brooch, a large amount of Roman material,[36] early medieval objects[37] and some medieval artefacts[38] amongst the kind of post-medieval material more normally found in fields in the Trent Valley. Whilst it is possible that this concentration may reflect the focus of an individual metal detectorist, or a group of detectorists, the range of material, both in date and object form, appears to point to some focus of activity, perhaps a settlement, in this location. Away from this area, there are further PAS records of earlier prehistoric to medieval date in the immediate site environs. These include a concentration of artefacts of mainly medieval date immediately east of the site near Hill Covert. The Site itself only contains four PAS records, which all lie in the northern section of the Site. They relate to finds of Bronze Age to medieval artefacts near Park Farm and of a medieval finger ring in fields north of Chapmans Nurseries.

6.14 The course of a possible Roman Road, running between Ibstock in Leicestershire and Rykneild Street in Staffordshire, runs though the northern tip of the site (**Figure 6.1**: MDR11325).

6.15 The northern tip of the site lies within the former extent of Drakelow Park (**Figure 6.1**: MDR2518). Drakelow Park was originally a deer park, established in the medieval period, which was converted to a landscape parkland around Drakelow Hall in the post-medieval period. The park was enlarged several times during its history, including in the 18th and 19th century, and remained in existence into the 1950s. It was sold in 1950 for development of a series of coal-fired power stations, collectively known as Drakelow, and now themselves decommissioned and removed. Despite development and decommissioning of the power stations, some elements of the parkland, such as its extent and peripheral plantations, remain legible in the landscape. The remaining HER entries within the site also evidence medieval use of the land and show that it was farmed during this period.[39]

6.16 Oaklands Farm is not a listed building but appears to be of some age, being shown on the first edition Ordnance Survey along with what appears to be a range of agricultural workers' cottages on the opposite side of the road (Derbyshire 1:2,500 scale 1883). Both sets of buildings appear to have been extended and the farm has a range of recent bungalows and an extensive complex of more recent agricultural sheds and slurry lake to its north. Despite subsequent changes, both assets appear to have retained earlier fabric and be recognisable as historic rural buildings. As such, they may be considered as non-designated heritage assets.

6.17 The fields within the Site are now heavily altered from the layout shown on the early Ordnance Survey editions, though some boundaries do survive (mainly hedges). The origin of this field system appears to be in piecemeal enclosure of former open field land, probably earlier post-medieval enclosure. Fieldscapes west of the site are much less heavily altered that those within the site and are a remarkably good preservation of fieldscapes of this nature.

6.18 LiDAR data shows multiple shallow pits in several of the fields within the site, these are probably former marl pits[40] but some of them are quite large so the potential for them to derive from some small-scale quarrying needs to be borne in mind. All the pits are of some age as they appear to be mapped, in part, on the first edition Ordnance Survey.

Proposed Surveys and Assessment Methodology

Legislation, Policy and Guidance

6.19 The following will inform the approach to the design and assessment of the Proposed Development:

- Infrastructure Planning (Decisions) Regulations 2010.
- The Planning (Listed Buildings and Conservation Areas) Act 1990 (excluding normal planning procedures, which are disapplied by the DCO if granted).
- The Ancient Monuments and Archaeological Areas Act 1979.

[35] The PAS is an identification and recording service for archaeological material found by members of the public and includes finds made and reported by metal detectorists.
[36] Including many slingshot bullets (*glandes*)
[37] Gaming pieces, spindle whorls and a spur.
[38] Including an ampulla and brooch as well as coins.
[39] Cropmarks derived from ridge and furrow, a form of medieval farming practice which created distinctive sinuous earthworks.
[40] A pit created when marl, a mixture of clay and carbonate of lime, is excavated for use as a fertiliser. Definition derived from Forum for Information Standards on Heritage (FISH) 2021 *Monument Type Thesaurus*.

- Department for Energy and Climate Change. 2011. Overarching National Policy Statement for Energy (EN-1).
- Department for Energy and Climate Change. 2011. National Policy Statement for Renewable Energy Infrastructure (EN-3).
- Department for Energy and Climate Change. 2011. National Policy Statement for Electricity Networks Infrastructure (EN-5).
- National Planning Policy Framework (NPPF).
- Historic England. 2015. Managing Significance in Decision-Taking in the Historic Environment: Historic Environment Good Practice Advice in Planning Note 2 (GPA 2).
- Historic England. 2017. The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (GPA 3).
- Historic England. 2019. Statements of Heritage Significance: Analysing Significance in Heritage Assets.
- Historic England. 2008. Conservation Principles, Policies and Guidance.
- Chartered Institute for Archaeologists (CIfA). 2020. Standard and Guidance for historic environment desk-based assessment.
- South Derbyshire Local Plan. Adopted June 2016. (Policy BNE2: Heritage Assets)

Proposed Study Area

6.20 A 2.5km study area is proposed for the assessment. This has been informed by a review of the Proposed Development's Zone of Theoretical Visibility (ZTV), as recommended by Historic England Guidance, and liaison with the LVIA topic specialists which indicates significant visual effects will be confined to within 2.5 km of the site.

Desk Study and Field Surveys

6.21 The sources listed at paragraph 6.4 will also be used for the ES baseline, with additional information collated via desk-based assessment (DBA) and site visits. The DBA will make use of existing documentary evidence as well as additional archival research where necessary and if permissible, given the on-going Covid-19 restrictions.

6.22 As per CIfA guidance for DBAs,[41] the site visit will enable the assessment of the Site's character, identify visible historic features, and assess possible factors that may affect the survival or condition of known or potential assets. As part of the site visit, assets within the study area that have been identified as potentially sensitive to effects will be visited to further understand the contribution made by setting to their significance and the way in which the Proposed Development may interact with their setting. A photographic record will be made of the site visit and a selection of images utilised in the baseline reporting.

Consultation

6.23 Consultation will be undertaken with:

- Historic England
- DCC, as archaeological advisor to SDDC.
- South Derbyshire District Council.

Assessment method

Receptor Value

6.24 The value of receptors (heritage assets) is referred to in historic environment policy as their 'significance'. To avoid confusion with the EIA concept of the 'Significance of Effect' upon receptors, the significance of heritage assets will be termed their 'heritage significance'. This will be articulated with reference to the Historic England (2008) guidance document *Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment*, hereafter referred to as 'Conservation Principles' which sets out four key values:

- **Evidential value** - deriving from the potential of a place to yield evidence about past human activity.
- **Historical value** - deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. This is typically either illustrative or associative.
- **Aesthetic value** – deriving from the ways in which people draw sensory and intellectual stimulation from a place. This includes architectural and artistic interest.
- **Communal value** - deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

6.25 These values are a way of transparently articulating an asset's archaeological, architectural or historic interest. Whilst they can help explain an asset's heritage significance, they do not set out the level of that significance. For that, professional

[41] CIfA 2020. Standard and guidance for historic environment desk-based assessment.

judgment will be employed alongside use of the designation criteria for assets of national significance, where appropriate.

6.26 The level of assets' heritage significance will be articulated using the following criteria:

- **High**: assets of national or greater importance, comprising designated heritage assets and non-designated assets of demonstrably equivalent value.
- **Medium**: assets of regional importance, for example those identified by regional research priorities, via engagement with relevant consultees or through the assessment of their significance.
- **Low**: assets of local importance.
- **Uncertain**: assets of uncertain importance.

6.27 The contribution made by setting to an asset's heritage significance will be set out discursively with reference to HE's setting guidance.[42] This, and an understanding of the nature and likely interaction of the Proposed Development with the contribution of setting to the asset's significance, will be used to determine sensitivity to setting change. All heritage assets within the Site will be assumed to be of high sensitivity to physical change, unless otherwise stated.

Effect levels

6.28 Effects to assets will be expressed with reference to the degree of harm that will be created. Current historic environment policy outlines three levels of harm: total loss, substantial harm and less than substantial harm.[43] This may be understood as the overall effect to an asset and equates most closely to an extent to the concept of 'significance of effect' commonly used in EIA.

6.29 The following levels of effect, drawing on Section 5.8 of NPS EN-1, will be used to convey the Proposed Development's predicted effects to heritage assets:

- Total loss – removal of the entire heritage asset.
- Substantial harm – change or changes which either remove altogether or very much reduce a heritage asset's significance.
- Less than substantial harm – change or changes which do not remove altogether or very much reduce a heritage asset's significance.
- None – the proposed project will leave the asset's heritage significance unaffected.
- Beneficial – the proposed project will enhance the heritage significance of the asset.

6.30 The level of effect ascribed will be supported by a description of how the Proposed Development will affect the receptor's heritage significance and whether or not this effect will be temporary or permanent. A clear statement will be made as to whether or not an effect is considered to be a significant effect in terms of the EIA regulations. Without prejudice to the findings of the assessment, total loss or substantial harm to a High value heritage asset, i.e. a designated heritage asset or non-designated asset of demonstrably equivalent value, will be considered to be a significant effect.

Potential Sensitive Receptors

6.31 This section set outs the assets scoped into the assessment on the basis of the preliminary baseline review undertaken for the Scoping Report. The need for inclusion of any other assets (e.g. those hitherto unrecorded but recognised during site surveys) will be kept under review during baseline studies for the ES.

6.32 The assets scoped in comprise all known assets within the Site and those in proximity to the Site which may be affected due to change in their setting. Assets sensitive to setting change as a consequence of the Proposed Development have been identified by applying the first two steps of Historic England's recommended approach to setting assessment.[44]

- **Step 1**: Identify which heritage assets and their settings are affected.
- **Step 2:** Assess the degree to which these settings make a contribution to the significance of the heritage asset(s) or allow significance to be appreciated.

6.33 For Step 1 an intersection analysis has been undertaken. This identified all designated and non-designated heritage assets that intersect with both the 2.5km study area and the ZTV[45] (i.e. all assets within 2.5km that have theoretical visibility of the Proposed Development). **Figure 6.1** shows all the cultural heritage assets in the Site and 2.5km study area plus the ZTV to demonstrate this intersection. For

[42] Historic England. 2017. The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (GPA 3)
[43] NPS EN 1 draws its terminology from Planning Policy Statement (PPS) 5 (2010) on the Historic Environment. PPS 5 was superseded by NPPF in 2012. NPS EN 1 footnotes 118 and 121 make it clear that successors to PPS 5 are relevant to the application of this NPS. NPPF uses the same principles and terminology with regard to the historic environment as PPS 5. As such, NPPF terminology and its supporting Planning Practice Guidance (PPG), articulate the current approach to evidence and decision making on historic environment matters and will be used in assessments for this scheme.
[44] Historic England. 2017. The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3 (GPA 3)
[45] The ZTV was run using 2m LiDAR Digital Surface Model data and that a screening layer with a viewer height of 2m was created using building and tree heights.

Step 2, all assets identified as having theoretical intervisibility were then reviewed to develop a high-level understanding of:

- their heritage significance, including any contribution made by setting; and
- the potential interaction between that significance and the Proposed Development.

6.34 All assets identified as having the potential to experience change to their heritage significance have been scoped into the assessment. Assets that do not have a setting that contributes to their significance, or, which have a setting that contributes to their significance but does not interact with the Proposed Development, have been scoped out of the assessment.

6.35 Consideration was given to whether those assets that do not have intervisibility with the Proposed Development have any other form of setting relationship with the site (e.g. non-visual factors such as historical, artistic, literary, place name, or scenic associations, intellectual relationships, or other sensory factors). Assets that have such relationships that may be changed by the Proposed Development are scoped into the assessment.

Hitherto unrecorded assets

6.36 The potential for the Site to contain hitherto unrecorded assets, either in the form of buried archaeological remains or previously unrecognised above-ground features, will be reviewed during the ES baseline research. This will be considered in relation to the pattern and significance of known heritage assets (drawn from the HER data and review of historic mapping and digital aerial imagery) in the vicinity, as well as the history of the Site's land use and the findings of site surveys/ evaluation.

Potential Significant Effects of the Proposed Development

6.37 Effects will be described in terms of the extent to which the Proposed Development will degrade or enhance the assets' significance based on professional judgement. Where appropriate wireframe or accurate visual representations will be produced to inform the assessment of effects.

6.38 In accordance with the EIA Regulations, potential significant effects will be reported on in the ES chapter. Non-significant effects will be reported in a technical appendix to ensure that potential harm to the historic environment is reported in accordance with the NPPF.

Construction

6.39 Taking account of the findings of the work undertaken to date, whilst still adopting a precautionary approach at this preliminary stage, potential construction (including cumulative) effects to be assessed in the EIA include:

- Direct effects to heritage assets within the Proposed Development footprint; and
- Effects related to setting change.

Operational

6.40 Taking account of the findings of the work undertaken to date, whilst still adopting a precautionary approach at this preliminary stage, potential operational (including cumulative) effects to be assessed in the EIA include:

- Effects related to setting change to assets within the Site and study area.

Cumulative Effects

6.41 Once the cumulative schemes for assessment have been identified they will be reviewed to determine whether cumulative effects to heritage assets may arise. Based on the preliminary understanding of the historic environment baseline it is considered that cumulative physical effects are unlikely given the nature of the Proposed Development and heritage assets within the Site. However, effects to the heritage significance of assets beyond the Site as a result of changes in their setting associated with the cumulative schemes may be possible and will be considered where identified.

Effects Scoped Out

6.42 On the basis of the work undertaken to date, the professional judgement of the assessment team and experience from other similar projects and consultation responses, it is proposed that the following effects can be scoped out due to good design and implementation of standard good practice construction measures:

- Direct physical effects during operation (since physical effects will only occur during construction).
- Direct physical effects to assets beyond the Proposed Development footprint.
- Effects related to setting change for all heritage assets lying more than 2.5km from the Site[46].

[46] This distance is based on professional judgement and is similar to that used on other solar schemes.

Approach to Mitigation

6.43 In the first instance the Proposed Development will seek to avoid and minimise effects by design. Where interaction cannot be completely avoided, additional mitigation measures to prevent, reduce, and/or where possible offset these effects will be proposed.

6.44 Measures which may be adopted include:

- The fencing off or marking out of heritage assets in proximity to working areas;
- Investigation and recording of assets/affected sections of assets in advance of construction activities where avoidance of effects is not feasible.
- Implementation of a working protocol should unrecorded heritage assets, including archaeological features, be discovered in the course of works.

Questions

Question 6.1: Do the consultees consider the study area appropriate?

Question 6.2: Are there any other relevant consultees who should be consulted about this topic?

Question 6.3: Are consultees aware of any other supplementary guidance of relevance to the assessment of effects to heritage assets?

Question 6.4: Is the approach to the assessment of effects appropriate?

Question 6.5: Is the approach to field survey considered appropriate?

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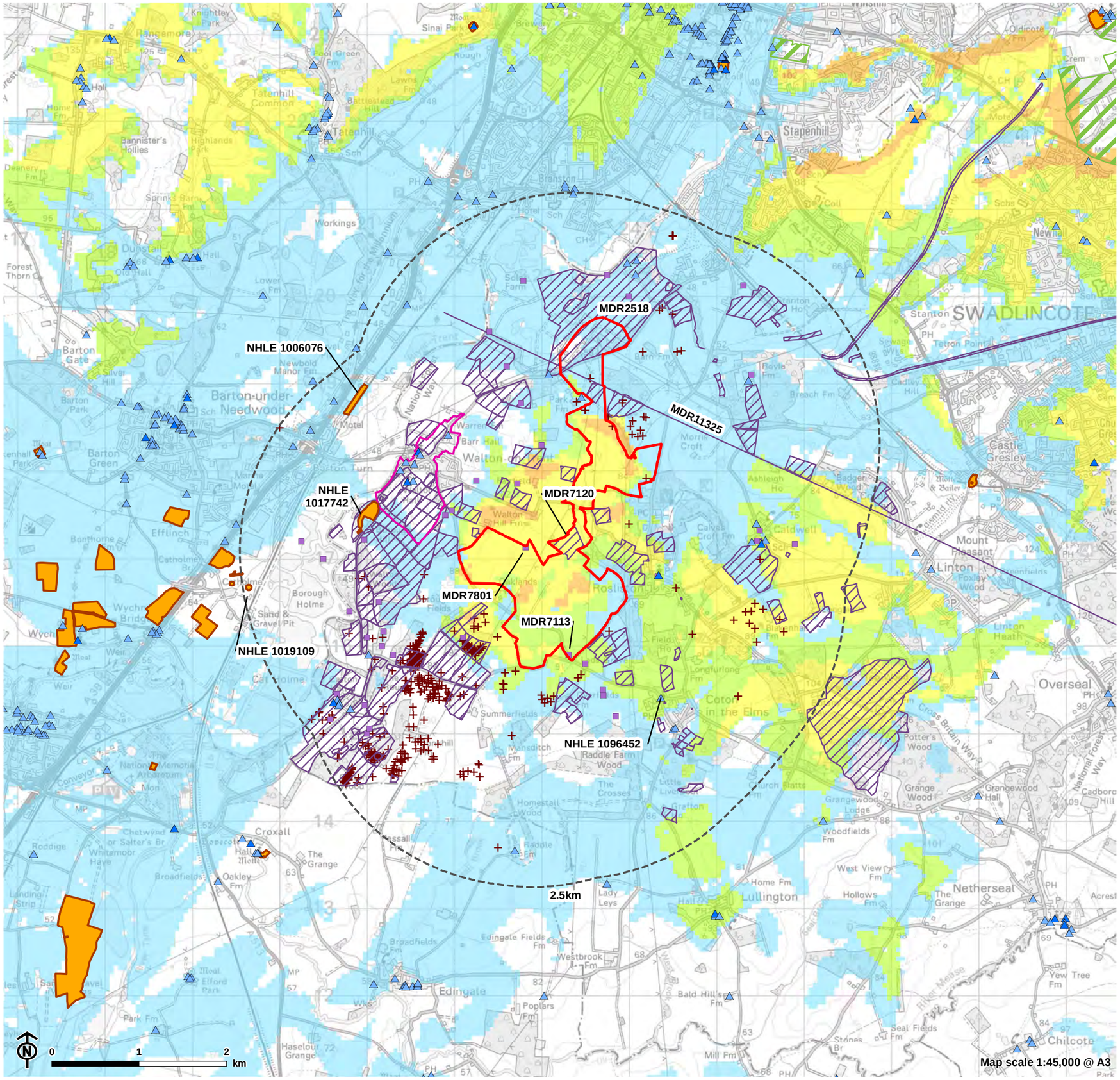
Figure 6.1: Designated heritage assets and Derbyshire Historic Environment Record Entries



- Site boundary
- Study Area

Designated Heritage assets

- Scheduled Monuments
- Registered Parks Gardens
- Listed Buildings I
- Listed Buildings II*
- Listed Buildings II
- Walton-on-Trent Conservation Area

Derbyshire Historic Environment Record Entries

- Points
- Polylines
- Polygons
- Portable Antiquities Scheme

Bareground ZTV to Maximum Panel Height (2.7m)

- Up to 25% visible
- Up to 50% visible
- Up to 75% visible
- Up to 100% visible

Note: The ZTV is calculated to maximum panel height of 2.7m from a viewing height of 2m above ground level.

The terrain model assumes bare ground and is derived from OS Terrain 50 height data.

Earth curvature and atmospheric refraction have been taken into account. The ZTV was calculated using ArcMap 10.5.1 software.

BayWa r.e.

CB: EB:Packham_B LUC Fig6_1_Designated_heritage_assets_and_HER 16/08/2021
Source: OS, LUC, BayWa r.e., Historic England, Derbyshire County Council

Chapter 7
Transport and Access

Introduction

7.1 This chapter considers the Traffic and Access impacts of the Proposed Development though construction, operation and decommissioning phases.

7.2 This chapter has been prepared by Integrated Transport Planning (ITP) – specialist transport planning consultants with a wide range of experience across development planning sectors.

Existing Conditions

Information Sources

7.3 The following sources of information have been reviewed during the desk-based research for this Scoping Report:

- Ordnance Survey Open Data; and
- Online mapping, e.g. Open Street Map, Google Maps.

Proposed Surveys and Assessment Methodology

Legislation, Policy and Guidance

7.4 The following guidance documents will inform the approach to the design and assessment of the Proposed Development:

- Department for Energy and Climate Change. 2011. Overarching National Policy Statement for Energy (EN-1).
- Department for Energy and Climate Change. 2011. National Policy Statement for Renewable Energy Infrastructure (EN-3).
- Department for Energy and Climate Change. 2011. National Policy Statement for Electricity Networks Infrastructure (EN-5).
- National Planning Policy Framework.
- Design Manual for Roads and Bridges.

- Manual for Streets[47].
- 6 C's Design Guide / Delivering Streets and Places[48].

Proposed Study Area

7.5 The impact from construction and maintenance activities will largely be experienced on the local unclassified roads adjacent to the Site since these have a lower baseline traffic level than surrounding classified routes.

7.6 The nearest classified A-roads are located approximately 5km from the Site, which is considered an appropriate radius for consideration.

7.7 The construction impact will be concentrated on the local road network immediately surrounding the Site, but journeys will be made to and from further afield. Since the impact will be quickly diluted away from the Site, no wider assessment is considered necessary.

7.8 During operation the impact of maintenance trips will be negligible on the wider network.

Desk Study and Field Surveys

Desk Study

7.9 Potential receptors have been identified using online mapping and satellite imagery and will be screened as part of future EIA work. These include:

- Villages and standalone residential properties
- Visitor attractions
- Commercial premises

7.10 Two principal routes for construction traffic have been identified between the Site and the nearest classified A-roads (see **Figure 7.1**). These have sought to avoid potential receptors and allow for physical road constraints and limitations, such as weight and height restrictions.

7.11 Separate construction vehicle routes have been proposed for each site using online mapping and street view imagery. These have been proposed to seek to avoid as many potential receptors as possible, whilst recognising physical access constraints, such as height and weight restrictions. The routes are taken from the nearest classified A-roads which link directly to the Strategic Road Network (see **Figure 7.1**). The road hazards identified include a weak and narrow bridge in Walton-on-Trent, and low bridges under the railway lines north east of Caldwell and west of Croxall.

7.12 Access to the Park Farm site is from the A444/A5189 at Stapenhill via Rosliston Road and Walton Road. This route is also anticipated to carry any required abnormal loads, subject to a further detailed route study.

7.13 Access to the Oaklands site is from the A513 near Alrewas via Catton.

7.14 Noting the height restriction on the A513, it is proposed that any abnormal loads travelling to the Oaklands site do so from Junction 11 of the M42 via the A444. This will require passing through the village of Coton in the Elms, however these limited events would be subject to detailed coordination with the Highways Authority and Police. The delivery of abnormal loads will be managed through a Construction Traffic Management Plan (CTMP) to be submitted with the application.

Field Surveys

7.15 Due to the impact of the Covid-19 pandemic, it has not been possible to collect reliable and accurate traffic survey to date. This is expected to take place from September 2021, subject to consultation with the relevant highway authorities.

7.16 Site visits are also expected to take place at the same time as traffic surveys to identify any survey anomalies and confirm the proposed vehicle routing.

Consultation

7.17 Following EIA scoping, discussions on the format and scope of the proposed ES Transport & Access chapter will continue with Derbyshire County Council's Highways Development Control Officers.

7.18 Pre-application comments will also be sought from Highways England, in their role as Highway Authority for the strategic road network, which locally includes the A38.

7.19 This additional consultation will be necessary to discuss the results and implications of planned traffic survey data.

Potential Significant Effects of the Proposed Development

Construction

7.20 The potential impact is most likely to arise during the construction phases, when materials and contractors will have to be brought to the Site. The impact will be a temporary rise in the amount of traffic travelling to and from the Site on the local road network.

[47] Department for Transport (2007) Manual for Streets. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/341513/pdfmanforstreets.pdf

[48] Derbyshire County Council (2017) Delivering Streets and Places. Available at: https://www.nottinghaminsight.org.uk/Document-Library/Document-Library/197452

7.21 This is likely to consist of:

- Delivery of solar panels, mounting equipment, electrical hardware and connections
- Civil, electrical and landscaping contractors

7.22 There are no identified intense activities, such as large-scale concrete pours, which would result in a large impact over a short time. The impact is likely to be evenly spread over the construction period.

7.23 The Proposed Development is an established technology that uses standard components with minimal ground works. The relative complexity and associated risk are therefore low.

7.24 Due to the predictable nature of the construction programme and known precedents of other similar sites, the likely impact is highly predictable and relatively fixed.

Operation

7.25 A much-reduced operational impact will include:

- Scheduled and emergency maintenance
- Landscaping, e.g. grass cutting/grazing

7.26 Maintenance of the Site is likely to follow a rolling timetable and therefore will not result in intense activity.

Decommissioning

7.27 Eventual decommissioning of the Site will result in much the same impact as during construction, with no additional traffic and transport implications.

Cumulative Effects

7.28 There are a limited number of major committed and emerging developments locally, including a similar proposed solar farm site at Lullington and the significant housing allocation (2,239 units) at Drakelow Park. There is no inherent conflict in traffic and any interaction can be suitably managed by coordinating Construction Traffic Management Plans.

Effects Scoped Out

7.29 The impacts will occur in line with the construction activities, so will occur through the working day. The most significant period of impact, during construction, is temporary by definition and will not result in any sustained and irreversible effects. Once construction is complete, traffic levels will reduce to 1 or 2 mid-sized vans or pickup trucks at the site each day for maintenance activities. Tractors or quad bikes with attachments for landscaping will also be in attendance for annual and biannual landscaping works.

7.30 On this basis, and as presented in **Table 7.1**, it is proposed that the traffic and transport impact of the construction phase is assessed through the EIA process, with the operational phase scoped out of further assessment.

7.31 During the time-limited construction period, the potential for driver and pedestrian delay will be monitored and controlled through a Construction Environmental Management Plan. This will stipulate working hours and approved access routes that will limit, if not eliminate, significant impact on drivers and pedestrians. No further assessment of the potential impact is therefore considered necessary.

7.32 The rural nature of the sites further reduces the likelihood of concentrated impact on driver or pedestrian delay due to the low level of congestion and pedestrian movements within the vicinity of the sites. Further away from the site, any impact will become diluted by route choice and variety of destinations.

7.33 Once in operation, the minimal trip generation will have a negligible traffic impact and therefore no assessment of driver or pedestrian delay is deemed necessary

7.34 Eventual decommissioning will follow a similar process to construction, therefore separate assessment is not considered necessary. It can be assumed that the calculated impact of construction can be applied to decommissioning.

Approach to Mitigation

7.35 Due to the planned nature of construction, multiple actions can be put in place to reduce the scale and impact of the Proposed Development. This can formally be controlled by a Construction Traffic Management Plan, and is likely to include:

- Approved HGV routing
- Temporary signage and traffic control
- Haul track to contain internal trips within the site
- Limited operational hours, e.g. deliveries by HGV can be restricted to certain hours outside of peak periods. Operatives travelling to and from the site will be encouraged to travel outside of peak hours and shift patterns can be arranged in order to facilitate this.

7.36 Access routes to the Site are also constrained by several features, including the River Trent and railway lines, which means that the routing of traffic can be reliably predicted and managed.

7.37 The impact of the operational phase will naturally be limited to the minimum necessary. The proposed use does not require intensive maintenance and there will be minimal staff on site each day (likely to be 3 people on site) therefore no further reduction is necessary.

Questions

Question 7.1: Are there any specific conditions or requirements being sought for Drakelow Park allocation regarding operational hours, vehicle routing or similar which we can align to?

Table 7.1: Summary of potential likely effects

Criteria	Traffic and Access Impact		
	Construction	Operation	Decommission
Magnitude and spatial extent	Medium	Low	Medium
Nature of the impact	Medium	Low	Medium
Transboundary nature	Low	Low	Low
Intensity and complexity	Low	Low	Low
Probability of the impact	High	High	High
Expected onset, duration, frequency and reversibility	Medium	Low	Medium
Cumulation with other existing and/or approved development	Low	Low	Low
Possibility of effectively reducing the impact	High	-	High

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Figure 7.1: Proposed vehicle routes to the site

Site boundary
Road hazard
Recommended access route
Abnormal load route (subject to detailed study)
A Road
B Road
Potential receptors
Other proposed solar farm

Weak and Narrow Bridge (3T mgw and 7'6")

Low Bridge (12'6")

Low Bridge (13'9")

0 1 2 km

Map scale 1:40,000 @ A3

CB: EB:Packham_B LUC Fig7_1_Vehicle_routes 16/08/2021
Source: OS, LUC, BayWa r.e., ITP World

BayWa r.e.

Chapter 8
Noise

Introduction

8.1 This chapter considers the scope and methodology for the assessment of noise and vibration effects at sensitive receptors surrounding the Proposed Development, together with a summary of preliminary information available at this stage.

8.2 This chapter has been prepared by Sustainable Acoustics Ltd.

Existing Conditions

Information Sources

8.3 The following sources of information have been reviewed during the desk-based research for this Scoping Report:

- South Derbyshire District Council Local Plan and Supplementary Planning Documents.
- Natural England Open Data Geoportal.
- Derbyshire Mapping Portal.
- Planning applications reference DMOT/2020/1374 (screening request for Solar Farm at Land north of Lullington, Swandlincote) and DMPA/2020/1460 (Drakelow Park Housing allocation for up to 2,239 dwellings) on South Derbyshire District Council planning portal.
- EirGrid Evidence Based Environmental Studies Study 8: Noise Literature review and evidence based field study on the noise effects of high voltage transmission development.

Existing noise Climate

8.4 An initial daytime noise survey was undertaken in May 2021 to observe the existing noise climate and determine existing noise and vibration sources near to the Site.

8.5 The Site and surrounding area are predominantly rural land in farming use. Ambient and background noise levels are generally controlled by road traffic noise on local roads, farm animals and birdsong. Local roads are relatively lightly

trafficked and consequently noise levels around the Site are low. The busiest road is Walton Road to the north of Park Farm.

8.6 Daytime background noise levels at the nearest residential properties around the Site typically range between approximately 30-45 dB L_{A90}, with average ambient noise levels of approximately 40-55 dB L_{Aeq}, which is common for a rural area.

8.7 Approximately 2km to the north-west of the Site is the A38, which was not observed to be audible during the initial noise survey but may potentially contribute to background noise levels under north-westerly wind direction. There is also a railway line parallel to the A38 running from Litchfield/ Tamworth to the south towards Burton-upon-Trent to the north and on towards Derby, however, this was also not audible during the initial daytime noise survey under calm/southerly wind conditions. The line carries freight traffic and there are sidings at Barton-under-Needwood approximately 2km to the west.

8.8 To the north of Walton Road is the former Drakelow Power Station. Existing high voltage overhead lines cross the Site towards Drakelow Power Station. During the initial survey, one of these lines was observed to generate noticeable 'corona discharge' crackle noise during dry conditions, which was measurable above the background noise level at around 50m away and in one location faintly audible beyond 200m, which is less common and may be an old line. Noise from high voltage power lines is typically more significant in wet conditions.

8.9 Short term noise sources include farming activity and it is noted that some of the farm buildings in the area contain industrial units. Ventilation fans on barns at Oaklands farm run continuously which control background noise levels at this location.

8.10 No significant sources of vibration were observed during the initial survey.

Proposed Surveys and Assessment Methodology

Legislation, Policy and Guidance

8.11 The following guidance documents will inform the approach to the design and assessment of the Development:

- The Control of Pollution Act 1974.
- British Standard BS5228:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites*.
- The Environmental Protection Act 1990.
- The National Planning Policy Framework (NPPF).
- The Noise Policy Statement for England (NPSE).
- Planning Policy Guidance on Noise (PPG:Noise) 2019.
- Department for Energy and Climate Change. 2011. Overarching National Policy Statement for Energy (EN-1).
- Department for Energy and Climate Change. 2011. National Policy Statement for Renewable Energy Infrastructure (EN-3).
- Department for Energy and Climate Change. 2011. National Policy Statement for Electricity Networks Infrastructure (EN-5).
- British Standard BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.
- South Derbyshire District Council Local Plan.

Construction and Decommissioning

8.12 Statutory control of noise from construction sites is implemented through the Control of Pollution Act 1974 (COPA). Section 60 of the COPA enables a local authority to serve notice of its requirements for the control of site noise, taking account of any codes of practice issued under Part III of the COPA, and the need to ensure that "best practicable means" are employed. Section 61 allows those undertaking works to apply to the Local Authority in advance with a proposed program to avoid notice being served upon them.

8.13 The British Standard BS5228:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites* includes a method for the prediction of noise levels resulting from demolition, site preparation and construction works, including construction traffic movement along haul roads. The Standard outlines methods of setting noise limits from sites, taking account of existing noise levels. Attention is drawn to legislative controls, selection of the most suitable methods to provide an appropriate level of noise control and establishing community relations.

Operation

8.14 Legislation to protect people from the adverse effects of noise is provided by the Environmental Protection Act 1990, which enables a Noise Abatement Notice to be issued by the Local Authority if it is considered that a "nuisance" is being caused. The Act does not, however, provide an objective basis on which to judge whether a noise is a nuisance.

8.15 The National Planning Policy Framework (NPPF) provides policy on noise in Paragraph 180 in which the aim is to "*mitigate and reduce to a minimum adverse impact*" and to

"*avoid significant adverse impacts on health and quality of life*".

8.16 The Noise Policy Statement for England (NPSE) sets out policy vision to "*Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development*".

8.17 Further guidance is provide in Planning Policy Guidance on Noise (PPG:Noise) 2019, in which it is stated that "*good acoustic design needs to be considered early in the planning process*". Examples of outcomes are given; at the Lowest Observed Adverse Effect Level (LOAEL), "Noise can be heard and causes small changes in behaviour, attitude or other physiological response".

8.18 Overarching National Policy Statement for Energy (EN-1) sets out national policy for energy development. Reference will be made to Section 5.11.4 in the ES, which describes what the Applicant should include in noise assessments.

8.19 National Policy Statement for Electricity Networks Infrastructure (EN-5), Section 2.9, identifies the potential noise effects and conditions required in relation to high-voltage cables and substation equipment. It recommends the use of alternative assessment methods (such as National Grid TR(T)94 - *A Method for Assessing the Community Response to Overhead Line Noise*), which consider the background noise during wet conditions.

8.20 Commercial and industrial noise sources are normally assessed and rated using the methodology in BS4142:2014+A1:2019. The sound from the industrial/commercial source is rated by considering the sound level and its characteristics, such as tonal, impulsive or intermittency. The rating level is then compared to the existing background noise level to determine the likelihood of an adverse impact on people, depending upon the context.

8.21 Policy SD6, *Sustainable Energy and Power Generation*, of the South Derbyshire District Council Local Plan, states that the Council will support renewable and other energy developments and ancillary buildings or infrastructure subject to consideration "*that proposals will not give rise to unacceptable impacts on local amenity, or give rise to safety concerns, as a result of noise*".

Proposed Study Area

8.22 For assessment purposes, potential noise and vibration sensitive receptors within an approximate 300m radius of the Site, immediate access route and cable route have been identified. These have been identified by desktop study and the list will be refined as details of the Proposed Development are confirmed and through consultation with stakeholders including Environmental Health at South Derbyshire District Council. The receptor locations are identified on **Figure 8.1**.

Table 8.1: Sensitive Receptor Locations

Name	Easting/Northing
Park Farm (Landholder)	423457 318839
Park Farm Cottages	423284 318916
Grove Lodge	423254 319036
Spring Cottage	424010 318630
The Chestnuts	424254 317877
Fair View	424244 317804
Ten Acres	424220 317710
Corner Farm	423507 317548
Walton Lane Farm	423649 317308
Walton Hill Farm	422371 317409
Ladsgrove Cottage	423310 315846
Borough Fields Cottage	422355 616531
Pennyworth Cottage	422368 316527
Twin Oaks House	422541 316531
Twin Oaks House/Oaklands Farm (Landholder)	422453 316534
Walton on Trent	422063 317854
Rosliston	424238 316614
Barn Farm	424445 319231
2 Catton Cottage	422307 315541

Desk Study and Field Surveys

Desk Study

8.23 Construction noise levels will be calculated and assessed using the methodology in BS5228:2009+A1:2014 Part 1 using typical data for likely plant and equipment, or manufacturers data where specific plant and equipment is known.

8.24 If considered to be necessary, construction traffic would be assessed following guidance and methodology in Calculation of Road Traffic Noise (CRTN) 1988 and Design Manual for Roads and Bridges (DMRB), *Sustainability and*

Environment Appraisal LA 111 Noise and Vibration Revision 2, 2020.

8.25 If considered necessary, construction vibration would be assessed following guidance and methodology in BS5228:2009+A1:2014 Part 2.

8.26 Operational noise will be calculated using the methodology described in ISO9613:1996 *Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation* (or other nationally recognised methodology where appropriate) using typical source sound power levels or manufacturers data where specific plant is known. Operation noise will be assessed using the methodology in BS4142:2014+A1:2019 relative to existing background noise levels determined through surveys.

8.27 Noise from high voltage overhead cables (>350kV) will be qualitatively assessed if necessary, with reference to NPS EN-5 and National Grid TR(T)94 - *A Method for Assessing the Community Response to Overhead Line Noise* depending on distance to receptors and taking account of typical rainfall induced background noise levels.

Field Surveys

8.28 In addition to the initial daytime noise survey undertaken, it is proposed to undertake baseline continuous noise monitoring over a period of a few days at key locations identified as being representative of the most effected noise sensitive receptors. The locations would be agreed with Environmental Health at SDDC. The measurement procedures would follow guidance in BS4142:2014+A1:2019 and BS7445-1:2003 '*Description and environment of environmental noise - Part 1: Guide to quantities and procedure*'. This may be supplemented with additional attended measurements at any additional sensitive receptors identified.

Consultation

8.29 SDDC Environmental Health will be consulted with regard to location of additional surveys and the methodology for assessment of noise and vibration as appropriate.

Assumptions and Uncertainties

8.30 Ambient and background noise levels vary from day to day and may be influenced by unpredictable events. For example, the Covid-19 pandemic has disrupted the level of travel which temporarily reduced road traffic noise levels (however overall daily flows on main road had returned to pre-pandemic levels by the time of the initial noise survey in at the end of May 2021). These effects will be minimised by undertaking surveys in appropriate weather conditions for sufficient duration following best practice guidance and accounted for where practicable.

8.31 There will be a degree of uncertainty associated with predictions and calculations. This will be minimised through best practice and use of appropriate methodology and procedure. Where uncertainty is considered to be higher than is typical, this will be identified.

8.32 Details of specific construction plant and equipment, and of operating plant may not be known until detailed design is undertaken. Typical noise and vibration data (such as that in BS5228) and empirical calculations based on likely parameters will be used.

8.33 Location of operational plant is not yet known.

8.34 Information on the likely construction programme is not yet available.

8.35 It is assumed that noise and vibration effects during decommissioning will be similar to the construction phase.

Potential Significant Effects of the Proposed Development

Construction

8.36 Source of noise during construction will include site preparation and development of access tracks with mobile plant such as tracked excavators, installation of substation and battery storage plant, piling solar panel supports, vehicle movements, cable laying and vehicle movements to supply materials to the Site.

8.37 Construction noise will be assessed in the ES.

8.38 Sources of vibration during construction will primarily be limited to piling solar panel supports and movement of mobile plant close to sensitive receptors. The piles required are small and typically limited to less than 3m depth. Assuming a small piling rig with a hammer energy of less than 1 kJ, there is only likely to be potential of minor significance effect within approximately 10m of sensitive properties where there is a risk of complaints of perceptible vibration. There are no properties this close. There is no risk of structural damage to properties. The duration of piling activity near to sensitive properties is also likely to be limited.

8.39 Vibration from large tracked excavators can cause sufficient vibration to give rise to complaints from sensitive receptors when moving within approximately 50m depending on ground conditions, however it is considered unlikely that large units would be required for any significant duration close to sensitive properties and it is noted that there are only 3 properties identified within 50m of the Site boundary. Vibration

from the use of tracked excavators is therefore unlikely to be significant.

8.40 Vibration from vehicle movements on roads and access tracks is generally only noticeable where they are poorly maintained. As such it is considered reasonable to scope construction vibration out of the ES.

Operation

8.41 The sources of noise during the operational phase are considered to be:

- Inverters (to convert from DC to AC);
- Transformer substations and battery storage plant; and
- High voltage overhead cables for connection to the grid (if required and dependent on voltage).

8.42 The solar PV panels and connecting cables do not emit noise.

8.43 Inverters will be 'string' inverters fitted to the rear of PV panels. Inverters can produce a faint hum/electrical nois from small assisted cooling fans. Current generations of string inverters are generally very quiet and typically not likely to be perceptible beyond approximately 10-30m in quiet environments.

8.44 As solar panels require light to operate the noise emission from the above is certain to be highest in the daytime period and significantly lower at night when background noise levels are lower.

8.45 Large transformers can emit a low frequency hum. The main noise source from substations and battery storage plant is typically from cooling fans.

8.46 Overhead cable can give rise to corona discharge noise (crackle) and low frequency hum in specific conditions when it is wet and to a lesser extent where debris has accumulated in a prolonged dry period. This is only likely to be of significance for voltages >350kV and is typically not significant where receptors lie beyond approximately 100m from cables. It should also be noted that background noise levels are higher during rainfall, reducing the relative impact.

8.47 The route of the proposed overhead cable connection to the grid may fall within approximately 100m of residential properties, however it is noted that these properties are already at a similar distance to two existing overhead cable routes towards Drakelow for which higher potential noise levels may be expected during adverse conditions.

8.48 Operational noise as described above will be assessed in the ES.

8.49 There are no significant sources of vibration during the operational phase and assessment of vibration during operation is therefore proposed to be excluded from the scope of the ES.

Decommissioning

8.50 It is assumed that noise and vibration during decommissioning would be similar to and no greater than that during construction.

Cumulative Effects

8.51 A development of up to 2,239 dwellings and community facilities at Drakelow Park is under consultation approximately 1km to the north-east of the Site (DMPA/2020/1460). This may potentially result in increased traffic (during construction and operation) and therefore, increase road traffic noise on some local roads. Operational traffic from the Site is likely to be very low and the cumulative effect during operation would be negligible.

8.52 A proposed solar farm development at Lullington, approximately 2km to the south-east of the Site is of a smaller scale. The only perceived cumulative effect would be from construction traffic sharing the same roads if this occurred during the same period. It is therefore considered that the cumulative impact is likely to be negligible.

8.53 No other significant noise and vibration generating developments proposed near to the Site are known. Where any are identified through consultation with stakeholders, the cumulative effect will be assessed.

8.54 Noise and Vibration impacts may have some influence on other subject areas covered within the ES, for example Historic Environment and Ecology. Commentary on noise and vibration would sit within these chapters.

Effects Scoped Out

8.55 Note that the effects of noise or vibration on Ecology are outside of the scope of this chapter (please refer to Chapter 5), however, no specific noise or vibration sensitive Ecological sites have been identified.

8.56 Noise and vibration from maintenance and traffic during operation is not likely to be significant as the level of maintenance required is low.

8.57 Vibration from vehicle movements on public roads and access tracks is not likely to be significant.

8.58 Vibration from construction is unlikely to be significant beyond the Site.

8.59 Noise and vibration during Decommissioning is assumed to be no greater than that during construction. Therefore, there is no intention to assess decommissioning as a separate stage within this ES.

Approach to Mitigation

8.60 The construction process will follow the guidance in BS5228:2009+A1:2014 to use best practical means to minimise unnecessary noise and vibration. These will be detailed in the Construction Environmental Management Plan (CEMP). The measures will include:

- Appropriate selection of plant and machinery, kept well maintained;
- Equipment switched off when not in use;
- Appropriate phasing to minimise duration of activity close to sensitive receptors;
- Appropriate construction hours; and
- Consideration of routing of construction traffic on public roads.

8.61 Operational noise will be a main consideration when selecting equipment and designing installations. Plant will be located away from sensitive receptors wherever practicable and can be located in enclosures to reduce noise. Noise through ventilation openings and cooling fans can be attenuated. It is assumed that plant will be designed to have no significant tonal, impulsive or intermittent characteristics.

Questions

Question 8.1: Are there any other noise sensitive receptors that should be included in the assessment, for example amenity spaces?

Question 8.2: Should noise from off-site vehicle movements (during construction) on public roads be assessed? If this is a yes, we would propose to carry out a commentary level of assessment by reviewing significant increases in traffic movements.

Question 8.3: Can vibration from vehicle movements on roads and tracks be excluded from the scope?

Question 8.4: Should construction vibration be included in the scope?

Question 8.5: Can assessment of overhead cable noise for cables below 350kV be excluded from the scope?

Question 8.6: Are there any other stakeholders that should be consulted with respect to the assessment of noise and vibration (other than South Derbyshire District Council)?

Oaklands Farm Solar Park
Baywa r.e. UK

LUC

Figure 8.1: Sensitive noise receptor locations

Site boundary
Noise receptor

Barn Farm
Grove Lodge
Park Farm Cottages
Park Farm
Spring Cottage
Walton on Trent
The Chesnuts
Fair View
Ten Acres
Corner Farm
Walton Hill Farm
The Pastures (Walton Lane Farm)
Rosliston
Borough Fields Cottage
Pennyworth Cottage
Twin Oaks House
Oaklands Farm
Ladsgrave Cottage
2 Catton Cottage

0 1 2 km

Map scale 1:17,500 @ A3

CB: EB:Packham_B LUC Fig8_1_Sensitive_noise_receptors 16/08/2021
Source: OS, LUC, BayWa r.e., Sustainable Acoustics

BayWa r.e.

Chapter 9
Socio-Economics

Introduction

9.1 The socio-economic and tourism assessment will assess the likely effects of the Proposed Development on the baseline socio-economic and tourism conditions within the local and wider areas. The Proposed Development is expected to generate socio-economic effects including employment opportunities through the construction of the Proposed Development and spending from employees. Noise or visual effects of the solar farm could also impact on local tourism and recreation.

9.2 Along with socio-economics and tourism, the chapter will consider the following sub-topics:

- Land-use; and
- Recreation.

9.3 This chapter has been prepared by LUC.

Existing Conditions

Information Sources

9.4 The following sources of information will be reviewed during the desk-based research for the baseline for the ES:

- Build Back Better: our plan for growth, UK government;
- The Ten Point Plan for a Green Industrial Revolution, UK Government;
- Recovery and Growth Strategy, D2N2 Local Enterprise Partnership (LEP);
- Economic Development Strategy, South Derbyshire District Council; and
- South Derbyshire Council Website.
- 2011 Census;
- Office for National Statistics (ONS);
- Business Register and Employment Survey (2019);
- Destination Research, Economic Impact of Tourism: Derbyshire (2017); and
- Consultation with SDDC.

9.5 A summary of the existing baseline conditions including the population, economy and tourism within and around the Site has been provided below.

9.6 The local authority area has a population of approximately 105,000 residents, with many residents living in rural areas and the following main settlements:

- Swadlincote (35,000);
- Melbourne (6,500); and
- Hilton (7,714).

9.7 South Derbyshire's economy has grown by 23% in Gross Value Added (GVA) over the last five years[49].

9.8 In Derbyshire, between 2009-11, the number of day visitors rose from 32.7m to 35m per year, with the total spend per head being £29. Visitor spend in 2014 was £1.918 billion, supporting a sector that employs over 27,000 people. Every £1 visitor spend is thought to generate 39p in GVA to the local economy, which results in £401.9m direct GVA produced in the County[50].

9.9 The National Forest contains 200 square miles of woodland, linking two ancient Forests of Charnwood and Needwood. The National Forest includes the Rosliston Forestry Centre, located 250m south east of Park Farm, comprising of woodland walks, indoor and outdoor play, cycle hire, fishing, gift shop and restaurant[51].

9.10 From analysis of the Derbyshire County Council definitive map[52], the following Public Rights of Way (PRoW) have been identified in close proximity to the Site:

- Number 1 - footpath to the east;
- Number 2 - footpath runs through Park Farm;
- Number 4 - footpath to the south east;
- Number 6 - bridleway to the south west;
- Number 7 - footpath to the south west;
- Number 9 - footpath runs east-west through the Site (this is also the route of the Cross Britain Way; and
- Number 5 - footpath runs north-south through the eastern side of the Site.

9.11 The assessment will consider whether the Proposed Development will affect any PRoW for walkers, horse riders and cyclists within or surrounding the Site. A significant effect on a recreational receptor would be where the Proposed Development would lead to fundamental or material impacts on the receptors or where it would substantially affect recreational resources that have more than local use or importance. Consideration will be given to the sensitivity (national, regional or local significance) of the receptor and its sensitivity to change. As such, this will be informed by desk-based research, consultation and professional judgement.

Proposed Surveys and Assessment Methodology

Legislation, Policy and Guidance

9.12 There is no legislation relevant to the assessment of socio-economic effects, but there are relevant national and local planning and economic development policies. The methodology for the assessment of socio-economics effects has been developed using good practice and professional judgement.

Proposed Study Area

9.13 The socio-economic assessment will consider two study areas as effects are likely to materialise in these areas:

- The local authority area – South Derbyshire District; and
- The region – East Midlands.

9.14 Tourism effects are only likely to be localised so effects will only be considered in the local authority area. The definition of the impact area will be defined in relation to other technical topics, such as LVIA or Noise.

Desk Study and Field Surveys

Desk Study

9.15 The assessment will be desk-based with no additional survey work proposed as part of the socio-economics assessment. The Proposed Development will be assessed at both the construction and operational phases.

9.16 The assessment will be informed by data collected from widely available sources, along with information provided by

[49] SDDC (2021) Investing in South Derbyshire. Available at: https://www.southderbyshire.gov.uk/our-services/business-and-investment/investing-in-south-derbyshire
[50] DCC (2017) Review of tourism in Derbyshire Available at: https://www.derbyshire.gov.uk/site-elements/documents/pdf/council/council-works/improvement-scrutiny/completed-improvement-scrutiny-reviews/2017-the-review-of-tourism-in-derbyshire.pdf
[51] The National Forest (2021) Rosliston Forestry Centre. Available at: https://www.nationalforest.org/visit/attractions/rosliston-forestry-centre
[52] Available at: https://www.derbyshire.gov.uk/leisure/countryside/access/rights-of-way/faqs/definitive-map-and-statement/definitive-map-and-statement.aspx [Accessed 17/08/21]

the Applicant regarding construction and operation employee figures.

Potential Significant Effects of the Proposed Development

Construction

- Generation of employment during construction works (indicative figure of up to 350 people at peaks times for solar farm construction and 35 for grid connection work);
- Spending associated with construction workers;
- Generation of employment from construction supply chain effects; and
- Noise and visual effects on tourism receptors, including users of PRoW. Note this would be informed by the LVIA and Noise assessments.

Operation

- Economic benefits to Oaklands and Park Farms estates and the wider community;
- Renewable energy and educational resource for the wider community; and
- Visual effects on tourism receptors, including users of PRoW. Note this would be informed by the LVIA assessment.

Decommissioning

9.17 When the operational stage ends, the Proposed Development will require decommissioning. This will generate further direct and in-direct socio-economic effects similar to those during the construction phase.

Cumulative Effects

9.18 Cumulative effects of other development will need to be considered as part of the assessment. The cumulative assessment on economic receptors will consider the impact of the Proposed Development in combination with other developments on the supply chain and labour market capacity and capability in the impact areas.

9.19 Cumulative effects on tourism receptors will be assessed using other the physical effects in topic chapters, such as LVIA and noise, to assess the overall scale of cumulative effects on tourism.

Effects Scoped Out

9.20 Operational employment and associated spending could result in similar effects to those of construction employment, but to a much lesser extent, as operational employment numbers will be much lower (3 people on site per day during operation of the solar park). Therefore, no significant effects are expected, and operational employment and associated spending effects have been scoped out of the EIA.

Approach to Mitigation

9.21 Any employment and associated spending effects and community benefit are likely to be positive and therefore, no mitigation will be required. However, if significant negative effects are associated with the Proposed Development and tourism, mitigation will be required.

9.22 When assessing whether the Proposed Development will have a significant effect on tourism, other topic assessments will be used, such as LVIA and noise. If effects in these topic assessments are expected to be result in significant negative effects, then mitigation will be required to reduce these effects and would be detailed within these topics.

Land Use

9.23 This section will consider the likely effects on land-use during construction and operation of the Proposed Development. Ground-mounted solar PV developments are designed to be sited on agricultural land; however it is preferred to use poorer quality land over higher quality. In addition, options should explore continual agricultural use.

9.24 An initial feasibility study and detailed Agricultural Land Classification (ALC) study for Oaklands Farm found the following grades of ALC:

- 23% is Grade 2;
- 44% is Grade 3a; and
- 33% is Grade 3b.

9.25 Similarly, an initial feasibility study for Park Farm found the following grades of ALC:

- 9.3% is Grade 2;
- 15.1% Grade 3a; and
- 75.6% Grade 3b.

9.26 Information on Agricultural Land Classification will be provided with the application.

9.27 The Development will result in a change of land-use from arable cultivation to energy generation from solar PV. At present it has not been decided how land under and around the solar PV modules will be used, but there is potential for continued grazing and this will be outlined within the ES. The

solar PV modules will not alter the land's ALC rating, meaning land can be used in the future for arable cultivation.

9.28 As stated in the ground conditions section in chapter 10, a farm impact questionnaire will also be issued to all owner/ tenant farmers. The results will be used to collate information relating to current farming practices, including; land-use; crop types; grazing patterns; fertilisers/ pesticides/ herbicides/ fungicides consumption, application and timings; agri-environment/ environmental stewardship measures and irrigation use. The results from this questionnaire can be used to help understand the current and future land use.

9.29 No significant environmental effects are expected for land use because the land will not be permanently sterilised and grazing can continue around the solar panels. Therefore this has been scoped out of the ES.

Questions

Question 9.1: Is the scope of proposed significant effects deemed acceptable?

Question 9.2: Are there any other tourisms receptors other than the Rosliston Forestry Centre that should be scoped in to the assessment?

Question 9.3: If no significant effects are identified during assessment Socio-Economic topics will be scoped out, and details of Socio-Economic benefits will be included in the Planning Statement which will be submitted alongside the DCO application. Do you agree with this approach?

Chapter 10
Other Issues

Introduction

10.1 This chapter of the Scoping Report presents other topics that have been considered for inclusion within the EIA. These include the topics introduced by the current EIA Regulations (The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017: climate change, major accidents and disasters, and human health.

10.2 Any decision to scope topics out of the ES has been informed by professional judgement as well as consideration of the advice at paragraph 5.11 of Advice Note 7 from the Inspectorate[53].

Climate Change

10.3 The Proposed Development is inherently designed to provide a renewable source for generating electricity and therefore, by its very nature, will contribute to reducing carbon emissions and the effects of climate change. The Proposed Development will also be interacting with a changing climate from which significant effects could arise.

10.4 The climate change assessment will focus on the interaction of the Proposed Development with a changing climate and whether this would result in significant effects. The assessment will draw on guidance from the Institute of Environmental Management and Assessment (IEMA) entitled Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation (2020) to establish a comprehensive assessment methodology[54].

10.5 The assessment will cover:

- Vulnerability of the Proposed Development to climate change, such as changes to temperature, wind speed, cloud cover and flood risk. This assessment would consider the Proposed Development as a receptor and will draw on UK climate projections[55]. It will set out how

[53] Advice Note Seven: Environmental Impact Assessment: Process, Preliminary Environmental Information and Environmental Statements (available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-seven-environmental-impact-assessment-process-preliminary-environmental-information-and-environmental-statements/#5)

[54] Institute of Environmental Management and Assessment (2020) IEMA Environmental Impact Assessment guide to Climate Change Resilience and Adaptation

[55] UK Climate Projections (UKCP) https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

the Proposed Development has been designed to avoid or minimise being affected by impacts of a changing climate. A Flood Risk Assessment and Outline Drainage Strategy will be submitted to accompany the application.

- Influence of the Proposed Development on climate change, including predicted greenhouse gas emissions and the Proposed Development's contribution to carbon emissions savings through the generation of renewable energy.
- Effects of the Proposed Development on environmental receptors sensitive to climate change. This will consider receptors assessed in other chapters of the ES and summarise their sensitivity to climate change including changes in temperature and precipitation, when combined with the effects of the Proposed Development.

Glint and Glare

10.6 Early modelling of the Proposed Development has been undertaken (see **Appendix E**). This has identified numerous locations where mitigation is recommended screen road users and residential dwellings from potential impacts. The implementation of such screening would ensure that any impacts cannot be considered significant in the context of the EIA Regulations.

10.7 The most common mitigation solution is the provision of screening at the site perimeter to obstruct views from ground-based receptors, as well as any potential reflections from panels. Mitigation will therefore be built into the design of the solar park. This is a technically viable solution and is based on technical assessment of this site, using industry best practice and experience of similar scenarios.

10.8 As such, it is proposed to **scope glint and glare out** of the ES, but to include an updated modelling report (based on the final site layout) with the planning application to provide information on the modelling that has been undertaken.

Major Accidents and Disasters

10.9 Solar parks are designed and maintained to adhere to health and safety standards. This will include ensuring that elements of the development which are potentially hazardous, such as transformers and grid infrastructure, will be located a suitable distance from sensitive receptors so as not to pose a health and safety risk. The site will be secured to prevent access by unauthorised people, and the site infrastructure will be designed with inbuilt control systems to avoid risks associated with electrical infrastructure. As such, major accidents and disasters has been **scoped out** of the ES.

Human Health

10.10 Solar parks are designed and maintained to be safe and minimise any risk to human health. The site infrastructure will be designed with inbuilt control systems to avoid risks associated with electrical infrastructure.

10.11 Potential limited interactions with human health could principally relate to effects from noise, transport and effects on residential amenity, which could potentially cause annoyance. Assessment of these issues will be covered in other topics and it is considered that their effects on human health would not be significant from a development of this scale.

10.12 As such it is considered that this topic can be **scoped out** of the ES. A separate HSE consultation/safety report will be submitted with the application.

Electric, magnetic and electromagnetic fields

10.13 Power frequency electric, magnetic and electromagnetic fields (EMFs) arise from the generation, transmission, distribution and use of electricity. EMFs occur around power lines; electric cables; and domestic, office or industrial equipment that uses electricity.

10.14 Electric fields can be blocked by fences, shrubs and buildings. Magnetic fields are produced by the flow of electric current and most materials do not block magnetic fields. With increasing distance from the source, the intensity of both electric and magnetic fields decreases.

10.15 Electric fields depend on the operating voltage of the equipment and magnetic fields on the electrical currents flowing. The latter is not limited by most common materials. Ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line, but can be higher at small distances from the cable.

10.16 There is no statutory provision in the planning system regarding protection from EMFs however, the Department for Energy and Climate Change (DECC) (2012) suggest that guidelines published by International Commission on Non – Ionizing Radiation Protection (ICNIRP) in 1998 for both occupational and public exposure should be considered[56]. This guidance states that 'overhead power lines at voltages up to and including 132 kV, underground cables at voltages up to and including 132 kV and substations at and beyond the

[56] DECC Power Lines: Demonstrating compliance with EMF public exposure guidelines, A Voluntary Code of Practice 2012

publicly accessible perimeter' are not capable of exceeding the ICNURP exposure guidelines. As such, no assessment is required for the proposed infrastructure or cables, which are under 132kV and this topic will be **scoped out**.

Ground Conditions

10.17 The Site's ground conditions have been considered. Initial screening of the Site indicates that it has remained in agricultural use since the earliest available mapping (1883).

10.18 The underlying geological strata include discontinuous superficial deposits including Glacio-Fluvial Deposits, Glacial Till, Alluvium, Peat and River Terrace Deposits. These are underlain principally by the Edwalton Member (sandstone and mudstone) with the Mercia Mudstone Group in the far north.

10.19 A land quality focussed preliminary risk assessment (Desk Top Study) will be prepared and submitted with the planning application as a separate document. The Desk Top Study will be used to establish the contemporary and historical context of the Site with regards to ground conditions and contamination. It will recommend appropriate mitigation measures that can be incorporated within the design of the solar park, to ensure that it minimises potential risk to site users and the wider environment.

10.20 An initial screening of the Site shows that whilst it falls within a Coal Authority reporting area and may have historically been mined, the Coal Measures strata are estimated to be in excess of 400m deep with a significant cover of Triassic rock.

10.21 A desk-based Coal Mining Risk Assessment will also be undertaken to understand the potential for future instability due to historic underground workings.

10.22 As the Site is currently used for agricultural practices, a farm impact questionnaire will also be issued to all owner/ tenant farmers. The results will be used to collate information relating to current farming practices, including; land-use; crop types; grazing patterns; fertilisers/ pesticides/ herbicides/ fungicides consumption, application and timings; agri-environment/ environmental stewardship measures and irrigation use.

10.23 No significant effects are expected for ground conditions during construction, operation or decommissioning, subject to the implementation of a detailed Construction Environment Management Plan (CEMP). As such, it is proposed that ground conditions is **scoped out** of the ES.

Hydrology

10.24 Hydrology could be affected by the solar park however; careful design can remove any significant effects. The majority of the Site is within Flood Zone 1 with only minor areas along the eastern boundary of the southern portion (Oaklands Farm) and western boundary of the northern portion (Park Farm) in close proximity to the watercourse, which are in Flood Zone 2 and 3. In addition, a number of surface water (pluvial) overland flow routes are identified across the Site.

10.25 The development will comprise a large number of solar panels, plus access tracks and small structures to house inverters and substations. Solar panels are typically fixed to the ground using steel piles, driven into the ground and supported by metal frames. Rain falling on each solar panel will return to ground at the base of the panel. There is therefore no net reduction in infiltration associated with the panels themselves.

10.26 Each development area (Oaklands, the southern area, and Park Farm, the northern area) will be accessed separately from public highways, and there is no intention to create a new track connecting the two areas. Within each development area, tracks of crushed aggregate material will be constructed to provide permanent access routes to service the sites. However, the vast majority of the site will be grazing pasture upon completion of the project. Tracks will be designed such that they return any antecedent rainfall back to ground, via trackside ditches, swales and soakaways as appropriate.

10.27 Small metal enclosures will house transformers and larger storage containers will be located around the site. These, together with the substation and battery storage area, require areas of impermeable surface. Potential drainage issues will be mitigated by returning water falling on these areas to ground via soakaway or swale.

10.28 Generally solar panels will not to be constructed within Flood Zones 2 and 3. The nature of the development is such that the solar panels impede pluvial overland flow routes or fluvial flow during flood events. Inverters and substations can be located outside of such routes and tracks designed to not impede such flow.

10.29 Consultation will take place with the Environment Agency to obtain relevant data pertaining to parts of the Site which lie within Flood Zones 2 and 3 adjacent to the watercourse. The Lead Local Flood Authority (LLFA), Derbyshire County Council will be consulted as part of the pre-application consultation.

10.30 A Flood Risk Assessment (FRA) and Outline Drainage Strategy will be included in the application. The FRA will be used to establish appropriate mitigation measures that can be incorporated within the design of the solar park to ensure that it minimises risk to life, damage to property or disruption to people living and working on the Site or elsewhere in the floodplain. This may include the use of SUDs techniques where required.

10.31 Construction of tracks and footings for structures will create areas of potential increased run-off and silt generation. This can be effectively controlled however by implementation of a detailed CEMP. Subject to the design and implementation of such a CEMP, no potential significant effects are predicted during construction.

10.32 The development is anticipated to cause no nett reduction in infiltration across the site as a whole. This is in large part due to the nature of the development, but also due to the planned use of SUDS techniques where required.

10.33 As a result, there are considered to be no potential significant effects subject to the implementation of suitable mitigation and drainage measures which will be provided in the FRA and Outline Drainage Strategy.

10.34 No significant effects are expected for hydrology during construction, operation or decommissioning, subject to the implementation of a detailed CEMP, FRA and Outline Drainage Strategy, that will ensure suitable mitigation is designed and implemented. As such, it is proposed that hydrology is **scoped out** of the EIA.

10.35 The River Mease SAC has been identified as a potential receptor during the desk study. The likelihood of impact is considered low due to the following reasons:

- The site of the Proposed Development is proportionally a tiny part of the overall catchment and is distant from the SAC itself (as it is in the upper headlands of one of its tributaries).
- Whilst there is a watercourse shown on site on OS mapping, a site walkover and conversations with the landowners have shown this to be a dry overland flow path, rather than a watercourse. This means that there is a very limited potential for a pathway to be present between the site and nearest actual watercourse.

10.36 This issue will be addressed in the baseline Desk Top Study to be included in the application, and is not considered to lead to significant effects.

Telecommunications, Television Reception and Utilities

10.37 Solar parks can potentially affect existing utility infrastructure below ground. Therefore, to identify any existing infrastructure constraints, a desk-based study will be undertaken. Consultation will take place with relevant telecommunication and utilities providers, including telecoms, water, gas and electricity providers. Any information gained from suppliers will be used to inform the design and to avoid or otherwise mitigate any adverse effects identified such that no significant effects will occur. Therefore, it is proposed to scope this topic out of the assessment.

Waste

10.38 The quantities of waste from construction are unknown at this stage. However, the Site is comprised of arable field so there is not likely to be any waste needing to be removed prior to construction.

10.39 Waste streams during construction could still include:

- General construction waste (e.g. wood, cardboard and paper etc)
- Packaging
- Waste metals
- Waste chemicals, fuels and oils
- Wastewater from cleaning (e.g. wheel wash)
- Wastewater from dewatering of excavations
- Welfare facility waste

10.40 A Site Waste Management Plan (SWMP) will detail how waste will be dealt with using the waste hierarchy: reduce, reuse, recycle, recover and dispose.

10.41 Vehicles associated with the removal of waste material will be assessed in the transport and access chapter.

10.42 No significant effects are predicted in relation to the waste associated with the Proposed Development. In addition, all waste will be dealt with through the appropriate licensed receivers. The operators who receive the waste will be subject to their own consenting procedures and therefore, waste does not need to be considered further within the EIA process. As such, it is proposed **to scope waste out** of the ES.

Air Quality

10.43 Air quality emissions are likely to be restricted to construction and decommissioning phases (e.g. vehicle movements and dust and emissions from plant and machinery). Effects from vehicle movements are considered in the transport and access chapter and good practice construction methodologies will be proposed to manage dust and emissions during construction, and no significant effects are predicted. As such, air quality effects during the construction phase are scoped out.

10.44 When operational, no emissions to air would result from the solar park operation, and with only 2 or 3 maintenance vehicle visits per day (non HGV) there will be minimal emissions associated with servicing the Proposed Development. As such, consideration of air quality impacts during the operational phase is **scoped out**.

Questions

Question 10.1: Are consultees in agreement with the scoping out of the following topics, as explained in the text above:

- Glint and Glare;
- Major Accidents and Disasters;
- Human Health;
- Ground Conditions;
- Hydrology;
- Telecommunications, Television Reception and Utilities;
- Waste; and
- Air Quality.

Question 10.2 Are consultees in agreement with scoping in Climate Change?

Appendix A
List of Scoping Questions

Table A.1: Summary of Scoping Questions

List of Scoping Questions	
Chapter 2: The Environmental Impact Assessment	
Question 2.1	Are there are any further consultees that should be engaged with?
Question 2.2	Are there other solar farm proposals or other developments that should be considered in the cumulative assessment?
Question 2.3	Do the consultees agree the approach to consideration of various standard good practice measures as 'pre-mitigation' is appropriate?
Chapter 4 Landscape and Visual	
Question 4.1	Do consultees consider the size of the 5km radius study area to be appropriate?
Question 4.2	Are there any other relevant parties who should be included within the post-scoping consultation process for the LVIA?
Question 4.3	Is the proposed approach and scope for the assessment of effects on landscape character considered to be appropriate?
Question 4.4	Do consultees consider that the proposed viewpoints are appropriate to inform the visual assessment, and that the suggested presentation of visualisations is proportionate?
Question 4.5	Do consultees consider the effects proposed to be scoped out appropriate?
Question 4.6	Do consultees consider the proposed approach to mitigation appropriate?
Chapter 5 Ecology	
Question 5.1	Do the consultees agree with the survey scope and methods that are being deployed to inform this project?
Question 5.2	Do the consultees support the proposed applications of the CIEEM EcIA best practice methods detailed in the Ecology chapter?
Question 5.3	Do the consultees hold any further relevant data sets that may inform the assessment?
Chapter 6 Historic Environment	
Question 6.1	Do the consultees consider the study area appropriate?
Question 6.2	Are there any other relevant consultees who should be consulted about this topic?
Question 6.3	Are consultees aware of any other supplementary guidance of relevance to the assessment of effects to heritage assets?
Question 6.4	Is the approach to the assessment of effects appropriate?
Question 6.5	Is the approach to field survey considered appropriate?
Chapter 7 Transport and Access	
Question 7.1	Are there any specific conditions or requirements being sought for Drakelow Park regarding operational hours, vehicle routing or similar which we can align to?
Chapter 8 Noise	
Question 8.1	Are there any other noise sensitive receptors that should be included in the assessment, for example amenity spaces?
Question 8.2	Should noise from off-site vehicle movements (during construction) on public roads be assessed? If this is a yes, we would propose to carry out a commentary level of assessment by reviewing significant increases in traffic movements.
Question 8.3	Can vibration from vehicle movements on roads and tracks be excluded from the scope?

List of Scoping Questions	
Question 8.4	Should construction vibration be included in the scope?
Question 8.5	Can assessment of overhead cable noise for cables below 350kV be excluded from the scope?
Question 8.6	Are there any other stakeholders that should be consulted with respect to the assessment of noise and vibration (other than South Derbyshire District Council)?
Chapter 9 Socio-Economics	
Question 9.1	Is the scope of proposed significant effects deemed acceptable?
Question 9.2	Are there any other tourisms receptors other than the Rosliston Forestry Centre that should be scoped in to the assessment?
Question 9.3	If no significant effects are identified during assessment Socio-Economic topics will be scoped out, and details of Socio-Economic benefits will be included in the Planning Statement which will be submitted alongside the DCO application. Do you agree with this approach?
Chapter 10 Other Issues	
Question 10.1	Are consultees in agreement with the scoping out of the following topics, as explained in Chapter 10 - Glint and Glare; Major Accidents and Disasters; Human Health; Ground Conditions; Hydrology; Telecommunications, Television Reception and Utilities; Waste; and Air Quality.
Question 10.2	Are consultees in agreement with scoping in Climate Change?

Appendix B
Indicative ES Structure

Oaklands Farm Solar Park ES Structure

Non-Technical Summary

Chapter 1: Introduction

- Rationale for the Oaklands Farm Solar Park Project;
- Legislative Requirements for EIA;
- Responsibilities for ES; and
- Structure of the ES.

Chapter 2: The Environmental Impact Assessment

- Introduction;
- The EIA Process;
- Scope of the EIA; and
- The do-nothing scenario.

Chapter 3: Site Selection and Design

- Introduction;
- Site Context;
- Design Strategy;
- Design Evolution; and
- Alternatives.

Chapter 4: Project Description

- Introduction;
- Study Area Description;
- Development Description;
- Construction Process;
- Operational Details; and
- Decommissioning.

Chapters 5 to 10: Landscape and Visual; Ecology; Historic Environment; Transport and Access; Noise; and Socio-Economics

Each chapter will include:

- Introduction;
- Assessment Methodology;
- Baseline Conditions;
- Proposed Good Practice Measures;
- Assessment of Construction Effects (if scoped in);
- Assessment of Operational Effects (if scoped in);
- Cumulative Effects;
- Mitigation and Future Monitoring;
- Residual Effects; and
- Summary and Conclusions.

Chapter 11: Summary of Effects

Figures

Appendices

Appendix C

Preliminary Ecological Appraisal: Oaklands Solar Farm and Grid Connection Route (Arcus 2020)

PRELIMINARY ECOLOGICAL APPRAISAL REPORT

OAKLANDS SOLAR FARM & GRID CONNECTION ROUTE

BAYWA. RE UK LTD.

3719 AND VERSION 1

JULY 2020

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TABLE OF CONTENTS

1 SUMMARY

This report has been produced for Baywa.re UK Ltd. prior to the construction of the solar farm and grid connection route.

A desk-based study was carried out using MAGIC to determine designated European sites within 5 km and national designated sites with 2 km. The local records centre was contacted for results of protected/ notable species within 2 km of the Site. A phase 1 walkover survey was carried out on 6th, 7th, 11th May and 16th June 2020 to identify any ecological constraints to the inform the planning process. This included an assessment of habitat suitability for protected species, including mammals, nesting birds and herptiles (amphibians and reptiles).

The Site has suitable habitats for protected species and these habitats have the potential to be directly and indirectly impacted by the Development. Therefore, further protected species surveys have been recommended for birds and Great Crested Newt (GCN), with the subsequent surveys carried out and results recorded separately in order to inform the assessment of impacts, mitigation, and Development design.

Further mitigation and enhancement measures have been provided for a range of protected species which includes bats, badger, otter and invertebrates. This is provided in further detail in Section 5. Should they be adopted in the Development design, the proposed mitigation and enhancements will increase the Development's biodiversity value, which adheres to Government guidance set out in the NPPF[26].

The final Development design layout is not yet confirmed. Therefore, it is currently unknown whether suitable reptile habitats (hedgerows and field margins) will be affected by the proposed Development. Should these habitats are to be affected, reptile surveys will need to be carried out to confirm presence/absence of reptiles on Site; and to inform appropriate mitigation and enhancement measures.

2 INTRODUCTION

Arcus Consultancy Services Limited (Arcus) were instructed by Baywa.re UK Ltd. to undertake a Preliminary Ecological Appraisal (PEA) at Coton Road, Walton-upon-Trent, South Derbyshire, East Midlands, DE12 8LP (henceforth referred to as the 'Site'). The PEA was undertaken in the form of an Extended Phase 1 Habitat Assessment and is therefore referenced as such, within this Preliminary Ecological Appraisal Report (PEAR).

This report is submitted to support the design and layout of a proposed solar farm with grid connection route; however, the full design and layout is not yet available (henceforth referred to as the 'Development').

This report details ecological baseline conditions and potential ecological impacts from the Development, taking into account relevant planning policy and legislation. Further surveys and mitigation have been recommended, where applicable, in order to provide additional information for assessing impacts and to inform recommendations to avoid or reduce potential ecological impacts.

2.1 Planning Policy and Legislation

All relevant legislation and policy discussed in the report are further detailed in Appendix A.

3 METHODS

3.1 Desk Study

Natural England's Multi Agency Geographic Information for the Countryside[1] (MAGIC) website was consulted to obtain information about any local or national statutory designated sites such as Sites of Special Scientific Interest (SSSI) within 2 km of the Site. A search of European statutory designated sites such as Special Areas of Conservation (SAC), Special Protection Areas (SPA) or Ramsar sites[2] within 5 km of the Site was also undertaken.

Local records of features of ecological interest within 2 km of the Site, such as Local Wildlife Sites (LWSs) and notable and protected species, were requested from Derbyshire Biological Records Centre (DBRC).

A review of historic aerial satellite imagery[3] was undertaken for the Site to gain an understanding of past land-use.

3.2 Extended Phase 1 Habitat Survey

An Extended Phase 1 Habitat Survey[4] was conducted on 6th, 7th, 11th May and 16th June 2020 by a suitably experienced ecologist. The survey included all land within the Site (Figure 1, Appendix B). The aim of this survey was to identify potential ecological constraints to inform the design and planning process. The survey was carried out following the Guidelines for Preliminary Ecological Appraisal[5], with an assessment of habitat suitability for protected species, including mammals, nesting birds and herptiles (amphibians and reptiles).

[1] Multi Agency Geographic Information for Countryside (MAGIC). Available at https://magic.defra.gov.uk/home.htm [Accessed 18.06.2020]
[2] Ramsar site is a wetland site designated to be of international importance under the Ramsar Convention. Available at https://data.gov.uk/dataset/acc63c60-0850-49a9-afce-88d58cd1a1b2/ramsar-sites [Accessed 18.06.2020]]
[3] Google LLC (2020) *Google Earth*. Available from: https://earth.google.com/web/ [Accessed 18.06.2020]]
[4] JNCC (2010) *Handbook for Phase 1 habitat survey: a technique for environmental audit*. Nature Conservancy Council
[5] CIEEM (2017), *Guidelines for Preliminary Ecological Appraisal, 2nd Edition*. Chartered Institute of Ecology and Environmental Management, Winchester.

3.3 Bat Roost Assessment

During the Extended Phase 1 Habitat Survey, a preliminary assessment of the potential of on-site features to support bat roosts and/or provide suitable commuting or foraging habitat was conducted. The bat assessment work and recommendations followed guidelines produced by the Bat Conservation Trust (BCT)[6]. This initial bat assessment informs whether or not further surveys are required to assess the potential impact of the Development on bats. Features subject to assessment included the adjacent habitats, the grassland and individual trees. The individual trees were classified according to their 'Roost Suitability'. Should evidence of bats be recorded or the features assessed to provide suitability for bats, then further surveys may be required.

3.4 Great Crested Newt Surveys

3.4.1 Habitat Suitability Index (HSI) Assessment

During the ecological walkover survey, a Habitat Suitability Index (HSI) assessment was carried out on waterbodies (where accessible) within 500 m of the Site. This followed a method based on Oldham R.S *et al* 2000[7]. It is used by surveyors to demonstrate whether a pond is suitable for great crested newts (*Triturus cristatus*) (GCN) and requires detailed survey. The HSI considers all the features which are valued by newts; e.g., the size of the pond, the extent of shading, the abundance of aquatic plants, the presence of fish and the quality of surrounding habitat. In general, ponds with a high HSI score are more likely to support GCN than those with lower scores.

The HSI scores are inserted into a table to calculate a score for the pond (See HSI results in Appendix E), with pond suitability for GCN assessed on the scale shown in Table 3.2.

Table 3.2 Categorisation of HSI Scores

HSI score	Pond suitability
< 0.5	Poor
0.5 – 0.59	Below average
0.6 – 0.69	Average
0.7 – 0.79	Good
> 0.8	Excellent

Following this assessment, waterbodies that had previously been surveyed or were deemed suitable for GCN when out in the field were recommended to be selected for eDNA testing.

[6] Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd ed.). The Bat Conservation Trust, London.
[7] Oldham R.S, et al. (2000). *Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus).* Herpetological Journal 10 (4), 143-155.

3.6 Ornithological Walkover

A walkover of the study area and adjacent habitats (where access was possible) was carried out at the same time as the Extended Phase 1 Habitat Survey. The aim of this survey was to determine the potential of the Site and surrounding area to support breeding or wintering birds of conservation concern (for example birds listed in Schedule 1 of the Wildlife and Countryside Act 1981[17] (as amended) and Annex I of the EC Birds Directive).

3.7 Limitations and Assumptions

The survey was undertaken in dry weather by a suitably experienced ecologist who is a Graduate member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and holds a Natural England Licence for bats. Therefore, there were no limitations to the survey with the potential to affect its efficacy.

There were no citations available for the Local Wildlife Sites provided by the data centre.

Letters were issued to all landowners who had ponds located on their land within 250 m of the Site. At the time of the survey, no access was granted prior to survey them and this is therefore a limitation.

[8] Harris, S., Cresswell, P. and Jefferies, D. (1991) *Surveying Badgers,* The Mammal Society, London.

4 BASELINE RESULTS

4.1 Desk Study

4.1.1 Designated Sites

4.1.1.1 Statutory

There is one European designated site within 5 km; River Mease Special Area of Conservation (SAC) is approximately 4.4 km south of the Site, which is also designated as a Site of Special Scientific Interest (SSSI). There are no national or local statutory designated sites within 2km of the Site.

4.1.1.2 Non-Statutory

There are 13 non-statutory designated Sites within 2 km of the Site, all are Local Wildlife Sites (LWSs) and the closest LWS is Walton Hall which is approximately 0.6 km north-west from the Site.

Table 4.1: Designated sites and their proximity to the Site.

Site	Status	Minimum Distance and Direction (km) from Site boundary	Description/Reason for Designation
Statutory designated sites			
River Mease	SSSI SAC	4.4 km south	The River Mease is a small tributary of the River Trent, containing spined loach (*Cobitis taenia*) and bullhead (*Cottus gobio*). It is known to support populations of white clawed-crayfish (*Austropotamobitus pallipes*) and otter (*Lutra lutra*).
Non-statutory designated sites			
Walton Hall	LWS	0.6 km north-west	Wood pasture and parkland.
Church Farm Pond	LWS	0.8 km south	Site contains Derbyshire Red Plant Book (DRDB) plant species.
Walton Wood	LWS	0.8 km west	Ancient semi-natural oak woodland -mixed.
The Dumps	LWS	0.8 km north-west	Secondary broad-leaved woodland.
Church Street Grassland	LWS	0.9 km south	Unimproved neutral grassland.
Rosliston Forestry Centre – Meadow Pond	LWS	0.9 km east	Standing open water.
Hill Close Wood Pond	LWS	1 km south	Standing open water.
Borough Hill Wetland	LWS	1.2 km north-west	Lowland swamp.
New Ozier Bed Pond	LWS	1.4 km north-west	Standing open water.

Site	Status	Minimum Distance and Direction (km) from Site boundary	Description/Reason for Designation
Rosliston Forestry Centre Hedge	LWS	1.5 km east	Reason for site designation unknown.
Homestall Wood	LWS	1.6 km south-west	Relatively large area of secondary broadleaved woodland.
Grove Wood	LWS	1.65 km north	Ancient semi-natural oak woodland.
Brick Kiln Pits	LWS	2 km south-west	Secondary broad-leaved woodland.

4.1.2 Protected Species

A total of 15 protected species records were returned that were within 2 km of the Site and are dated from 2010 onwards, which were relevant to the habitats present and the Development. The species are protected under UK legislation (see Appendix A) and/or are listed under the Natural Environment and Rural Communities (NERC) Act 2006[19] as species of principal importance, and detailed further in Table 4.2.

Table 4.2: Protected and Priority Species within 2 km of the Site

Taxonomic group	Species	Number of records	Distance and direction of closest record from Site (Year)
Bats	Common Pipistrelle	6	0.8 km north-east (2002)
	Pipistrelle sp.	2	0.3 km east (2012)
	Noctule	2	0.7 km north-east (2001)
	Unidentified bat	1	0.4 km north-east (2008)
	Brown long-eared	2	1.3 km north-west (2014)
Mammals	Otter	1	1.7 km north (2000)
	Water Vole	6	1.8 km south (2001)
	Hedgehog	1	0.4 km north-east (2015)
	Brown Hare	1	0.7 km south-east (2005)
Birds	Yellowhammer	2	0.7 km east (2000)
	House Sparrow	1	0.4 km north-east (2015)
Reptiles	Adder	1	0.9 km north-east (2002)
	Grass snake	8	0.2 km north-east (2002)
	Common lizard	1	0.8 km north-east (2002)
Amphibians	Great Crested Newt	3	0.8 km south-east (2003)

4.1.3 Site History

Satellite imagery shows the majority of the Site has remained the same since 2000. Aerial photos recorded from 2019, 2018, 2016, 2010, 2007, 2005, 2003 and 2000 were available for the site and used in drawing this conclusion.

4.1.4 Site Description

The Site for the proposed Solar Development is approximately 177 hectares (ha) and the grid connect route is approximately 4.2 km. The Site is situated approximately 0.9 km to the south of the village of Walton-on-Trent and approximately 6 km to the south of Burton-on-Trent. The National Grid Reference for the approximate centre point is SK 23043 16695.

The majority of the Site comprised of arable crops, improved grassland, semi-improved neutral grassland, bare ground, tall ruderal, species-rich and species poor hedgerows with trees, standing water, running water, dry ditch and scattered trees.

No non-native invasive species were recorded at the time of the survey within the Site and study area.

4.2 Extended Phase 1 Habitats

For the purposes of this report, Latin names are excluded from plant species names in the following sections and only the common names are used. A botanical list of species can be found in Appendix C.

4.2.1 Arable land

The majority of the fields consist of arable crops at various stages of growth.

4.2.2 Bare ground

Some of the fields at the time of the walkover survey were bare soil. Further access tracks were noted throughout the Site leading from Coton road to the south. In addition, the grid connection route runs along Coton road, Main Street (within the village of Walton-on-Trent) and Walton road.

Some fly tipping of tyres was noted to the southern boundary (Target Note 3, Figure 1, Appendix B).

4.2.3 Improved Grassland

There were several fields which were improved grassland, although only one of which was being grazed by cattle at the time of the walkover survey (Target Note 9-10, Figure 1, Appendix B). All the other improved grassland fields sward was relatively tall with perennial rye-grass dominant with occasional white clover, dandelion and Yorkshire fog.

4.2.4 Semi-improved neutral grassland/tall ruderal habitat mosaic

There were some fields to the north of the Site which consisted of semi-improved neutral grassland, species in the sward include: perennial ryegrass, pineapple weed, red campion, herb-robert, false oat-grass, forget-me-not, daisy, creeping buttercup, cow's parsley and red fescue.

The majority of the field boundaries throughout the Site comprised of semi-improved neutral grassland. Grass species typical of semi-improved neutral grassland, such as Yorkshire fog and cocksfoot were found in this habitat, along with common dandelion, common nettle, cleavers, thistle, speedwell sp., common hogweed and broad-leaved dock.

A tall ruderal/grassland mosaic habitat was present along some of the field margins.

Further tall ruderal species were found in the understorey of the woodland to the north of the Site and within a field to the east. Species include common nettle, Yorkshire fog, ribwort plantain and creeping buttercup was found occasionally.

4.2.5 Scattered trees

Several fields have scattered trees present within the centre of the field; oak and ash were mostly dominant throughout the Site with occasional sycamore and beech present. All trees were assessed for their potential to support roosting bats and tree ID is shown on Figure 1, Appendix B; with further information provided in Section 4.3.2.

4.2.6 Species-rich hedgerow with trees

Most hedgerows on the Site were well managed and this included hedgerows with trees. Whilst these hedgerows were slightly more diverse than the species poor hedgerows, species diversity was still limited with blackthorn and hawthorn. Species present in the understorey, consisted of common ivy, dock, cow's parsley, hedge mustard, petty surge, red dead nettle, spear thistle and Shepherd's purse.

Further species-rich hedgerows with trees were present along the grid connection route on both sides of the road.

4.2.7 Broadleaved woodland

There were two pockets of small broad-leaved woodland to the north-east and south-eastern boundary of the Site. The woodland area to the north-east was very dense with a slow flowing ditch running through the centre.

4.2.8 Dense scrub

There were dense areas of scrub present to the north of the site within the understorey of the broadleaved woodland and further areas of dense scrub scattered throughout the Site. Species mainly consisted of bramble and hawthorn.

4.2.9 Scattered scrub

There was hawthorn, blackthorn, dogs rose scrub present within the centre of a field to the south-east of the Site.

4.2.10 Dry ditch

Dry ditches were present throughout the Site, some appeared to have been dry for a long period with tall ruderal and scrub vegetation present.

4.2.11 Standing water

Aerial imagery shows 9 ponds to be present within the Site boundary, however during the walkover survey only 3 of these ponds had standing water. The remaining 6 ponds were completely dry with some tall ruderal and scrub vegetation scattered throughout. Pond locations (P1-P9) are shown on Figure 1, Appendix B.

4.2.12 Fence

Barbed wire fencing and post and rail fencing were present surrounding the majority of the fields throughout the Site.

4.2.13 Species-poor hedgerows

Almost all of the species poor hedgerows recorded within the study area had been planted or regularly managed in recent decades. The hedgerows were not very diverse, and appeared to be dominated by either hawthorn or blackthorn, with occasional dog rose., and hornbeam found rarely. The hedgerows were immediately joined by semi-improved neutral grassland habitats or ditch systems.

4.2.14 Running Water

A slow flowing ditch was present to the north to the Site which flowed to the east within the understorey of the broadleaved woodland block and to the south adjacent to a public right of way access track.

4.2.15 Grid Connection Route

The proposed grid connection route mainly consisted of the Coton road, Main Street (within the village of Walton-on-Trent) and Walton road. Scattered scrub, trees, ornamental shrubs, residential properties and a small area of amenity grassland was present adjacent to both sides of the road. Species present in the sward included: willow herb, wild privet, common mallow, rose, perennial ryegrass, common dandelion, daisy and common nettle.

4.3 Protected Species

4.3.2 Bats

4.3.2.1 Trees

33 mature trees within the Site and three mature trees within the Grid connection route were identified as having varying levels of potential to support roosting or hibernating bats. Table 4.3 below provides further details of each tree, its location, roost potential, and Potential Roost Features (PRFs) such as rot holes, split limbs, and lifted bark. The locations of these trees are shown in Figure 1 Appendix B and photos are shown in Appendix D.

Table 4.3 Descriptions of Trees with Potential Roosting Features

Tree No	Species and Location	Bat Roost Potential	Potential Roost Features
1	Ash (SK 23046 16909)	High	Woodpecker hole, knot hole, horizonal spilt, gap under branches
2	Oak (SK 23096 16882)	Low	Gap under branches, knot hole, horizontal crack in bark
3	Ash (SK 23498 17350)	Moderate	Horizontal spilt, dense covering of ivy
4	Ash (SK 23472 17141)	Low	Horizontal spilt, dense covering of ivy
5	Ash (SK 23446 17131)	Low	Dense covering of ivy, knot hole
6	Ash (SK 23437 17087)	Low	Knot hole, horizontal crack in bark
7	Ash (SK 23454 16960)	Moderate	Dense covering of ivy, knot hole
8	Ash (SK 23468 16952)	Moderate	Horizontal spilt, cavity

9	Oak (SK 22812 16226)	Moderate	Knot hole, horizontal spilt, cavity
10	Horse Chestnut (SK 23308 16394)	Low	Horizontal spilt, cavity
11	Oak (SK 23334 16336)	Low	Horizontal crack/spilt, missing limbs
12	Oak (SK 23353 16249)	Low	Horizontal crack/spilt
13	Oak (SK 23645 16375)	Low	Gap under branches, knot hole
14	Ash (SK 23675 16393)	Moderate	Knot hole, dense covering of ivy
15	Ash (SK 23776 16445)	Moderate	Knot hole, cavities, large gap at base of the tree
16	Oak (SK 23889 16437)	Low	Dense covering of ivy
17	Oak (SK 23906 16459)	Moderate	Horizontal spilt, cavities
18	Oak (SK 23881 16423)	Low	Gap under branches
19	Oak (SK 23884 16638)	Low	Gap under branches
20	Oak (SK 23837 16630)	Moderate	Horizontal crack/spilt, knot hole
21	Oak (SK 23754 16615)	Moderate	Knot hole, horizontal spilt, missing limbs
22	Oak (SK 22828 16687)	Moderate	Several gaps at base, horizontal crack/spilt
23	Ash (SK 22694 16897)	Low	Knot hole, horizontal spilt
24	Oak (SK 22767 16941)	Moderate	Horizontal crack/spilt, knot hole, gaps under branches
25	Ash (SK 22721 17002)	Low	Dense covering of ivy, knot hole
26	Oak (SK 22700 17076)	Low	Gap under branches
27	Oak (SK 22535 17136)	Low	Gap under branches
28	Oak (SK 22471 17022)	Low	Gap under branches
29	Oak (SK 22483 16886)	Moderate	Gap under branches, knot hole
30	Oak (SK 22557 16930)	Low	Gap under branches
31	Oak (SK 22096 16918)	Low	Missing limbs
32	Oak (SK 22119 16842)	Low	Gap under branches
33	Oak (SK 22127 16834)	Low	Gap under branches
34	Sycamore (SK 21781 18301)	Low	Dense covering of ivy
35	Oak (SK 22501 18958)	Moderate	Horizontal spilt, cavities
36	Oak SK 22421 18929	Moderate	Horizontal spilt, cavities

The desk study returned 5 records of bat within 2 km of the Site, including recent records of common pipistrelle, noctule and brown long-eared bat species, with records dating up to 2014. The closest records to the study area were of common pipistrelle, 0.8 km to the north-east in 2002.

4.3.2.2 Habitats

The mosaic of habitats such as the species-rich hedgerows with trees, small areas of woodland and running ditches have the potential to support foraging and commuting bats.

These features were connected to suitable habitats in the wider area by further areas of hedgerows and areas of woodland.

As the Site itself does not experience any light levels and therefore is suitably dark for foraging and commuting bats. There is the possibility, however, of disturbance to foraging and commuting bats during the construction and operation phases of the Development. In order to minimise the potential disturbance, it is recommended that a night-time lighting strategy is employed during both stages of the proposed Development, as described in further detail in Section 5.4.2.2.

4.3.3 Birds

The broadleaved trees and species-rich hedgerows within the Site provide good foraging and nesting habitats for birds. The agricultural habitats present on Site also provide good foraging and ground nesting habitats for birds such as lapwing or skylark. Species of birds observed during the site visit included buzzard (*Buteo buteo*), carrion crow (*Corvus corone*) and blackbird (*Turdus merula*).

4.3.4 Amphibians

Habitats within the Site offered good foraging and sheltering opportunities for GCN and other amphibians. The woodland was damp in places and there were various log piles and brash piles present offering suitable hibernacula opportunities. In addition, the onsite ponds with water present had good quality vegetation which was deemed suitable for amphibians.

There are nine ponds shown to be present on Site, as shown on the aerial imagery, however during the walkover surveys only three ponds had water present and all other onsite ponds were dry.

A GCN habitat suitability index (HSI) test[9] was carried out on the three ponds within the Site, which contained standing water and were accessible. This test assessed the habitats' features for GCN suitability, such as location, area and surrounding terrestrial habitat. Full results of the HSI assessment are located in Appendix E, with a summary of the results in Table 4.4

Table 4.4 Pond descriptions and HSI results

Pond No.	Grid Reference	HSI Score	Description
1	SK 2258 1715	N/A	Dry Pond
2	SK 2263 1676	N/A	Dry Pond
3	SK 2303 1670	N/A	Dry Pond
4	SK 2346 1695	0.72	Small pond situated within corner of arable field.
5	SK 2375 1687	N/A	Dry Pond
6	SK 2354 1647	N/A	Dry Pond
7	SK 2394 1652	0.44	Pond of the east of the Site boundary.
8	SK 2353 1630	0.61	Small pond within margin of arable field.

[9] Oldham R.S., Keeble J., Swan M.J.S. & Jeffcote M. (2000). *Evaluating the suitability of habitat for the Great Crested Newt* (*Triturus cristatus*). Herpetological Journal 10 (4), 143-155.

9	SK 2320 1622	N/A	Dry Pond

Pond 7 (as shown on Figure 1, Appendix B) was calculated during the HSI assessment to have poor suitability for GCN and was scoped out for needing further assessment. However, Ponds 4 and 8 were calculated to have a good and average suitability for GCN respectively, and were considered of sufficient quality to support GCN.

A further 15 ponds were located offsite within 250 m of the Site boundary; however, these ponds were situated on private land and were not accessible at the time of the walkover survey.

Three records of GCN found within 2 km of the Site, the closest record was located approximately 0.8 km south-east and recorded in 2003.

4.3.5 Reptiles

The mixture of scrub, bare ground and grassland habitats found on Site provided suitable habitat for basking, foraging and sheltering reptiles. Log piles that were found adjacent to this area provided hibernacula potential for reptiles. The Site also has good connectivity to the wider landscape by hedgerows and areas of woodland.

No reptiles or evidence of reptiles was recorded, although habitats with potential to support foraging and sheltering reptiles, such as rough grassland, were present within the study area and along the field margins. Wet ditches provided good habitat for foraging grass snake, whilst the scrub habitat within the Site offered opportunities for hibernating or sheltering reptiles.

The desk study returned three records for reptile species; one for adder, one for common lizards and eight individual records for grass snake. The closest record to the Site is for adder, found approximately 0.9 km north-east in 2002.

4.3.6 Otter

No evidence of otter was recorded in any of the waterbodies. There were no habitats that were considered suitable to support foraging or resting otter. The desk study returned a single record for otter, recorded in 2000, approximately 1.7 km north of the Site.

4.3.7 Water Vole

No evidence of water vole was recorded at the time of the survey. Due to the small size of the onsite ditches and disconnected ditch habitats throughout much of the Site, both quantities of habitat and habitat connectivity suitable for water vole is likely to be limited to the boundaries and those areas just beyond.

The desk study retuned six records for water vole within 2 km of the Site, the nearest record is approximately 1.8 km south recorded in 2001.

4.3.8 Other Species

Several brown hare (NERC Act 2006[19])were observed during the walkover survey (see Target Note 6-8, Figure 1, Appendix B). Rabbits and roe deer were also observed on Site. It is considered that brown hare and deer are likely to be present at reasonable densities within the Site and surrounding landscape.

Mammal runs were also identified throughout the Site (Target Note 1-2, Figure 1, Appendix B).

5 DISCUSSION, FURTHER SURVEY REQUIREMENTS AND MITIGATION

5.1 Impact of Development

The Site has suitable habitats for protected species and these habitats have the potential to be directly and indirectly impacted by the Development. Where this is the case, additional ecology surveys are recommended to provide further information to help assess the potential ecological impacts of the Development and to inform mitigation.

In order to increase the Development's biodiversity value, and to adhere to Government guidance set out in the National Planning Policy Framework (NPPF) 2019[26], a range of enhancement measures are provided below.

5.2 Designated Sites

There is one European statutory designated site within 2 km of the proposed Site boundary; River Mease SSSI, SAC which is 4.4 km south from the Site. The River Mease is separated by distance and major roads, it is therefore thought that the Development will not adversely affect this or any other statutory designated sites or conservation features for which the sites have been designated.

There are 13 non-statutory Local Wildlife Sites (LWS) within 2 km of the Site boundary, the closest of which is Walton Hall which is approximately 0.6 km north-west from the Site boundary.

5.2.1.1 Mitigation Requirement

Given the distance from the proposed Development, it is unlikely that any statutory or non-statutory designated sites will be adversely affected by the Development and as such no further mitigation is required with respect to designated sites.

5.3 Habitats

Although the final layout design is not yet confirmed, it is considered likely the proposed Development will result in the permanent loss of arable habitat, small amount of semi-improved neutral grassland and bare ground.

It is expected that the hedgerow habitats and trees will be retained on the Site, and it is not envisaged that there will be any impact to this habitat from the Development. Further recommendations for mitigation and enhancement of habitats are detailed in Section 5.3.1.1.

5.3.1.1 Mitigation Requirement

The retention and improvement of grassland will be achieved through controlled management aimed at improving the sward structure and diversity through enhancement measures to be put in place. This change in use is likely to result in the development of a grassland habitat of greater species diversity and greater value to wildlife. The Development of a landscape plan and Landscape & Biodiversity Management Plan (LBMP) would seek to ensure the creation of ecological features and habitats that will complement and augment those already existing within the Site, such that there will be a substantial net habitat gain as a result of the Development.

Bird boxes and bat boxes have also been recommended to be installed in retained habitat within the Development, with reference to example prescriptions found in Appendix G.

5.4 Species

The mix of habitats on site have the potential to support a wide range of common species. The impacts on these species are highlighted in the following sections along with recommendations for mitigation and enhancement details.

5.4.2 Bats

Trees

Where trees have been identified as having bat roost potential may be affected by the Development, there is the potential for the Development to harm or disturb bats, and to damage, destroy or obstruct access to their place of rest and shelter. Therefore, it is advised that the design of the Development avoid trees that have been identified as having bat roost potential.

However, if for any reason there is a requirement to prune or fell trees with bat roost potential, it is recommended that a tree climbing inspection of each impacted tree is undertaken by a bat licenced ecologist using a pair of binoculars, endoscope and high powered torch to look for signs of bats such as droppings, scratch marks, and staining, or

determine the presence or otherwise of roosting bats. The findings of these surveys will inform the requirement for further surveys, or type and level of mitigation.

Habitats

Access to the existing grassland, hedgerows, trees and scrub habitats for use by foraging and commuting bats will be maintained throughout the Site, with no flight line obstruction to these habitats from the Development envisaged. Therefore, it is considered that there is no need for further surveys for foraging or commuting bats.

There is the possibility; however, of disturbance to foraging or commuting bats during both construction and operation of the Development. In order to minimise this potential disturbance, it is recommended that a night-time lighting strategy appropriate to a rural location (if installed during construction or operation) is employed.

5.4.2.1 Mitigation Requirements

It is not anticipated that the Development will cause foraging habitats to be lost or severed, which would result in habitat fragmentation. However, it is possible that there may be an impact caused by lighting, during construction and after the works are complete.

The final mitigation requirements for bats will depend on the results of further recommended survey work and Development design. However, mitigation is likely to include, but not be limited to:

- Ensuring all site operatives are made aware of current legislation protecting bats via a Toolbox Talk;
- In the event that any bats are encountered then works will cease and Natural England will be contacted to agree appropriate measures;
- Development design needs to ensure that the rest of the woodland and surrounding areas remains unlit; and
- A minimum of four bat boxes will be incorporated within the woodland to provide enhanced roosting opportunities. Installation needs to be in accordance with good practice guidelines[10], with examples of suitable bat box types provided in Appendix G.

5.4.2.2 Lighting and disturbance

The impacts of lighting on plants and animals are difficult to assess but it is known that lighting can adversely affect invertebrates and bats (as well as other species). To carefully manage light levels within the Development and to ensure the Site is able to provide continued undisturbed bat foraging and commuting habitat for bats, any new lighting should be designed in line with good practice[11], such as minimising light spill and directing it away from boundaries and retained mature habitats.

Should lighting by required during the construction and operational phase, the following controls would need to be applied:

- Motion sensitive security lighting and avoidance of floodlighting;
- Avoidance of lighting with ultra-violet (UV) components in areas where lighting is required for public safety purposes. UV light is particularly disruptive to bat behaviour[12],[13];
- Use of flat-glass protectors on luminaires to help reduce light spill above angles greater than 70º from the vertical plane; and

[10] Bat Conservation Trust (2019) *Bat Boxes: Putting up your box,* Available from: http://www.bats.org.uk/pages/bat_boxes.html [Accessed 03.07.2020]

[11] Bat Conservation Trust/ILP (2018), *(Guidance Note 08/18) Bats and artificial lighting in the UK: Bats and the Built Environment series.* London, UK

[12] Fure, A. (2006) Bats and Lighting. The London Naturalist, No. 85.

[13] Emery, M. (2008) Effect of Street Lighting on Bats. Urbis Lighting Ltd.

- Avoiding light spill by using accessories such as shields, louvres, hoods and cowls.

The provision of bat boxes suitable for roosting and hibernating bats are also proposed to be installed on retained trees within the Development. Example bat box designs and further information on installation can be found in Appendix G.

5.4.3 Birds

Without mitigation, and depending on the time of year that works are carried out, it is possible that during the construction phase, the Development will adversely impact breeding birds and further breeding bird surveys have been recommended. Further breeding bird surveys have been carried out and the results and more detailed mitigation are provided in a separate, standalone report[14]. However, simple mitigation and enhancements with respect to nesting birds are provided below.

5.4.3.1 Mitigation Requirements

To ensure compliance with the Wildlife and Countryside Act 1981[17] (as amended), any work involving vegetation clearance during the peak bird nesting season (March to September inclusive, or earlier/later if weather conditions are particularly mild) must be avoided.

If any clearance works to nesting habitats are required during the nesting season, then pre-construction checks for nesting birds would need to be carried out by a suitably experienced ecologist no more than 48 hours prior to the works commencing.

If any nesting birds are found to be present, an appropriate buffer zone would be implemented, within which works are excluded for the duration of the breeding attempt. Any active nests will need to be left *in situ* until a suitably experienced ecologist confirms that birds have stopped using them.

In the unlikely event that any birds listed under Schedule 1 of the Wildlife and Countryside Act 1981[17] (as amended), are found to be nesting on Site, an ecologist will need to be contacted for further advice (see also legislation in Appendix A).

It is recommended that bird boxes be installed within the woodland areas to provide enhanced nesting opportunities for a number of different bird species. A minimum of three bird boxes will need to be installed within suitable locations, and all boxes must be installed in accordance with good practice guidelines[15]. Examples of suitable bird box types provided in Appendix G.

5.4.4 Amphibians

Following HSI assessments of onsite ponds, the assessment identified two ponds, which were of average and good suitability for supporting GCN, it was recommended that a further presence/absence survey in the form of eDNA survey be completed. These surveys have been completed, with reporting provided in full to support the planning submission once the design has been finalised. For expediency, the raw results are provided in Appendix F.

As no ponds were recorded as either being suitable for GCN following the HSI assessments or absent of GCN, it is considered unlikely that GCN are present on site and are unlikely to be a constraint to the Development design.

However, in the unlikely event that GCN are identified on the Site during works, it is recommended that works stop immediately and a suitably experienced ecologist is contacted for advice.

[14] 2020 Breeding Bird Report*: Oaklands Solar Farm. Baywa-re UK LTD.* (June 2020) Arcus Consultancy Services Ltd.
[15] Royal Society for the Protection of Birds (nd*) Nestboxes: Find out how to provide, or make, nestboxes for birds in your garden*, Available from: www.rspb.org.uk/advice/helpingbirds/nestboxes [Accessed 03.07.2020]

No further specific mitigation with respect to GCNs are required; however, the avoidance of higher value terrestrial habitats for GCN and the application of Reasonable Avoidance Measures (RAMs) will ensure that GCN and other amphibian species are protected from injury or harm.

5.4.4.1 Mitigation Requirements

RAMs will be adopted during the works. In accordance with this precautionary approach, where required, a supervised clearance exercise will be carried out for the vegetation on site. The works will be supervised by an ecologist and completed during the appropriate time of year when amphibians are fully active (usually from April through to September, although this is weather and temperature dependent). This will be carried out in conjunction with the methods for other species on site, if possible.

5.4.5 Reptiles

Suitable habitat (hedgerows and field margins) to support foraging, basking and sheltering reptiles were recorded on Site. If these habitats are to be affected by the proposed Development, it is recommended that presence/absence surveys take place during an appropriate time of the year (April to September inclusive) and following standard methodology[16] to inform appropriate mitigation/enhancement measures.

5.4.5.1 Mitigation Requirements

Mitigation measures will be provided once the full extent of the Development design is known.

5.4.6 Otters

No evidence of otter was recorded at the time of survey. The ditch networks present on Site were very shallow at the time of the walkover and unlikely to support foraging otter.

5.4.6.1 Mitigation Requirements

In order to prevent harm in the unlikely event that otters are using the Site, the following precautionary controls should be implemented during the works, if possible:

- Cover excavations overnight to prevent animals falling into them. Inspect excavations daily for the presence of animals before recommencing work on them;
- Any deep excavations that are to be left open overnight should include a means of escape for any animals that may fall in;
- Where possible, works should be limited to the hours from dawn to one hour before sunset;
- The creation of large stock piles of earth should be avoided as these may be attractive for animals;
- Store building materials above ground on pallets; and
- Should any new mammal burrows be identified, works in the area will need to stop and a suitably experienced ecologist contacted for advice.

5.4.7 Water Voles

The Development will not encroach upon, nor impact the connectivity of, any habitat which could potentially be used by water vole, and therefore no further survey or specific mitigation is recommended with respect to these species and they are not considered further within this report.

[16] Froglife (1999) Reptile Survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation. Froglife Advice Sheet 10. Froglife, Halseworth.

5.4.8 Invertebrates

The Development will not significantly encroach upon, nor impact the connectivity of habitat which could potentially be used by invertebrates, and therefore no further survey or specific mitigation is recommended with respect to invertebrates. However, some general habitat enhancement provisions that will benefit invertebrates can be found below.

5.4.8.1 Mitigation Requirements

It is recommended that some of the cuttings from the vegetation clearance be retained and created into log piles to provide shelter and food for the insects on site.

6 CONCLUSIONS

Several protected species have the potential to be adversely affected by the Development in the absence of mitigation and a final design. As detailed above, this includes bats, birds, reptiles, and GCN (amphibians).

Further survey work, as described Section 5, has been recommended, and for breeding birds and great crested newts this has been carried out to inform the assessment of impacts and mitigation. In order to increase the Development's biodiversity value, and to adhere to Government guidance set out in the NPPF[26], a range of enhancement measures have also been provided.

Further mitigation and enhancement measures have been provided for a range of protected species which includes bats, badger, reptile, otter and invertebrates.

APPENDIX A – PLANNING POLICY AND LEGISLATION ENGLAND

The Wildlife & Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 198117, as amended by the Countryside and Rights of Way Act (CRoW) 200018 and the Natural Environment and Rural Communities Act (NERC) 200619, consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 79/409/EEC on the Conservation of Wild Birds (Birds Directive)20, making it an offence to:

- Intentionally kill, injure or take any wild bird or their eggs or nests (with certain exceptions) and disturb any bird species listed under Schedule 1 to the Act, or its dependent young while it is nesting;
- Intentionally kill, injure or take any wild animal listed under Schedule 5 to the Act; intentionally or recklessly damage, destroy or obstruct any place used for shelter or protection by any wild animal listed under Schedule 5 to the Act; intentionally or recklessly disturb certain Schedule 5 animal species while they occupy a place used for shelter or protection; and
- Pick or uproot any wild plant listed under Schedule 8 of the Act. Schedule 9, Part II of the Act also lists many species for which it is an offence to plant, or otherwise cause to grow, in the wild. Any material containing Japanese knotweed is also identified as controlled waste under the Environment Protection Act 1990[21] and must be disposed of properly at licenced landfill according to the Environmental Protection Act (Duty of Care) Regulations 1991[22].

Conservation of Habitat and Species Regulations (Amendment) (EU Exit) 2019

The Conservation of Habitats and Species Regulations (Amendment) (EU Exit) 2019[23] (the 'Habitat Regulations') are the principal means by which Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna (the 'Habitats Directive') is transposed into law in England and Wales. The objective of the Habitats Directive is to protect biodiversity through the conservation of natural habitats and species of wild fauna and flora. The Directive lays down rules for the protection, management and exploitation of such habitats and species and makes it an offence to deliberately capture, kill or disturb wild animals protected under the Habitat Regulations[23]. It is also an offence to damage or destroy a breeding site or resting place of such an animal (even if the animal is not present at the time).

[17] Legislation.gov.uk *Wildlife and Countryside Act 1981 (as amended)* [online] Available from: https://www.legislation.gov.uk/ukpga/1981/69/pdfs/ukpga_19810069_en.pdf [Accessed 03.07.2020]
[18] Legislation.gov.uk *The Countryside and Rights of Way Act 2000* [online] Available from: http://www.legislation.gov.uk/ukpga/2000/37/contents [Accessed 03.07.2020]
[19] Legislation.gov.uk *Natural Environment and Rural Communities Act 2006*. [online] Available from: https://www.legislation.gov.uk/ukpga/2006/16/contents [Accessed 03.07.2020]
[20] EUR Lex: Access to European Law. *Birds Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds* [online] Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147 [Accessed 03.07.2020]
[21] Legislation.gov.uk *Environmental Protection Act 1990*, [online] Available from: http://www.legislation.gov.uk/ukpga/1990/43/contents [Accessed03.07.2020]
[22] Legislation.gov.uk *Environmental Protection Act 1991* [online] Available from: http://www.legislation.gov.uk/uksi/1991/2839/made [Accessed 03.07.2020]
[23] Legislation.gov.uk *The Conservation of Habitats and Species (Amendment) (EU Exit) Regulation 2019 drafted [online] Available at:* https://www.legislation.gov.uk/ukdsi/2019/9780111176573/contents [Accessed 09.07.2020]

Natural Environment & Rural Communities (NERC) Act 2006

The NERC Act 2006[19] places a duty on local planning authorities to have due regard for biodiversity and nature conservation during the course of their operations, and thus ensures that biodiversity is a key consideration in the planning process.

Protection of Badgers Act 1992

Badgers receive strict protection under the Protection of Badgers Act 1992[24], which prohibits the taking, injuring, selling, possessing or killing of badgers and makes it an offence to ill-treat any badger, damage, destroy, disturb or cause a dog to enter a badger sett. The 1992 Act defines a badger sett as *"any structure or place, which displays signs indicating current use by a badger"*.

The Hedgerow Regulations 1997

The Hedgerow Regulations 1997[25] (as amended by the Hedgerow [Amendment] [England] Regulations 2002; hereafter collectively called the Hedgerow Regulations) were made under Section 97 of the Environment Act in 1995 providing the necessary legislation for the protection of certain hedgerows. The overall aim of the Hedgerow Regulations is to secure the retention of important countryside hedgerows, principally ancient and species-rich hedges. The Hedgerow Regulations also introduced new arrangements for planning authorities in England and Wales to protect important hedgerows in the countryside by controlling their removal through a system of notification.

National Planning Policy Framework 2019

The National Planning Policy Framework (NPPF) 2019[26] sets out the Government's requirement for the planning system in England and in doing so establishes framework within which local planning authorities can develop their own planning policies. The NPPF explicitly addresses the conservation and enhancement of the natural environment, including biodiversity, through paragraphs 174–177.

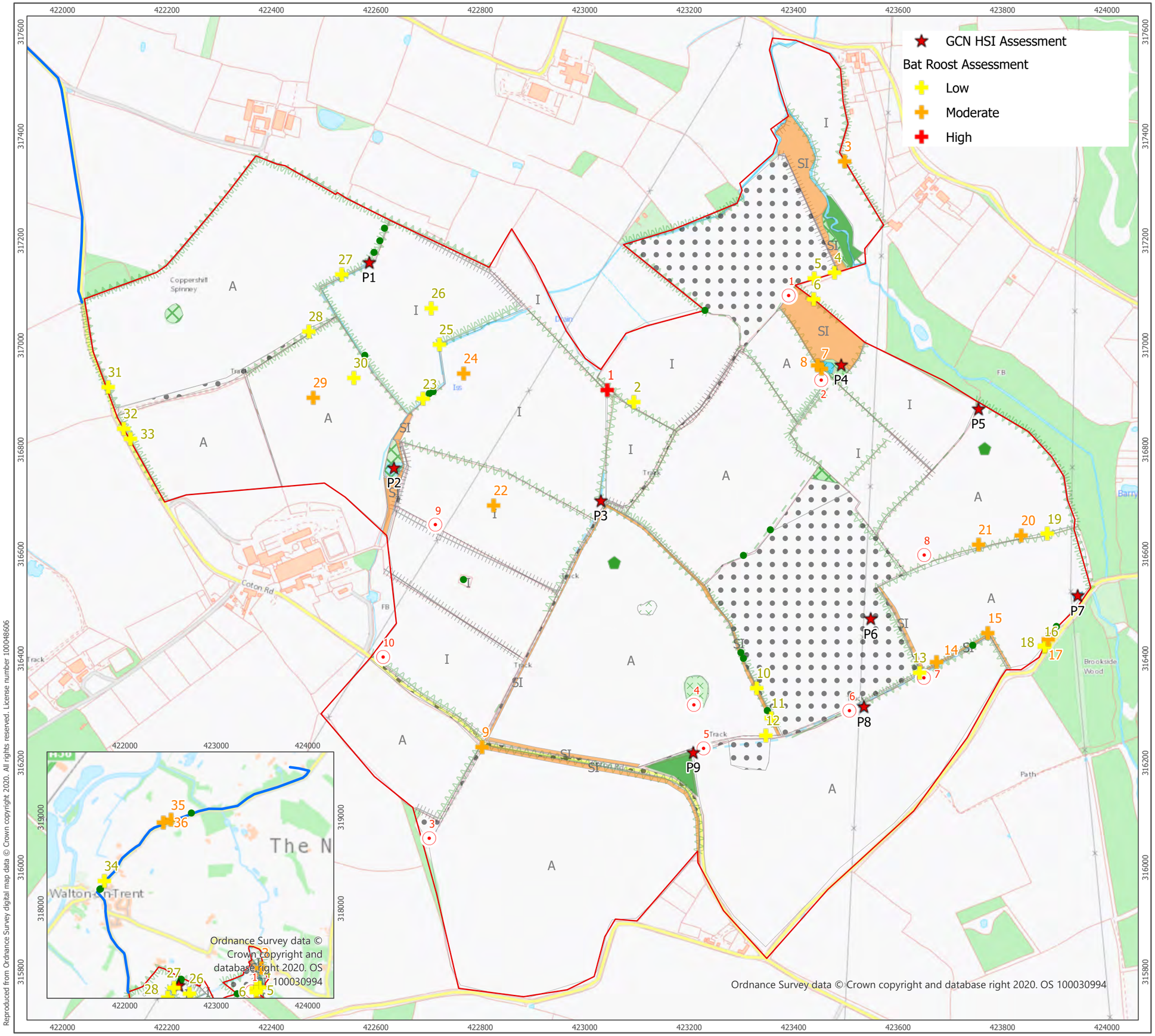
Biodiversity Action Plans

The UK Biodiversity Action Plan (UKBAP) was developed to fulfil the Rio Convention on Biological Diversity in 1992, to which the UK is a signatory. The UK Post-2010 Biodiversity Framework' now (as of July 2012) succeeds the UKBAP, although the UKBAP priority species and habitats are retained through the NERC Act. Regional and local BAPs have also been organised to develop plans for species/habitats of nature conservation importance at regional and local levels.

[24] Legislation.gov.uk *Protection of Badgers Act 1992* [online] Available from: https://www.legislation.gov.uk/ukpga/1992/51/contents [Accessed 03.07.2020]
[25] Legislation.gov.uk *The Hedgerow Regulations 1997* [online] Available from: http://www.legislation.gov.uk/uksi/1997/1160/contents/made [Accessed 03.07.2020]
[26] Gov.uk *National Policy Planning Framework 2019* [online] Available from: https://www.gov.uk/government/publications/national-planning-policy-framework—2 [Accessed 03.07.2020]

APPENDIX B - FIGURES

Figure 1: Extended Phase 1 Habitat Map



ARCUS

- Site Boundary
- Proposed Grid Route
- Broadleaved woodland - semi-natural
- Scrub - dense/continuous
- Scrub - scattered
- Other tall herb and fern - ruderal
- SI — Neutral grassland - semi-improved
- I — Improved grassland
- A — Cultivated/disturbed land - arable
- Bare ground
- Standing water
- Running water
- Intact hedge - native species-rich
- Defunct hedge - species-poor
- Intact hedge - species-poor
- Defunct hedge - native species-rich
- Hedge with trees - native species-rich
- Fence
- Dry ditch
- Target Note
- Broadleaved parkland/scattered trees
- Bird

1:7,000 Scale @ A3

0 140 280 m

NORTH

Produced By: CW	Ref: 3719-REP-001
Checked By: SC	Date: 09/07/2020

Phase 1 Habitat Survey
Figure 1

Preliminary Ecological Appraisal Report
Oaklands Solar Farm

N:\Projects\Ecology\Projects\3719 Oaklands Solar Farm\3719 Oaklands Solar Farm.aprx\3719-REP-001 Fig1 Phase 1 Habitat Map

ARCUS

- Site Boundary
- 250 m Buffer of Site Boundary
- Pond Location

1:9,000 Scale @ A3

0 180 360 m

NORTH

Produced By: CW	Ref: 3719-REP-002
Checked By: SC	Date: 03/06/2020

Pond Locations within 250 m
Figure 1

Oaklands
PEA Report

N:\Projects\Ecology\Projects\3719 Oaklands Solar Farm\3719 Oaklands Solar Farm.aprx\3719-REP-002 Fig2 Pond Locations with 250 m

APPENDIX C – PLANT SPECIES LIST

Table C.1 – List of plant species recorded during the Extended Phase 1 Habitat Survey

Common name	Latin name
Ash	*Fraxinus excelsior*
Annual meadow grass	*Poa annua*
Beech	*Fagus sylvatica*
Bitter dock	*Rumex obtusifolius*
Blackthorn	*Prunus spinosa*
Bramble	*Rubus saxatilis*
Broad leaved dock	*Rumex obtusifolius*
Cleavers	*Galium aparine*
Chickweed	*Stellaria media*
Cocksfoot	*Dactylis glomerata*
Common hogweed	*Heracleum sphondylium*
Common ivy	*Hedera helix*
Common nettle	*Urtica dioica*
Common nipplewort	*Lapsana communis*
Cow's parsley	*Anthriscus sylvestris*
Creeping buttercup	*Ranunculus repens*
Creeping thistle	*Cirsium arvense*
Daisy	*Bellis perennis*
Dandelion	*Taraxacum* agg.
Dock	*Rumex* sp.
Dog's rose	*Rosa canina*
False oat grass	*Arrhenatherum elatius*
Forget-me-not	*Myosotis sylvatica*
Gorse	*Ulex europaeus*
Hawthorn	*Crataegus monogyna*
Hedge parsley	*Torilis arvensis*
Hedge mustard	*Sisymbrium officinale*
Herb-Robert	*Geranium robertianum*
Horse chestnut	*Aesculus hippocastanum*
Mouse-ear chickweed	*Cerastium vulgatum*
Oak	*Quercus robur*
Perennial ryegrass	*Lolium perenne*
Petty surge	*Euphorbia peplus*
Pineapple weed	*Matricaria discoidea*
Red campion	*Silene dioica*
Red dead nettle	*Lamium purpureum*

Red fescue	*Festuca rubra*
Rose	*Rosa* sp.
Spear thistle	*Cirsium vulgare*
Shepard's purse	*Capsella bursa-pastoris*
Sycamore	*Acer psedoplatanus*
Thistle	*Cirsium* sp.
Water hemlock	*Cicuta virosa*
White dead nettle	*Lamium album*
Wild chervil	*Anthriscus sylvestris*
Wild privet	*Ligustrum vulgare*
Willow	*Salix* sp.
Willowherb	*Epilobium* sp.
Yorkshire fog	*Holcus lanatus*

APPENDIX D - PHOTOGRAPHS

Table D.1 – Table of photographs taken during the Extended Phase 1 Habitat Survey

	
Photograph 1: Semi-improved grassland field.	Photograph 2: Recently ploughed field with scrub and tall ruderal species, facing south.
	
Photograph 3: Species-rich hedgerow with trees.	Photograph 4: Semi-improved grassland with native species-rich hedgerows surrounding the margins of the field.
	
Photograph 5: Running water/ditch to the north of the Site.	Photograph 6: Scrub and scattered trees to the north of the Site.

Photograph 7: Tree with bat roost potential.

Photograph 9: Grassland access tracks were present throughout the Site.

Photograph 10: Part of the grid connection route, facing north.

APPENDIX E – HSI RESULTS TABLE

Table E.1 Great Crested Newt HSI results

Pond 4

HSI Parameter	HSI Number	HSI Score
Location	S1	1
Pond Area	S2	0.8
Pond Drying	S3	0.5
Water Quality	S4	0.67
Shade	S5	0.4
Fowl	S6	1
Fish	S7	0.67
Ponds	S8	1
Terrestrial	S9	1
Macrophytes	S10	0.5
Total HSI Score		0.72

Pond 7

HSI Parameter	HSI Number	HSI Score
Location	S1	1
Pond Area	S2	0.1
Pond Drying	S3	0.1
Water Quality	S4	0.67
Shade	S5	0.2
Fowl	S6	0.67
Fish	S7	0.67
Ponds	S8	1
Terrestrial	S9	0.67
Macrophytes	S10	0.7
Total HSI Score		0.44

Pond 8

HSI Parameter	HSI Number	HSI Score
Location	S1	1
Pond Area	S2	0.2
Pond Drying	S3	0.5
Water Quality	S4	0.33
Shade	S5	1
Fowl	S6	1
Fish	S7	1
Ponds	S8	1
Terrestrial	S9	0.67
Macrophytes	S10	0.3
Total HSI Score		0.61

APPENDIX F – eDNA SURVEY RESULTS

SureScreen Scientifics

Folio No: E7914
Report No: 1
Purchase Order: 3719
Client: ARCUS CONSULTANCY SERVICES LTD
Contact: Charlotte Wade

TECHNICAL REPORT

ANALYSIS OF ENVIRONMENTAL DNA IN POND WATER FOR THE DETECTION OF GREAT CRESTED NEWTS (TRITURUS CRISTATUS)

SUMMARY

When great crested newts (GCN), *Triturus cristatus*, inhabit a pond, they continuously release small amounts of their DNA into the environment. By collecting and analysing water samples, we can detect these small traces of environmental DNA (eDNA) to confirm GCN habitation or establish GCN absence.

RESULTS

Date sample received at Laboratory: 22/06/2020
Date Reported: 27/06/2020
Matters Affecting Results: None

Lab Sample No.	Site Name	O/S Reference	SIC	DC	IC	Result	Positive Replicates
4452	P4, Oaklands	SK 23473 16971	Pass	Pass	Pass	Negative	0
4453	P8, Oaklands	SK 23524 16319	Pass	Pass	Pass	Negative	0

If you have any questions regarding results, please contact us: ForensicEcology@surescreen.com

Reported by: Sarah Evans **Approved by:** Chris Troth

APPENDIX G - BAT AND BIRD BOX RECOMMENDATIONS

Table G.1 – Table of recommended bat and bird boxes

	
2F Schwegler Bat Box	Schwegler 1FF Bat Box
	
1B Schwegler Bird Box	Large Wooden Bird Box

Appendix D

Breeding Bird Survey Report: Oaklands Solar Farm (Arcus 2020)

2020 BREEDING BIRD SURVEY REPORT

OAKLANDS SOLAR FARM

BAYWA.RE UK LTD.

3719, VERSION 1-1

JULY 2020

Prepared By:

Arcus Consultancy Services

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North Yorkshire
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Registered in England & Wales No. 5644976

TABLE OF CONTENTS

1 SUMMARY

This report has been produced for BayWa.re UK Ltd. to inform development design and planning submission strategy for a proposed solar development near Walton-upon-Trent, South Derbyshire.

A three-visit Breeding Bird Survey was carried out to establish the bird interests at the Site and recorded 56 bird species, including 22 species of conservation concern. Eleven species of conservation concern showed evidence of breeding within the BBS Area, including six species within the Site Boundary.

The proposed Development has the potential to adversely impact bird species and some mitigation and/or enhancements will be required. Provisional mitigation measures are proposed; however, Site- and Development-specific measures may also be required but are subject to review of the Development design and proposed construction timetable.

If the project is to be progressed as a Nationally Significant Infrastructure Project (NSIP), some further Breeding Bird Surveys and additional Desk Study data may be required to inform potential impacts.

2 INTRODUCTION

Arcus Consultancy Services Limited (Arcus) were instructed by BayWa.re UK Ltd. to undertake Breeding Bird Surveys (BBS) at Coton Road, Walton-upon-Trent, South Derbyshire, East Midlands, DE12 8LP (henceforth referred to as the 'Site').

The Development is a proposed solar farm including arrays of photovoltaic panels and associated infrastructure; however, the full design and layout is not yet available.

The Preliminary Ecological Appraisal[1] recorded areas of habitat which could provide suitable breeding habitat for birds. Therefore, BBS were undertaken to determine species richness and spatial distribution of breeding birds within the Site and immediate surrounds, and provide a basis on which to assess the potential for disturbance and/or harm to bird species during the construction, decommissioning and operational phases of the Development.

This report describes the methods and results of this survey and provides an overview of the associated potential constraints to the Development, with recommendations for any further survey effort, mitigation and/or enhancements.

The report is supported by the following appendices:

- Appendix A – Planning Policy, Legislation and select Guidance;
- Appendix B – Bird Species Names and Conservation Designations;
- Appendix C – Figures; and
- Appendix D – Field Survey Details.

2.1 Planning policy, legislation and guidance

The following planning policy, legislation, and guidance were consulted during preparation of this report, with a further summary of each provided in Appendix A:

- European Union (Withdrawal) Act 2018[2];
- Directive 2009/147/EC on the Conservation of Wild Birds ('Birds Directive')[3];
- Wildlife and Countryside Act 1981 (as amended)[4];
- Natural Environment and Rural Communities (NERC) Act 2006[5]; and
- Birds of Conservation Concern (BoCC) 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man (Eaton *et al.*, 2015)[6].

English (British) vernacular and scientific names of bird species referred to in this report follow the British List maintained by the British Ornithologists' Union (BOU)[7], with a full list provided in Appendix B.

[1] Arcus (2020) Oaklands Solar *Preliminary Ecological Appraisal Report*, York UK

[2] UK Government (2018) European Union (Withdrawal) Act 2018 [Online] Available at: http://www.legislation.gov.uk/ukpga/2018/16/contents (Accessed 03/07/20)

[3] European Parliament (2009) Directive 2009/147/EC [Online] Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN (Accessed 03/07/20)

[4] UK Government (1981) The Wildlife and Countryside Act 1981 (as amended) [Online] Available at: http://www.legislation.gov.uk/ukpga/1981/69 (Accessed 03/07/20)

[5] UK Government (2006) Natural Environment and Rural Communities Act 2006 [Online] Available at: http://www.legislation.gov.uk/ukpga/2006/16/section/41 (Accessed 03/07/2020)

[6] Eaton M.A., Aebischer N.J., Brown A.F., Hearn R.D., Lock L., Musgrove A.J., Noble D.G., Stroud D.A. and Gregory R.D. (2015). Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* 108, 708–746.

[7] British Ornithologists' Union. (2017) The British List: A Checklist of Birds of Britain (9th edition). *Ibis* 160, 190-240.

3 METHODS

3.1 Desk Study

A desk study was undertaken as part of the Preliminary Ecological Appraisal[1] and this was reviewed to inform this report.

The desk study included a search of designated sites within or around the Site and a request for species records from the Derbyshire Biological Records Centre[8], including all records within the Site boundary and 2 km buffer. Relevant desk study results are summarised in Section 4.1.

A further search of publicly accessible data (including NBN Atlas[9], and eBird[10] websites) was made for some select species that could trigger a requirement for further surveys, e.g. barn owl, lapwing or golden plover, wildfowl, with records referenced separately in this report, where applicable.

3.2 Field Survey

A BBS was carried out between April and June 2020.

The BBS followed a reduced version of the British Trust for Ornithology's (BTO) method for the Common Birds Census (CBC)[11]. The surveyor walked slowly around the BBS Area recording and mapping all species encountered, including behavioural observations where applicable. Survey efforts focussed on field margins and hedgerows, with open habitats searched using binoculars. This is considered the most appropriate method for the predominantly lowland farmland habitats present in the BBS Area.

The BBS Area included all land within the Site Boundary and an additional 500 m buffer, where accessible (Appendix C, Figure 1).

Three visits were carried out on the following dates:

- Visit 1: 27th April 2020;
- Visit 2: 14th May 2020; and
- Visit 3: 3rd June 2020.

Full details of the survey times and weather observations during each survey are provided in Appendix D.

3.2.1 Data analysis

Data analysis focussed on identifying breeding territory locations of species of conservation concern, which included any bird species matching one or more of the following criteria:

- Annex I listed species on the Birds Directive[3];
- Schedule 1 listed species on the Wildlife and Countryside Act 1981 (as amended)[4];
- Species of Principal Importance listed on the NERC Act, 2006[5]; and
- Red- and Amber-listed birds of conservation concern[6].

To analyse the data, all registrations of these species were transferred from the field maps to produce 'species summary maps' from which the number and distribution of likely territories for each species could be determined. The method was based on that described by Bibby (2000)[12], with an element of professional judgement.

[8] https://www.derbyshirewildlifetrust.org.uk/derbyshire-biological-records-centre
[9] https://nbnatlas.org/ (Accessed 03/07/2020)
[10] https://ebird.org/map (Accessed 03/07/2020)
[11] Marchant, J. (1983) *Common Birds Census Instructions*. British Trust for Ornithology, Thetford.
[12] Bibby, C.J., Burgess, N.D., Hill, D.A. and Mustoe, S.H. (2000). *Bird Census Techniques, 2nd edition*. Academic Press, London

For most species, a precautionary approach was taken and a bird was deemed to be holding territory if it was recorded singing or exhibiting other behaviour indicative of breeding during just one of the three BBS visits. For more mobile species (e.g. curlew) a minimum of two registrations in an area was recorded as a territory. For semi-colonial species (e.g. house sparrow, house martin), analysis was based on Bibby (2000)[12], by identifying clusters of observations and taking the high-count from within each cluster and dividing by two.

3.3 Survey Limitations

Outside of the Site Boundary, access was restricted to public rights of way; however, these offered good coverage of the much of the 500 m buffer area. Where access was not possible, the area was searched from accessible points by listening and scanning the area using binoculars.

Due to the size of the BBS Area, surveys took longer and continued later in the day than would be considered optimal. The area within the Site Boundary was prioritised and, to minimise any bias, a different route was taken during each visit to sample different areas of the Site at different times of the survey.

The weather conditions were good for the first two survey visits, but sub-optimal for the third with persistent light rain; however, results were broadly consistent with the first two visits.

Despite the limitations identified, the survey results are considered to be an accurate reflection of the ornithology interest at the Site (see Section 4.3).

4 RESULTS

4.1 Desk Study

4.1.1 Designated Sites

There are no designated sites with bird interest within 2km of the Site.

4.1.2 Existing records

The desk study returned three records of birds within 2km of the Site. These were two yellowhammer records and a house sparrow record.

4.2 Field Surveys

A total of 56 species were recorded during the BBS.

Of these, 22 were species of conservation concern (as defined in Section 3.2.1) including 11 that showed evidence of breeding or holding territory. Six species of conservation concern were recorded breeding or holding territory within the Site Boundary. Breeding and non-breeding species of conservation concern are summarised in Tables 4.1 and 4.2 respectively.

Approximate territory locations of species of conservation concern are shown in Appendix C, Figure 2. Territory locations are shown as the approximate mid-point of observations that were used to identify the territory.

The conservation status of all species recorded are provided in Appendix B.

Table 4.1: Species of conservation concern breeding or holding territory

Species	Number of Territories Within BBS Area	Details
Lapwing	1	A single displaying lapwing was recorded in the west of the BBS Area, in the buffer during the May survey visit.
Cuckoo	2	Two singing male cuckoos were recorded in woodland in the buffer in the east of the BBS Area during the May survey visit.
Skylark	28	A minimum of 28 territory holding males were identified, including 19 within the Site Boundary. Although widely distributed throughout the BBS Area, the birds seemed to favour the larger arable fields in the south of the Site.
House martin	2	Two pairs of house martin were present in both May and June, and presumed to be breeding, around Ladsgrove Cottage, in the south of the BBS Area.
Willow warbler	11	A minimum of 11 willow warbler territories were identified, primarily in wooded and scrubby habitats in the buffer of the BBS Area. One singing male was recorded within the Site Boundary.
Song thrush	11	Eleven territory-holding song thrush were recorded. Most were located in woodland habitats in the buffer; however, one was recorded in the hedgerow along the north of the Site Boundary.
Mistle thrush	1	One singing mistle thrush was recorded during June in the north of the BBS Area. This species typically breeds very early in the spring; therefore, further territories may be present in the area but undetected during the surveys.
House sparrow	56	A minimum of 56 house sparrow pairs were recorded. All were associated with farms or buildings in the Site buffer; however, it is likely that these breeding birds forage within the Site Boundary.
Dunnock	50	At least 50 territory-holding dunnock were recorded, with peak numbers of singing birds in May. Birds were widely and evenly scattered among hedgerow, woodland and scrubby habitats throughout the BBS Area, including 26 wholly or partly within the Site Boundary.
Linnet	24	A minimum of 24 linnet pairs were identified in hedgerow and scrub habitats with the BBS Area. Birds were widely distributed but with loose clusters present within the west and southeast of the Site Boundary.
Yellowhammer	35	Thirty-five yellowhammer territories were scattered in hedgerow habitats across the BBS Area, including at least 17 wholly or partly within the Site Boundary.

Table 4.2: Species of conservation concern recorded during the BBS but not considered to be holding territory

Species	Details
Greylag goose	Two greylag geese were observed overflying the BBS Area during the April survey visit.
Mallard	Mallard were recorded in small numbers during both the April and May survey visits, mostly overflying the Site or near small waterbodies associated with farms. There does not appear to be suitable habitat for this species to breed within the Site Boundary.
Curlew	Two curlew flew north through the east of the BBS Area during the April visit, but did not land, and this species was not observed subsequently.

Species	Details
Black-headed gull	Small flocks of black-headed gull, numbering between four and 12 birds, were observed flying through the BBS Area during all BBS visits.
Herring gull	Three herring gull flew northeast over the BBS Area during the May visit.
Stock dove	Singles or pairs of stock dove were recorded during all BBS visits but no evidence of breeding was recorded.
Swift	Small flocks, of typically less than five birds, were recorded overflying the BBS Area during both the May and June BBS visits.
Kestrel	Kestrel was observed during all survey visits but always single birds and in widely scattered locations. No evidence of breeding was recorded but suitable breeding habitat may be present within the BBS Area it is possible that a nesting attempt was made on Site or in the wider area.
Starling	Small numbers of starling were recorded during both May and June, with juvenile birds observed in the latter month. No evidence of breeding was observed but it is possible that this species bred in suitable habitat (e.g. around some of the farms and/or housing areas, or in tree cavities) within the BBS Area.
Yellow wagtail	Individual yellow wagtails were recorded in areas of potentially suitable breeding habitat during the May and June BBS visits but no territorial or breeding behaviour was observed.
Bullfinch	Bullfinch was observed on two BBS visits in the east of the BBS Area. This species could nest in the woodland and scrub habitats found in the buffer but no evidence of breeding was recorded.

A further 34 bird species (not of conservation concern[13]) were recorded; those believed to be breeding or holding territory within the BBS Area are underlined: Canada goose, grey heron, cormorant, moorhen, pheasant, red-legged partridge, sparrowhawk, buzzard, woodpigeon, collared dove, great spotted woodpecker, jay, magpie, jackdaw, rook, carrion crow, raven, long-tailed tit, blue tit, great tit, swallow, chiffchaff, garden warbler, blackcap, whitethroat, lesser whitethroat, goldcrest, wren, blackbird, robin, pied wagtail, chaffinch, greenfinch and goldfinch.

4.3 Results Reliability and Discussion

The species recorded during the Field Surveys are considered an accurate reflection of the bird interests at the Site, based on the geographic location and habitats present.

The bird breeding season can be protracted and influenced by local and national weather events with different species active at different times. It is inevitable that not all birds will be recorded during every visit and as a result some species may be over- or under-recorded. Some early breeding or cryptic species, such as tawny owl and mistle thrush, could be present or breed in greater numbers in the BBS Area; however, their detection would not influence the conclusions or any mitigation proposed.

The Site is considered to have limited potential to support Schedule 1 bird species, with the possible exception of barn owl. No records of barn owl were returned during the desk study, and during a search of publicly available data sources, no records were found within the Site Boundary and no suitable nest sites were noted during the field survey.

Habitats within the Site Boundary are primarily open, including arable and grazing areas with ground-nesting species associated with these habitats, e.g. skylark, likely to be the most affected by any development works due to habitat loss. Other species of conservation concern recorded, e.g. dunnock, linnet, and yellowhammer, require a mix of hedgerows

[13] Green-listed BoCC and not listed as SPI, Schedule 1 or Annex I, as cited previously.

for nesting and fields and field margins for foraging. These species could therefore be impacted by loss of foraging habitat and, if hedgerows and field margins are not retained, loss of nesting habitat. Mitigation and/or enhancements will be required to avoid and/or minimise any adverse impacts on bird species within the Site and immediate surroundings.

5 RECOMMENDATIONS

5.1 Further Survey

5.1.1 Non-breeding season

Non-breeding bird interests are currently scoped out of survey and assessment.

The habitats present could be expected to hold small numbers of passerine species during the non-breeding season (broadly September–March), potentially including some SPI or red-listed species of conservation concern such as skylark and linnet; however, in the context of the wider area and surrounding habitats, the Site is considered highly unlikely to be important, or to hold significant numbers of any notable species.

The desk study returned very few bird records and no noteworthy wintering species, and an additional search of publicly available data sources found no records of species such as lapwing, golden plover or wildfowl, within the Site Boundary.

General mitigation and enhancements should include measures that will protect and/or benefit possible non-breeding bird interest at the Site.

5.1.2 Breeding season

The results presented herein are considered an accurate reflection of the bird interests at the Site; however, if the project is progressed as an NSIP, due to the scale of the Development, repeat surveys may be required to ensure the dataset is sufficient to allow a robust assessment of potential effects on breeding birds.

If the project is progressed as two separate, smaller-scale developments, a single season of BBS is likely to be adequate to assess potential effects on breeding birds.

5.1.3 Other

Based on the results collected to date, no species-specific surveys are considered necessary.

5.2 Mitigation & Enhancements

5.2.1 Mitigation

Birds are subject to varying levels of legal protection. Therefore, to adhere to good practice guidelines and ensure compliance with the Wildlife and Countryside Act 1981 (as amended)[4], avoidance and/or mitigation measures will be required.

Provisional recommendations for mitigation include:

- Any work involving vegetation clearance during the peak bird nesting season (March to September, or earlier/later if weather conditions are particularly mild) must be avoided.
- If any clearance works to nesting habitats are required during the nesting season, then pre-construction checks for nesting birds would need to be carried out by a suitably experienced ecologist no more than 48 hours prior to the works commencing.
- If any nesting birds are found to be present, an appropriate buffer zone would be implemented, within which works are excluded for the duration of the breeding

attempt. Any active nests will need to be left *in situ* until a suitably experienced ecologist confirms that birds have stopped using them.

- In the unlikely event that any birds listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended)[4], are found to be nesting on Site, an ecologist will need to be contacted for further advice.

Full advice and recommendations for Site- and Development-specific mitigation can be made once further details of the Development design and the proposed construction timetable are available.

5.2.2 Enhancements

In order to increase the biodiversity value of the Development site, and to adhere to Government guidance set out in the National Planning Policy Framework 2019 (NPPF)[14], a range of enhancement measures will need to be incorporated into the Development design.

These may include retention of hedgerow habitats within the Site, sympathetic landscaping works to benefit bird interests at the Site, and providing artificial nesting opportunities. However, full Site- and Development-specific recommendations for suitable enhancements can be made once further details of the Development design are available.

6 CONCLUSION

The BBS Area holds a selection of species typical of the habitats and geographic location of the Site. A total of 56 species were recorded during the BBS, including 22 species of conservation concern.

The proposed Development has the potential to adversely impact bird species through alteration of habitats that are relied upon for foraging and nesting, and some mitigation and/or enhancements will be required.

Provisional mitigation measures have been proposed to protect nesting bird interests at the Site during Construction. However, additional Site- and Development-specific measures may also be required to protect breeding birds, but are subject to review of the Development design and proposed construction timetable.

Enhancement measures to benefit bird interests at the Site may be required to ensure adherence to biodiversity net-gain policy but the types and extent of measures required will be subject to review of the Development design.

No further bird surveys are recommended at this stage; however, this is subject to review depending on the Development scale and design.

[14] Gov.uk (2019) *National Planning Policy Framework* [online] Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/810197/NPPF_Feb_2019_revised.pdf [Accessed 06/07/2020]

APPENDIX A – PLANNING POLICY, LEGISLATION AND SELECT GUIDANCE

European Union (Withdrawal) Act 2018[2]

Following the UKs withdrawal from the European Union (EU), the European Union (Withdrawal) Act 2018 enabled the transposition of applicable EU law into UK law, including The Bird Directive, which is summarised below.

The Birds Directive[3]

Annex I of Directive 2009/147/EC on the conservation of wild birds (known as the 'Birds Directive') lists bird species that are of conservation importance at a European level. Bird species listed on Annex I are protected from deliberate disturbance, particularly during the period of breeding and rearing young. This refers specifically to disturbance levels that would affect delivery of the objectives of the Birds Directive, which means that the impact of disturbance must not adversely affect a species' conservation status. One of the main provisions of the Directive is the identification and classification of Special Protection Areas (SPAs) for rare or vulnerable Annex I bird species, as well as for all regularly occurring migratory species.

The Wildlife and Countryside Act 1981 (as amended)[4]

The Wildlife and Countryside Act 1981 (as amended) is the primary legislation protecting animals, plants, and certain habitats in the UK, including all wild birds and their nests, eggs and chicks. Under this legislation, it is an offence to intentionally or recklessly kill, injure or take any wild bird or their eggs, or to take, damage, destroy, obstruct or otherwise interfere with the nest of any wild bird while it is in use or being built.

Additional protection of birds at or around their nests is afforded to rare breeding species in the UK, and/or species under threat of human persecution. These species are listed on Schedule 1 of the Act. Further protection to some Schedule 1 species is afforded under Schedule 1A, which protects birds from intentional or reckless harassment at any time (i.e. all year round).

Natural Environment and Rural Communities Act[5]

The Natural Environment and Rural Communities (NERC) Act 2006 places a duty on local planning authorities to have due regard for biodiversity and nature conservation during the course of their operations, and thus ensures that biodiversity is a key consideration in the planning process. Section 41 (S41) of the Act lists habitats and species which are of principal importance for the conservation of biodiversity in England.

UK Birds of Conservation Concern[6]

The UK Birds of Conservation Concern (BoCC) is a periodic national review assessing the population trends of bird species in the UK. It uses a traffic light system to indicate an increasing level of conservation concern. Species that have a declining range and/or population, or that are vulnerable to population effects due to their small population size, are Red-listed or Amber-listed, depending on the extent of the decline or vulnerability, while those which are stable, increasing, or experiencing only small declines, are Green-listed.

APPENDIX B – BIRD SPECIES NAMES AND CONSERVATION DESIGNATIONS

Table A1 list provides English vernacular and scientific names for all bird species mentioned in this report.

Nomenclature and taxonomic order are based on the BOU 'British List'[7].

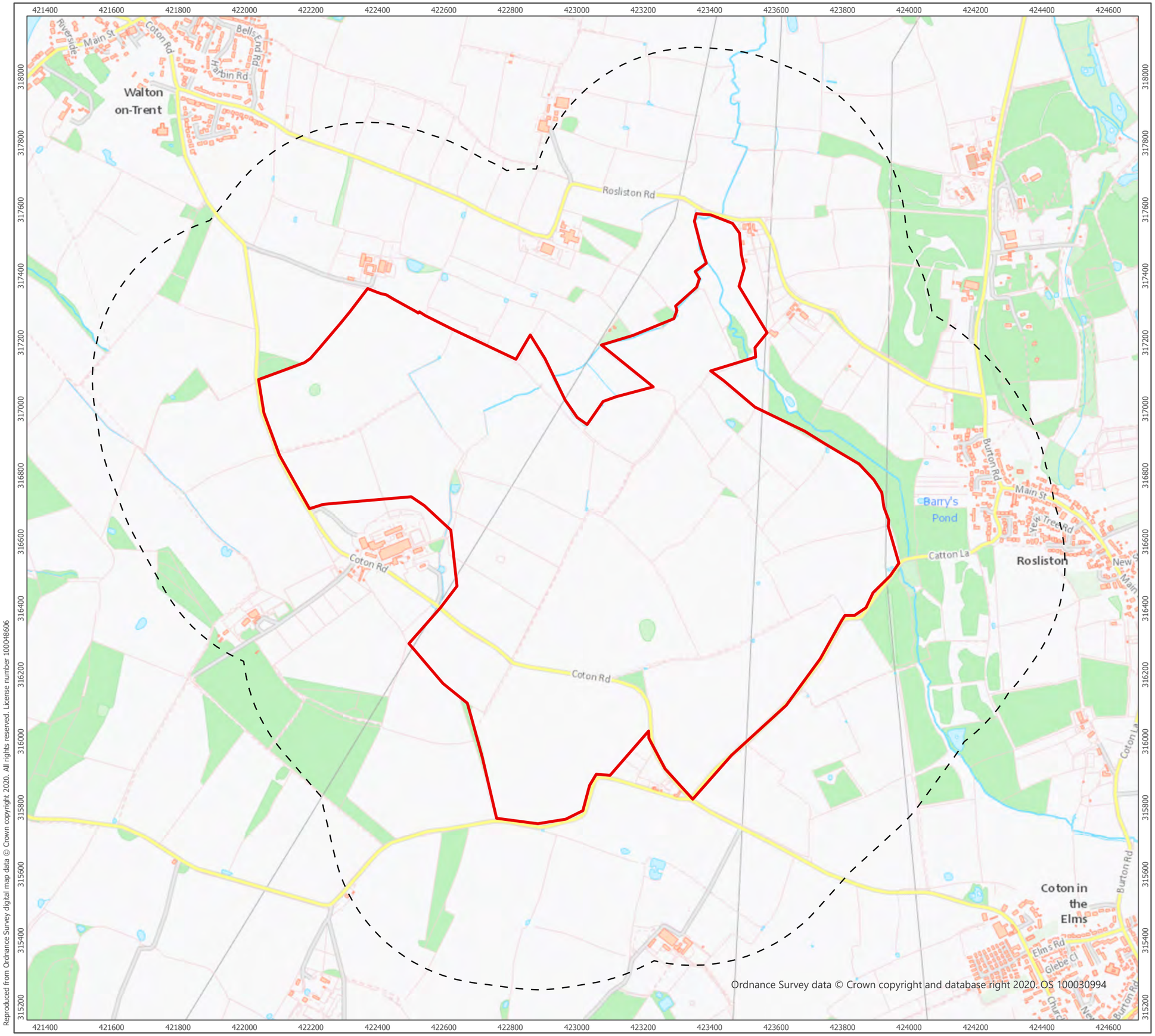
Table A1: List of English vernacular and scientific names of bird species

Species		Schedule 1/ Annex I Listings	SPI and/or BoCC Listing*
English (British) Vernacular Name	Scientific Name		
Canada goose	*Branta canadensis*		
Greylag goose	*Anser anser*		Amber
Mallard	*Anas platyrhynchos*		Amber
Red-legged partridge	*Alectoris rufa*		
Pheasant	*Phasianus colchicus*		
Grey heron	*Ardea cinerea*		
Cormorant	*Phalacrocorax carbo*		
Sparrowhawk	*Accipiter nisus*		
Buzzard	*Buteo buteo*		
Moorhen	*Gallinula chloropus*		
Lapwing	*Vanellus vanellus*		SPI, Red
Golden plover	*Pluvialis apricaria*	Annex I	
Curlew	*Numenius arquata*		SPI, Red
Black-headed gull	*Chroicocephalus ridibundus*		Amber
Herring gull	*Larus argentatus*		SPI, Red
Stock dove	*Columba oenas*		Amber
Woodpigeon	*Columba palumbus*		
Collared dove	*Streptopelia decaocto*		
Cuckoo	*Cuculus canorus*		SPI, Red
Barn owl	*Tyto alba*	Schedule 1	
Tawny owl	*Strix aluco*		Amber
Swift	*Apus apus*		Amber
Great spotted woodpecker	*Dendrocopos major*		
Kestrel	*Falco tinnunculus*		Amber

Species		Schedule 1/ Annex I Listings	SPI and/or BoCC Listing*
English (British) Vernacular Name	Scientific Name		
Jay	*Garrulus glandarius*		
Magpie	*Pica pica*		
Jackdaw	*Corvus monedula*		
Rook	*Corvus frugilegus*		
Carrion crow	*Corvus corone*		
Raven	*Corvus corax*		
Blue tit	*Cyanistes caeruleus*		
Great tit	*Parus major*		
Skylark	*Alauda arvensis*		SPI, Red
Swallow	*Hirundo rustica*		
House martin	*Delichon urbicum*		Amber
Long-tailed tit	*Aegithalos caudatus*		
Willow warbler	*Phylloscopus trochilus*		Amber
Chiffchaff	*Phylloscopus collybita*		
Blackcap	*Sylvia atricapilla*		
Garden warbler	*Sylvia borin*		
Lesser whitethroat	*Sylvia curruca*		
Whitethroat	*Sylvia communis*		
Goldcrest	*Regulus regulus*		
Wren	*Troglodytes troglodytes*		
Starling	*Sturnus vulgaris*		SPI, Red
Blackbird	*Turdus merula*		
Song thrush	*Turdus philomelos*		SPI, Red
Mistle thrush	*Turdus viscivorus*		Red
Robin	*Erithacus rubecula*		
House sparrow	*Passer domesticus*		SPI, Red
Dunnock	*Prunella modularis*		SPI, Amber

Species		Schedule 1/ Annex I Listings	SPI and/or BoCC Listing*
English (British) Vernacular Name	Scientific Name		
Yellow wagtail	*Motacilla flava*		SPI, Red
Pied wagtail	*Motacilla alba*		
Chaffinch	*Fringilla coelebs*		
Bullfinch	*Pyrrhula pyrrhula*		SPI, Amber
Greenfinch	*Chloris chloris*		
Linnet	*Linaria cannabina*		SPI, Red
Goldfinch	*Carduelis carduelis*		
Yellowhammer	*Emberiza citrinella*		SPI, Red
* Where no BoCC listing is shown, species are Green-listed.			

APPENDIX C – FIGURES



P:\Projects\Ornithology\Projects\3791 Oaklands Solar Ornithology\3791 Oaklands Solar Ornithology.aprx\3719-REP-004 Fig 1 The Site

ARCUS

Site Boundary

Breeding Bird Survey (BBS) Area - 500 m Buffer

1:11,000 Scale @ A3

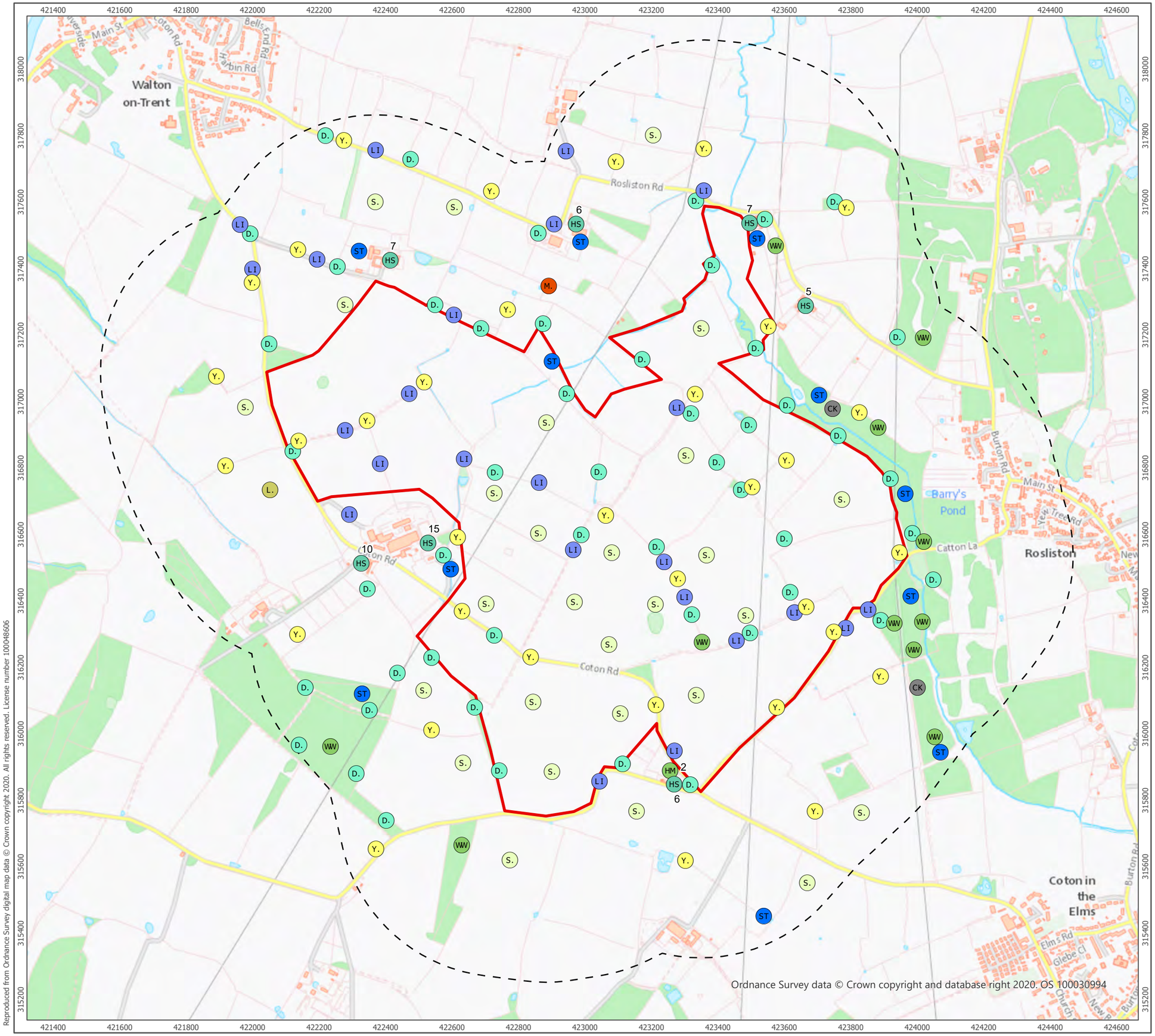
0 0.25 0.5 km

NORTH

Produced By: NE	Ref: 3719-REP-004
Checked By: MS	Date: 08/07/2020

The Site
Figure 1

2020 Breeding Bird Survey Report
Oaklands Solar Farm



ARCUS

- Site Boundary
- Breeding Bird Survey (BBS) Area - 500 m

Species

- CK Cuckoo
- D. Dunnock
- HM House Martin*
- HS House Sparrow*
- L. Lapwing
- LI Linnet
- M. Mistle Thursh
- S. Skylark
- ST Song Thursh
- WW Willow Warbler
- Y. Yellowhammer

* Number of territories (semi-colonial species)

1:11,000 Scale @ A3

0 0.25 0.5 km

NORTH

Produced By: NE	Ref: 3719-REP-005
Checked By: MS	Date: 08/07/2020

2020 BBS Survey Results
Figure 2

2020 Breeding Bird Survey Report
Oaklands Solar Farm

P:\Projects\Ornithology\Projects\3791 Oaklands Solar Ornithology\3791 Oaklands Solar Ornithology.aprx\3719-REP-005 Fig 2 BBS Survey Results

APPENDIX D – FIELD SURVEY DETAILS

Table A2 provides details of survey times and weather conditions.

Table A2: Survey times and weather conditions for all Breeding Bird Surveys

Date	Observer	Start of Survey	End of Survey	Hour	Wind Speed	Wind Direction	Rain	Cloud Cover	Cloud Height	Visibility	Frost	Snow
27.04.2020	CG	06:30	16:30	1	2	NW	0-1	8	1	2	0	0
27.04.2020	CG	06:30	16:30	2	2	NW	2	8	2	2	0	0
27.04.2020	CG	06:30	16:30	3	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	4	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	5	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	6	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	7	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	8	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	9	2	NW	0	8	2	2	0	0
27.04.2020	CG	06:30	16:30	10	2	NW	0	8	2	2	0	0
15.05.2020	CG	05:20	14:20	1	1	N	0	0	-	2	1	0
15.05.2020	CG	05:20	14:20	2	1	N	0	0	-	2	1	0
15.05.2020	CG	05:20	14:20	3	1	N	0	1	2	2	0	0
15.05.2020	CG	05:20	14:20	4	1	N	0	2	2	2	0	0
15.05.2020	CG	05:20	14:20	5	2	N	0	1	2	2	0	0
15.05.2020	CG	05:20	14:20	6	2	N	0	2	2	2	0	0
15.05.2020	CG	05:20	14:20	7	3	NE	0	2	2	2	0	0
15.05.2020	CG	05:20	14:20	8	3	NE	0	3	2	2	0	0
15.05.2020	CG	05:20	14:20	9	3	NE	0	3	2	2	0	0
03.06.2020	CG	04:45	14:00	1	2	NNW	4	8	1	1-2	0	0
03.06.2020	CG	04:45	14:00	2	2	NNW	4	8	2	2	0	0
03.06.2020	CG	04:45	14:00	3	2	NNW	4	8	2	2	0	0
03.06.2020	CG	04:45	14:00	4	2	N	4	8	2	2	0	0
03.06.2020	CG	04:45	14:00	5	3	NNE	4	8	2	2	0	0
03.06.2020	CG	04:45	14:00	6	3	NNE	4	8	2	2	0	0
03.06.2020	CG	04:45	14:00	7	3	NE	1	8	2	2	0	0
03.06.2020	CG	04:45	14:00	8	3	NE	1	8	2	2	0	0
03.06.2020	CG	04:45	14:00	9	3	NE	1	8	2	2	0	0

Notes:
Wind speed: according to Beaufort Scale
Wind direction: according to 16-point compass
Rain: 0 = None; 1 = Drizzle/Mist; 2 = Light showers; 3 = Heavy showers; 4 = Light rain; 5 = Heavy rain
Cloud cover: in eighths of sky (oktas). Cloud height: 0 = <150 m; 1 = 150-500 m; 2 = >500 m
Visibility: 0 = Poor (<1 km); 1 = Moderate (1-2 km); 2 = Good (>2 km)
Frost: 0 = None; 1 = Ground frost; 2 = All day frost. Snow: 0 = None; 1 = On site; 2 = On high ground
Observer: C. Gomersall

Appendix E

Solar Photovoltaic Glint and Glare Study (July 2021)

PAGERPOWER
Urban & Renewables

Solar Photovoltaic Glint and Glare Study

Land Use Consultants

Oaklands Farm Solar Park

July 2021





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ADMINISTRATION PAGE

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Issue	Date	Detail of Changes
1	13 July 2021	Initial issue
2	26 July 2021	Minor revisions

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EXECUTIVE SUMMARY

Report Purpose

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) development to be located southeast of Walton-on-Trent in Derbyshire, south of Drakelow Power Station, and is in South Derbyshire local authority area. This assessment pertains to the possible impact upon of glint and glare upon surrounding road users and residents in surrounding dwellings.

Overall Conclusions

A mitigation requirement has been identified for 23 receptors over approximately 2.2km of road and 13 dwellings due to the absence of screening and lack of mitigating factors that could reduce the level of impact.

Screening along the site boundary is recommended to obstruct views of the reflecting panels. The reflecting areas and recommended screening locations are defined in Section 7.2.1 and 7.3.1.

Guidance

Guidelines exist in the UK (produced by the Civil Aviation Authority) and in the USA (produced by the Federal Aviation Administration) with respect to solar developments and aviation activity, however a specific methodology for determining the impact upon road safety or residential amenity has not been produced to date. Therefore, Pager Power has reviewed existing guidelines and the available studies (discussed below) in the process of defining its own glint and glare assessment guidance document and methodology[1]. This methodology defines the process for determining the impact upon road safety and residential amenity.

Pager Power's approach is to undertake geometric reflection calculations and, where a solar reflection is predicted, consider the screening (existing and/or proposed) between the receptor and the reflecting solar panels. The scenario in which a solar reflection can occur for all receptors is then identified and discussed, and a comparison is made against the available solar panel reflection studies to determine the overall impact.

The available studies have measured the intensity of reflections from solar panels with respect to other naturally occurring and manmade surfaces. The results show that the reflections produced are of intensity similar to or less than those produced from still water and significantly less than reflections from glass and steel[2].

[1] Pager Power Glint and Glare Guidance, Third Edition (3.1), April 2021.
[2] SunPower, 2009, SunPower Solar Module Glare and Reflectance (appendix to Solargen Energy, 2010).

PAGERPOWER
Urban & Renewables

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 50 countries within Europe, Africa, America, Asia and Australasia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects;
- Building developments;
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 INTRODUCTION

1.1 Overview

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) development to be located southeast of Walton-on-Trent in Derbyshire, south of Drakelow Power Station, and is in South Derbyshire local authority area. This assessment pertains to the possible impact upon of glint and glare upon surrounding road users and dwellings.

This report therefore contains the following:

- Solar development details;
- Explanation of glint and glare;
- Overview of relevant guidance;
- Overview of relevant studies;
- Overview of Sun movement;
- Assessment methodology;
- Identification of receptors;
- Glint and glare assessment for identified receptors;
- Results discussion;
- Overall conclusions and recommendations.

1.2 Pager Power's Experience

Pager Power has undertaken over 650 Glint and Glare assessments in the UK and internationally. The studies have included assessment of civil and military aerodromes, railway infrastructure and other ground-based receptors including roads and dwellings.

1.3 Glint and Glare Definition

The definition of glint and glare can vary however, the definition used by Pager Power is as follows:

- Glint – a momentary flash of bright light typically received by moving receptors or from moving reflectors;
- Glare – a continuous source of bright light typically received by static receptors or from large reflective surfaces.

These definitions are aligned with those of the Federal Aviation Administration (FAA) in the United States of America. The term 'solar reflection' is used in this report to refer to both reflection types i.e. glint and glare.

2 SOLAR DEVELOPMENT LAYOUT AND DETAILS

2.1 Site Layout Plans

Early indicative layout plans upon which this assessment has been based are shown in Figure 1[3] below and Figure 2[3] on the following page. The solar panel locations are shown as the blue areas.

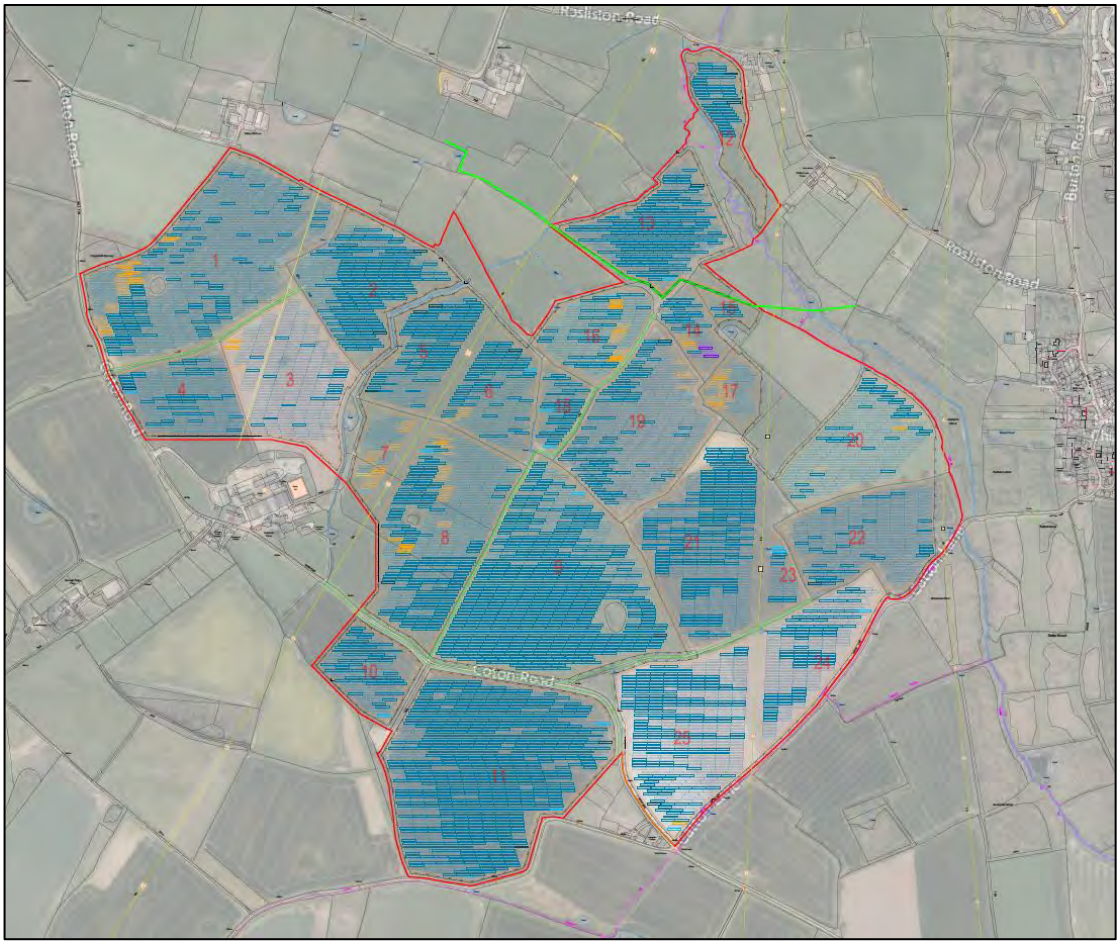


Figure 1 *Site layout plan 1*

[3] Source: BW21-OSF-PD-01_Module layout_2.5m (cropped).

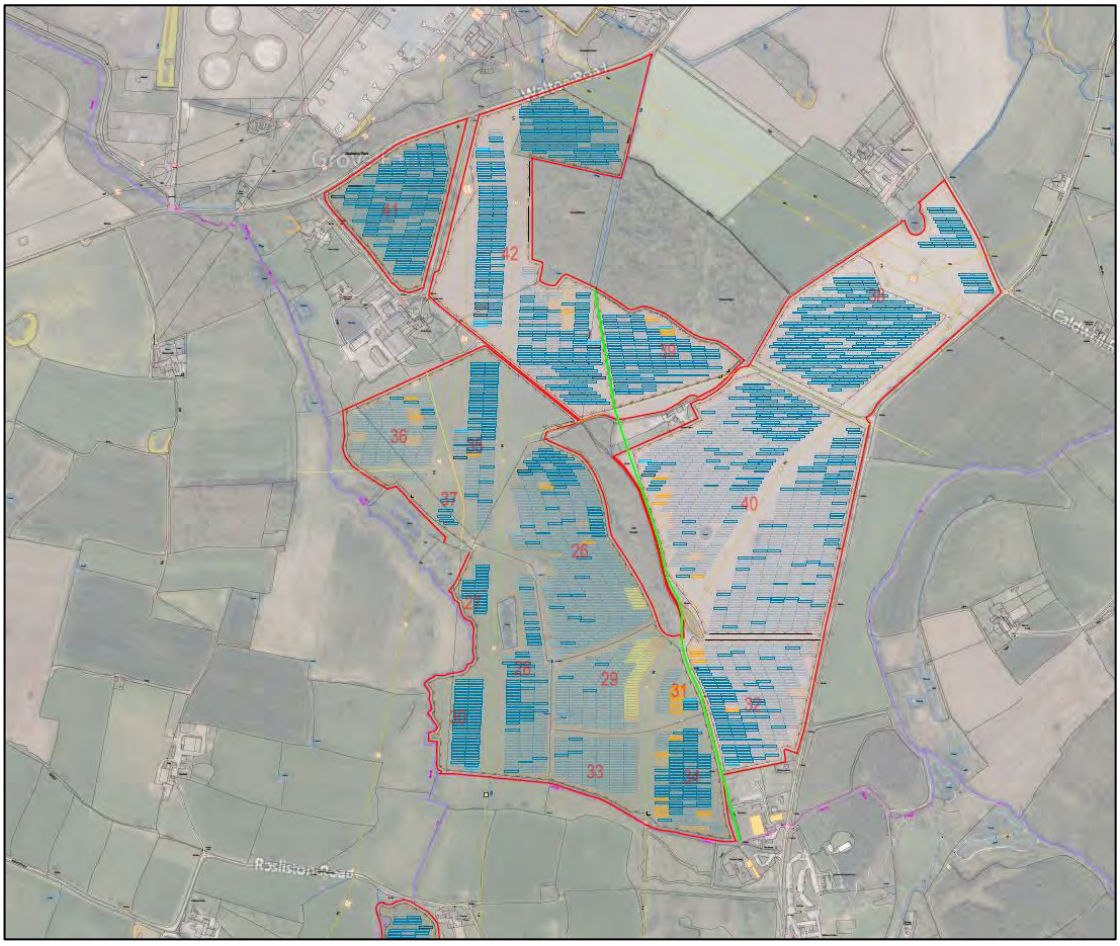


Figure 2 *Site layout plan 2*

2.2 Solar Panel Details

The solar panel details used in the assessment are presented in Table 1 below.

Panel Information	
Azimuth angle (°)	180 (south facing)
Elevation angle (°)	20
Assessed centre height (m agl[4])	1.75

Table 1 *Solar panel details*

[4] metres above ground level

3 GLINT AND GLARE ASSESSMENT METHODOLOGY

3.1 Guidance and Studies

Appendix A and B present a review of relevant guidance and independent studies with regard to glint and glare issues from solar panels. The overall conclusions from the available studies are as follows:

- Specular reflections of the Sun from solar panels are possible;
- The measured intensity of a reflection from solar panels can vary from 2% to 30% depending on the angle of incidence;
- Published guidance shows that the intensity of solar reflections from solar panels are equal to or less than those from water. It also shows that reflections from solar panels are significantly less intense than many other reflective surfaces, which are common in an outdoor environment.

3.2 Background

Details of the Sun's movements and solar reflections are presented in Appendix C.

3.3 Pager Power's Methodology

Pager Power's 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 the glint and glare assessments is as follows:

- Identify receptors in the area surrounding the proposed development;
- Consider direct solar reflections from the proposed development towards the identified receptors by undertaking geometric calculations;
- Consider the visibility of the reflectors from the receptor's location. If the reflectors are not visible from the receptor then no reflection can occur;
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur;
- Consider both the solar reflection from the proposed development and the location of the direct sunlight with respect to the receptor's position;
- Consider the solar reflection with respect to the published studies and guidance;
- Determine whether a significant detrimental impact is expected in line with Appendix D.

3.4 Assessment Methodology and Limitations

Further technical details regarding the methodology of the geometric calculations and limitations are presented in Appendix E and Appendix F.

4 IDENTIFICATION OF RECEPTORS

4.1 Overview

There is no formal guidance with regard to the maximum distance at which glint and glare should be assessed. From a technical perspective, there is no maximum distance for potential reflections. The significance of a reflection however decreases with distance because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. Terrain and shielding by vegetation are also more likely to obstruct an observer's view at longer distances.

A 1km buffer (orange outlined areas in the proceeding figures) is considered appropriate for glint and glare effects on ground-based receptors. Receptors within this distance are identified based on mapping and aerial photography of the region.

Reflections towards ground-based receptors to the north of the panels are unlikely at this latitude for fixed panels facing south and have therefore not been taken for geometric modelling. A more detailed assessment is made if the modelling reveals that a reflection would be geometrically possible.

The receptor details are presented in Appendix G and the terrain elevations have been interpolated based on OSGB36 data.

4.2 Road Receptors

Road types can generally be categorised as:

- Major National – Typically a road with a minimum of two carriageways with a maximum speed limit of up to 70mph. These roads typically have fast moving vehicles with busy traffic;
- National – Typically a road with a one or more carriageways with a maximum speed limit of up to 60mph or 70mph. These roads typically have fast moving vehicles with moderate to busy traffic density;
- Regional – Typically a single carriageway 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
- Local – Typically roads and lanes with the lowest traffic densities. Speed limits vary.

Several of the roads surrounding the proposed development are considered local roads where traffic densities are likely to be relatively low.

Local roads have not been taken forward for geometric modelling as any solar reflections from the proposed development that are experienced by a road user would be considered low impact in accordance with the guidance presented in Appendix D.

The analysis has therefore considered major national, national, and regional roads that:

- Are within one kilometre of the proposed development;
- Have a potential view of the panels.

The assessed receptors along the identified regional roads are shown in Figure 3[5] below. A height of 1.5 metres above ground level has been taken as typical eye level of a road user.

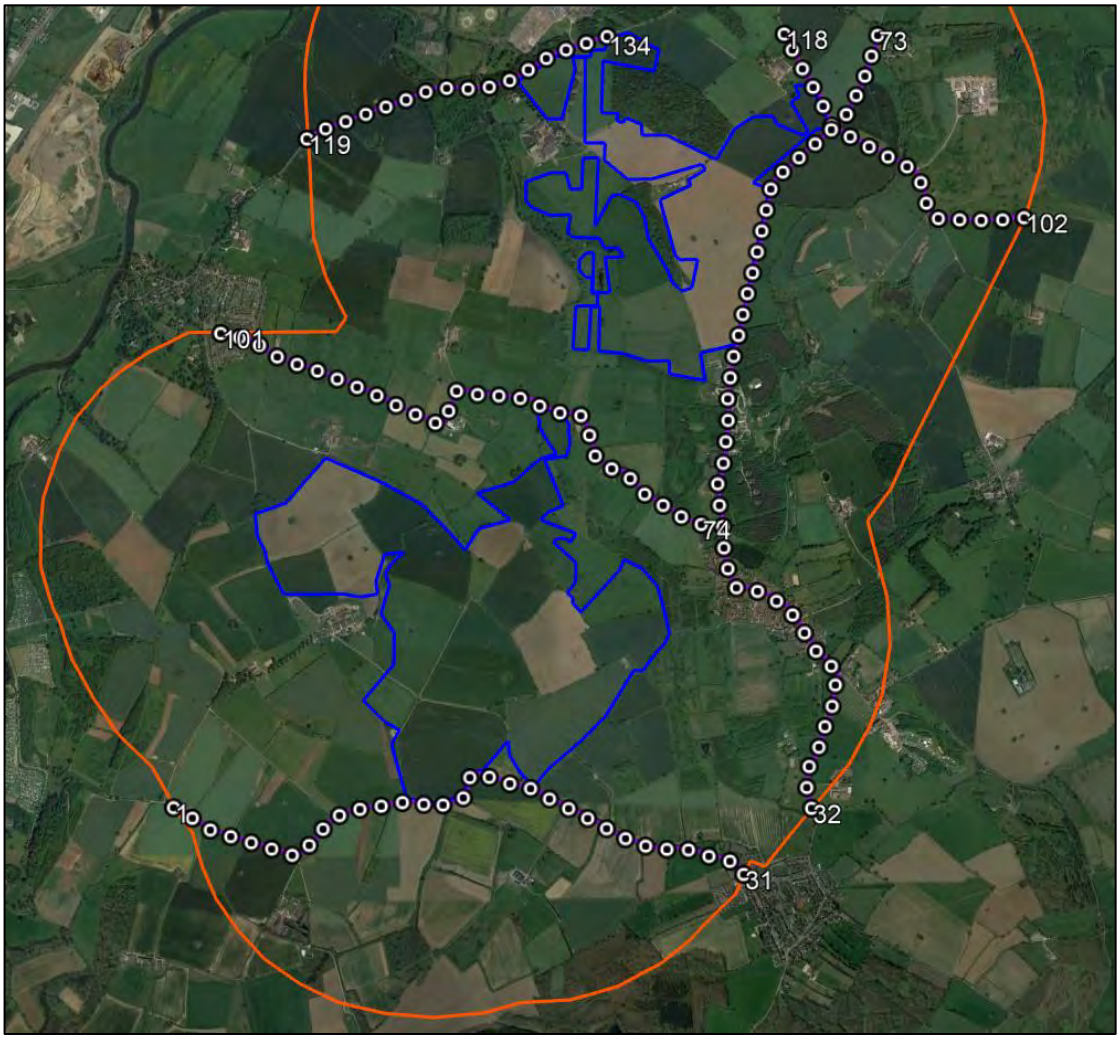


Figure 3 *Assessed road receptors*

[5] Copyright © 2021 Google.

4.3 Dwelling Receptors

The analysis has considered dwellings that:

- Are within one kilometre of the proposed development;
- Have a potential view of the panels.

In residential areas with multiple layers of dwellings, only the outer dwellings have been considered for assessment. This is because they will mostly obscure views of the solar panels to the dwellings behind them, which will therefore not be impacted by the proposed development because line of sight will be removed or will experience comparable effects to the closest assessed dwelling.

Additionally, in some cases, a single receptor point may be used to represent a small number of separate addresses. In such cases, the results for the receptor will be representative of the adjacent observer locations, such that the overall level of effect in each area is captured reliably.

The assessed dwelling receptors are shown in Figures 4 to 13[6] below and on the following pages. A height of 1.8m above ground level is used to simulate the typical viewing height of a ground floor window[7].

Figure 4 *Assessed dwelling receptors 1 to 7*

[6] Copyright © 2021 Google.
[7] Views from the upper floors of each dwelling are also considered in the results discussion.

Figure 5 *Assessed dwelling receptors 8 to 22*

Figure 6 *Assessed dwelling receptors 23 and 24*

Figure 7 *Assessed dwelling receptors 31 to 75*

Figure 8 *Assessed dwelling receptors 76 to 85*

Figure 9 *Assessed dwelling receptors 86 to 105*

Figure 10 *Assessed dwelling receptors 107 to 111*

Figure 11 *Assessed dwelling receptors 112 to 117*

Figure 12 *Assessed dwelling receptors 118 to 124*

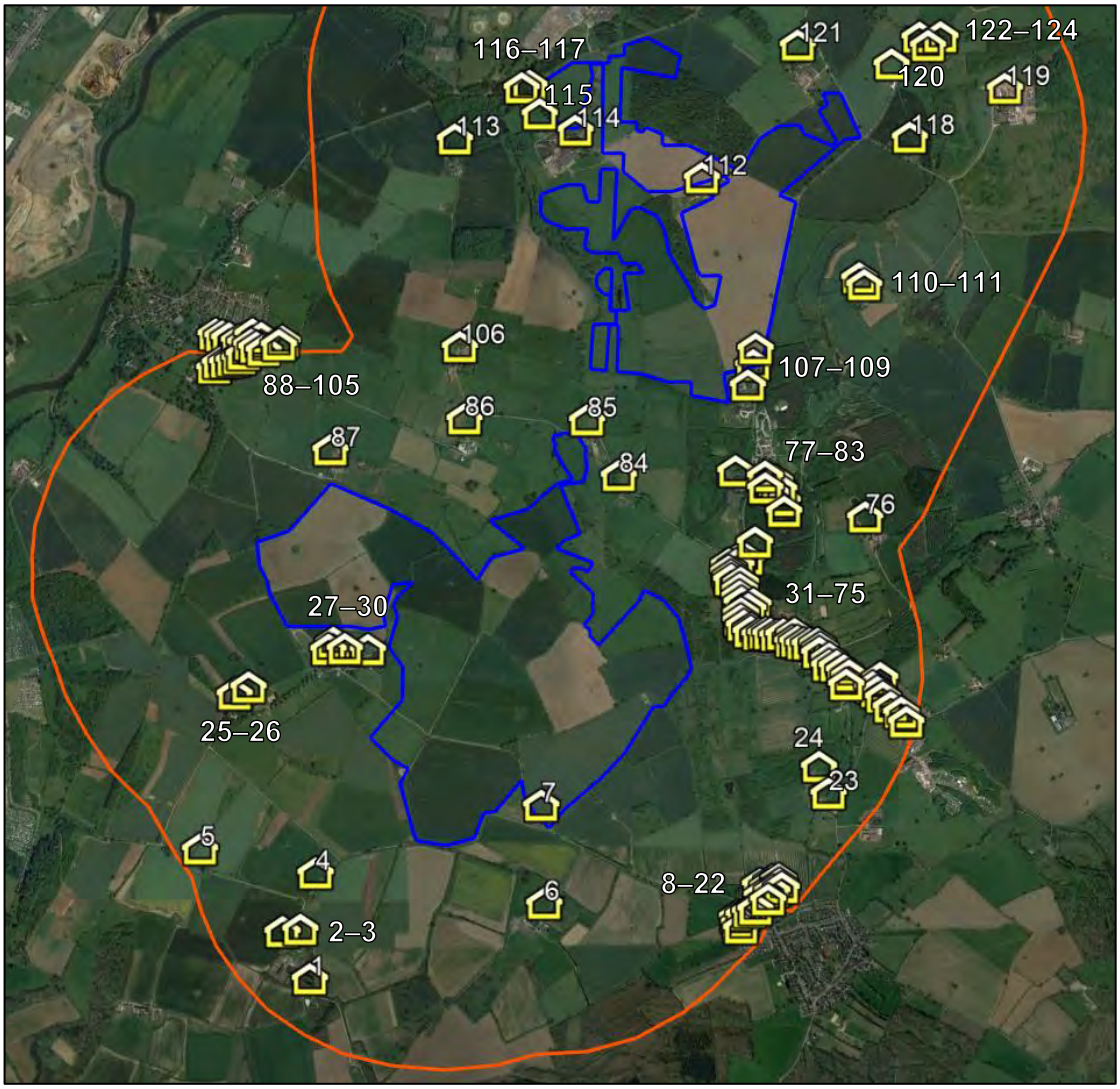


Figure 13 *Assessed dwelling receptor overview*

4.3.1 Drakelow Park

Further to the existing dwellings surrounding the proposed development, dwellings within the proposed Drakelow Park housing development have been considered as part of this assessment. The location of Drakelow Park relative to the proposed development is shown in Figure 14[8] on the following page.

The figure shows that the housing development is located north of the proposed development, which means solar reflections are not considered geometrically possible. No dwellings have therefore been taken forward for geometric modelling, and no impacts on any dwellings within Drakelow Park are predicted.

[8] Copyright © 2021 Google.

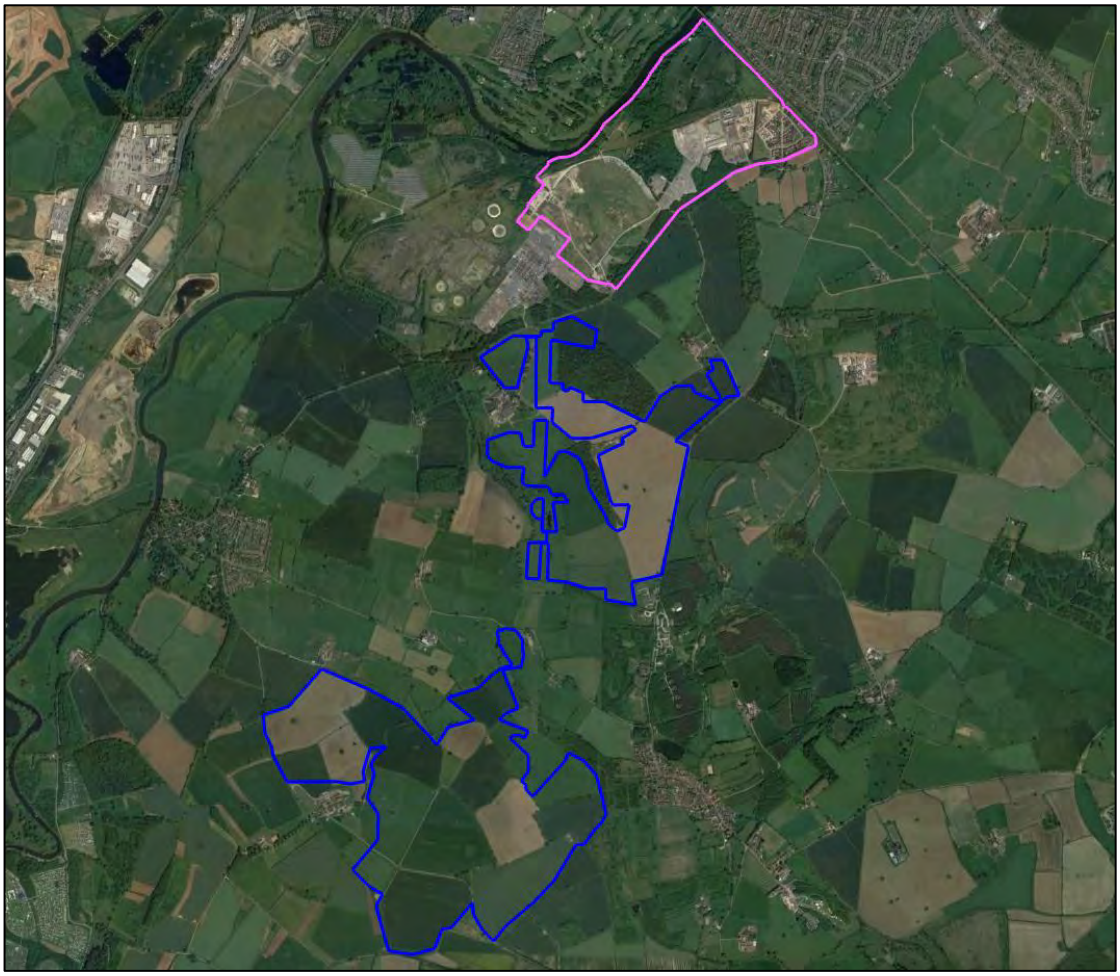


Figure 14 *Drakelow Park relative to the proposed development*

5 ASSESSED REFLECTOR AREAS

5.1 Reflector Areas

A number of representative panel locations are selected within the proposed reflector areas. The number of modelled reflector points is determined by the size of the reflector area and the assessment resolution. The bounding co-ordinates for the proposed solar development have been extrapolated from the site plans and can be found in Appendix G. All ground heights have been based on OSGB36 terrain data.

A geometric calculation is undertaken for each identified receptor every 30m from within the defined areas, resulting in 3010 individual reflector points. This resolution is sufficiently high to maximise the accuracy of the results – increasing the resolution further would not significantly change the modelling output. If a reflection is experienced from an assessed panel location, then it is likely that a reflection will be viewable from similarly located panels within the proposed solar development.

The assessed reflector areas are shown in Figure 15 below.

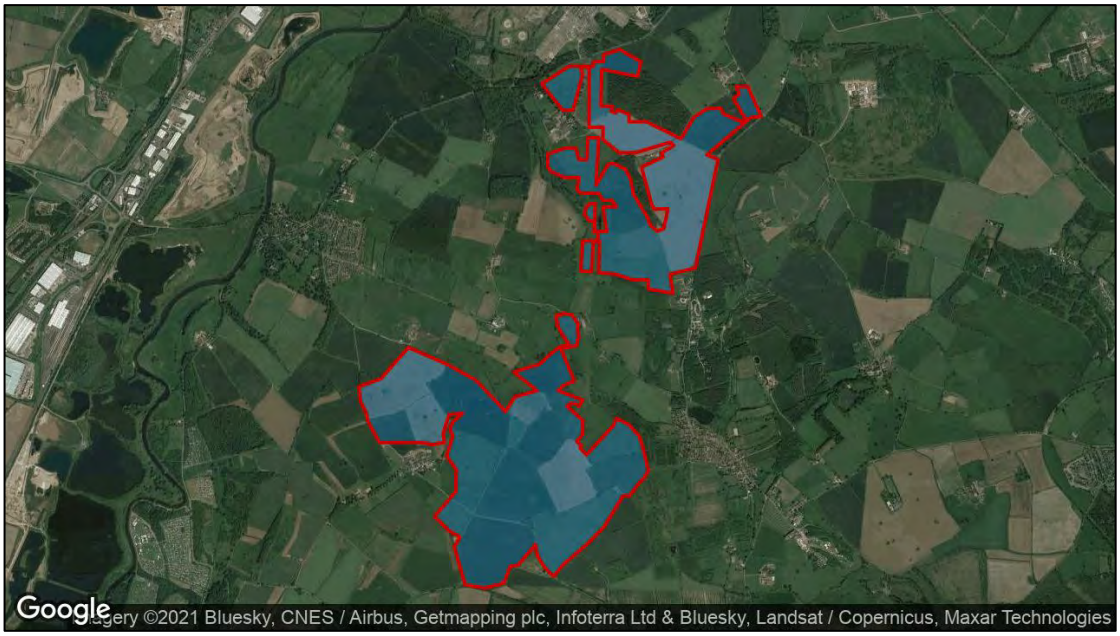


Figure 15 *Assessed reflector areas*

6 GEOMETRIC MODELLING RESULTS

6.1 Summary of Results

The tables in the following sub-sections summarise the results of the geometric modelling, based solely on bare-earth terrain i.e., without consideration of screening from buildings and vegetation. The final column summarises the worst-case impact significance for each receptor, which are considered further if a potentially significant impact has been identified.

The modelling output showing the precise predicted times and the reflecting panel areas are shown in Appendix H.

6.2 Geometric Modelling Results Overview – Road Receptors

The results of the geometric modelling for the road receptors are presented in Table 2 below.

Receptor	Solar Reflection Possible Towards the Road Receptors? (GMT)		Comment
	am	pm	
1 – 9	Yes.	No.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
10 – 15	Yes.	No.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
16 – 17	Yes.	Yes.	The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
18 – 20	Yes.	Yes.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
21 – 30	No.	Yes.	
31	No.	Yes.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).

Receptor	Solar Reflection Possible Towards the Road Receptors? (GMT)		Comment
	am	pm	
32 – 38	No.	Yes.	The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
39 – 45	No.	Yes.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
46 – 52			The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
53	No.	No.	No solar reflections geometrically possible. No impacts are predicted.
54 – 64	No.	Yes.	The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
65 – 69			The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
70 – 72			The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
73	No.	No.	No solar reflections geometrically possible. No impacts are predicted.

Receptor	Solar Reflection Possible Towards the Road Receptors? (GMT)		Comment
	am	pm	
74 – 81	No.	Yes.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
82 – 83	Yes.	Yes.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
84 – 101	Yes.	No.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
102 – 106	No.	Yes.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
107	No.	Yes.	The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
108 – 115			The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
116 – 117	No.	Yes.	The model output shows potential effects would originate from outside a road user's field of view. The worst-case impact is **low**, which is acceptable without mitigation.
118	No.	No.	No solar reflections geometrically possible. No impacts are predicted.

Receptor	Solar Reflection Possible Towards the Road Receptors? (GMT)		Comment
	am	pm	
119	Yes.	No.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).
120 – 134	Yes.	No.	The model output shows potential effects could originate from within a road user's field of view. The worst-case impact is **high**, which requires further consideration (see Section 7.2).

Table 2 *Geometric modelling results – road receptors*

6.3 Geometric Modelling Results Overview – Dwelling Receptors

The results of the geometric modelling for the dwelling receptors are presented in Table 3 below.

Receptor	Solar Reflection Possible Towards the Dwelling Receptors? (GMT)		Comment
	am	pm	
1 – 3	No.	No.	No solar reflections geometrically possible. No impacts are predicted.
4 – 5	Yes.	No.	The model output shows potential effects could last for more than three months per year and less than 60 minutes per day. The worst-case impact is **moderate**, which requires further consideration (see Section 7.3).
6	No.	No.	No solar reflections geometrically possible. No impacts are predicted.
7	No.	Yes.	The model output shows potential effects could last for more than three months per year and less than 60 minutes per day. The worst-case impact is **moderate**, which requires further consideration (see Section 7.3).

Receptor	Solar Reflection Possible Towards the Dwelling Receptors? (GMT)		Comment
	am	pm	
8	No.	Yes.	The model output shows potential effects would last for less three months per year and less than 60 minutes per day. The worst-case impact is **low**, which is acceptable without mitigation.
9 – 24	No.	Yes.	The model output shows potential effects could last for more than three months per year and less than 60 minutes per day. The worst-case impact is **moderate**, which requires further consideration (see Section 7.3).
25 – 30	Yes.	No.	
31 – 84	No.	Yes.	
85	Yes.	Yes.	
86 – 106	Yes.	No.	
107 – 111	No.	Yes.	
112	Yes.	Yes.	
113 – 117	Yes.	No.	
118	No.	Yes.	
119 – 123	No.	Yes.	The model output shows potential effects would last for less three months per year and less than 60 minutes per day. The worst-case impact is **low**, which is acceptable without mitigation.
124	No.	No.	No solar reflections geometrically possible. No impacts are predicted.

Table 3 *Geometric modelling results – dwelling receptors*

7 ASSESSMENT RESULTS AND DISCUSSION

7.1 Overview

The following sub-sections present the analysis for the receptors where further consideration is required. The significance of any predicted impact is considered in the context of existing screening and the relevant criteria. The criteria is determined by the assessment process, which is set out in Appendix D.

When evaluating visibility in the context of glint and glare, it is only the reflecting panel area that must be considered. For example, if the western half of the development is visible, but reflections would only be possible from the eastern half, it can be concluded that the reflecting area is not visible, and no impacts are predicted. Therefore, there can be instances where visibility of the development is predicted, but glint and glare issues are screened.

When determining the visibility of the reflecting panels for an observer, a conservative review of the available imagery is undertaken, whereby it is assumed views of the panels are possible if it cannot be reliably determined that existing screening will remove effects.

7.2 Road Results

The key considerations for quantifying impact significance for road users are:

- Whether a reflection is predicted to be experienced in practice;
- The location of the reflecting panel relative to a road user's direction of travel.

The key considerations for quantifying impact significance for road users along major national, national, and regional roads are:

- Whether a reflection is predicted to be experienced in practice;
- The location of the reflecting panel relative to a road user's direction of travel.

Where reflections originate from outside of a road user's field of view (50 degrees either side of the direction of travel), the impact significance is low, and mitigation is not required.

Where reflections originate from inside of a road user's field of view but there are mitigating circumstances, the impact significance is moderate is moderate and expert assessment of the following mitigating factors is required to determine the mitigation requirement:

- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers (such as HGVs) along dual carriageways and motorways compared to other types of road;
- Whether the solar reflection originates from directly in front of a road user – a solar reflection that is directly in front of a road user is more hazardous than a solar reflection to one side;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare.

Where reflections originate from within a road user's field of view and there are no further mitigating circumstances, the impact significance is high, and mitigation is required.

The modelling has shown that solar reflections could originate from solar panels within a road user's field of view for road receptors 1 – 15, 18 – 31, 39 – 45, 65 – 69, 74 – 78, 80 – 86, 88 – 106, 108 – 115, and 119– 134. These sections of road are shown as the yellow lines in Figure 16[9] below.

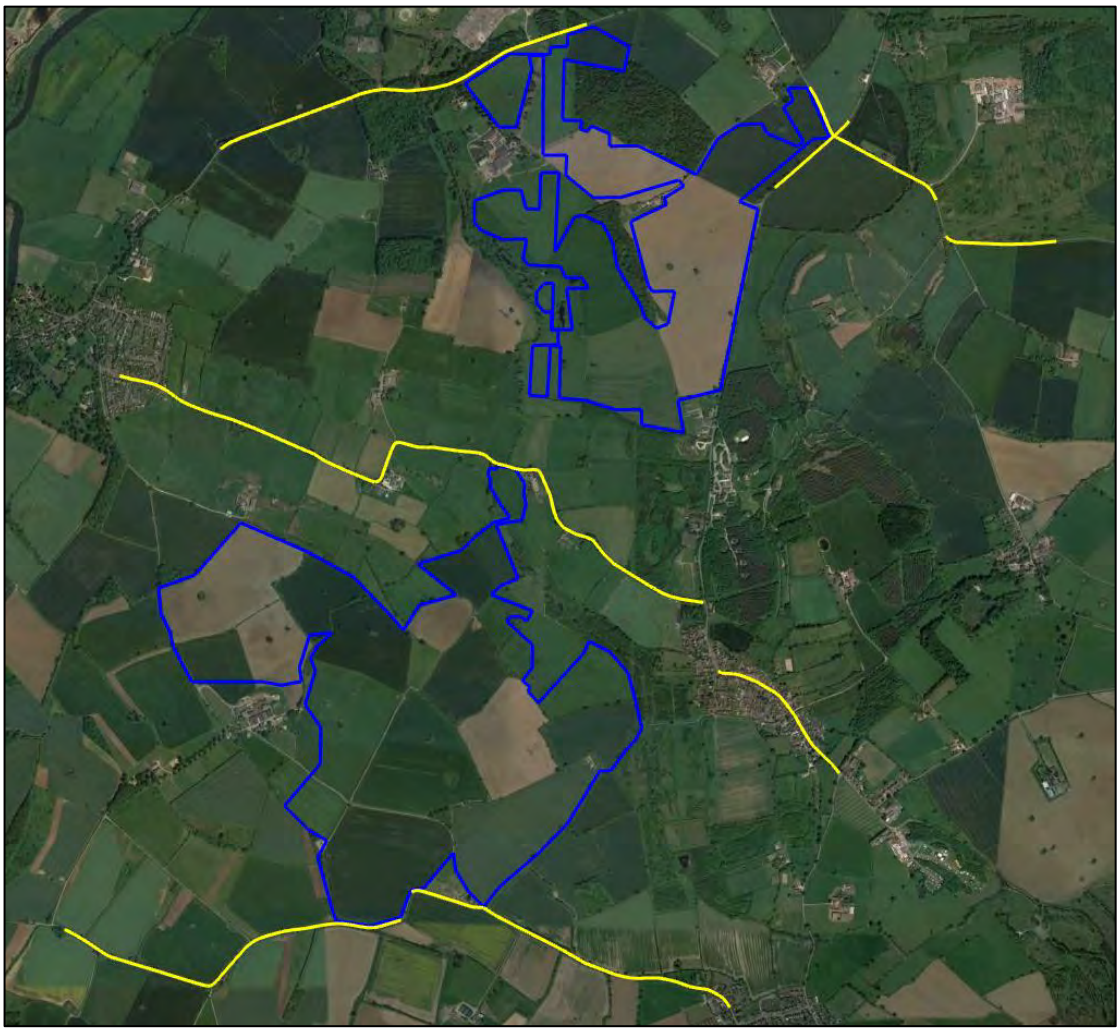


Figure 16 *Sections of road that could experience moderate or high impacts*

Each road receptor for which impacts are potentially moderate or high has been considered in turn to evaluate the mitigation requirement. Table 5 on the following page summarises the predicted impact significance and mitigation requirement based on the relevant mitigating factors.

[9] Copyright © 2021 Google.

Cases where mitigation is recommended/required are shown in red for ease of reference and discussed further in Section 7.2.1.

Road Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Glare Location	Separation Distance		
1 – 11	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and intervening terrain.	N/A	N/A	No impact.	No.
12 – 15	The reflecting areas are predicted to be partially obstructed by existing vegetation.	Glare predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 40 metres from the road user.	High.	Yes – required.
18 – 19			The nearest reflecting area is approximately 10 metres from a road user at its closest point.		
20 – 31	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and intervening terrain.	N/A	N/A	No impact.	No.

Road Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Glare Location	Separation Distance		
39 – 45	It is predicted that the reflecting areas will be entirely obstructed by surrounding dwellings.	N/A	N/A	No impact.	No.
65 – 69	The reflecting areas are predicted to be partially obstructed by existing vegetation.	Glare is not predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 10 metres from a road user at its closest point.	Moderate.	Yes – recommended.
74 – 75	It is possible that reflecting areas will be entirely obstructed by existing vegetation, but this cannot be reliably determined.	N/A	The nearest reflecting area is approximately 1 kilometre from a road user at its closest point.	Low.	No.
76	It is predicted that the reflecting areas will be entirely obstructed by surrounding dwellings.	N/A	N/A	No impact.	No.

Road Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Glare Location	Separation Distance		
77	It is possible that reflecting areas will be entirely obstructed by existing vegetation, but this cannot be reliably determined.	Glare is not predicted to originate from panels directly in front of a road user.	The nearest reflecting area is beyond 400 metres from a road user at its closest point.	Moderate.	No.
78	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and surrounding dwellings.	N/A	N/A	No impact.	No.
79	It is possible that reflecting areas will be entirely obstructed by existing vegetation, but this cannot be reliably determined.	Glare is predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 200 metres from a road user at its closest point.	High.	Yes – required.
80 – 85	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.

Road Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Glare Location	Separation Distance		
86 – 88	The reflecting areas are predicted to be partially obstructed by existing vegetation.	N/A	The nearest reflecting area is approximately 1 kilometre from a road user at its closest point.	Low.	No.
89 – 106	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.
108 – 110					
111 – 112	The reflecting areas are predicted to be partially obstructed by existing vegetation.	Glare is predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 200 metres from a road user at its closest point.	High.	Yes – required.
113 – 115	The reflecting areas are unlikely to be obstructed by screening.	Glare is not predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 10 metres from a road user at its closest point.	Moderate.	Yes – recommended.
119 – 128	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.

Road Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Glare Location	Separation Distance		
129 – 130	The reflecting areas are unlikely to be obstructed by screening.	Glare is predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 150 metres from a road user at its closest point.	High.	Yes – required.
131		Glare is not predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 280 metres from a road user at its closest point.	Moderate.	Yes – recommended.
132 – 134		Glare is predicted to originate from panels directly in front of a road user.	The nearest reflecting area is approximately 90 metres from a road user at its closest point.	High.	Yes – required.

Table 4 *Assessment of mitigation requirement – road receptors*

7.2.1 Sections of Road and Panel Areas to Mitigate

Based on the results of the assessment, mitigation recommended for receptors 65 – 69, 113 – 115, and 131; and required for receptors 12 – 15, 18 – 19, 79, 111 – 112, 129 – 130, and 132 – 134. The reflecting panel areas associated with these sections of road are shown as the yellow areas in Figures 17 to 22[10] on the following pages.

The mitigation strategy should obstruct views of the panel areas to sufficiently reduce the level of impact. The recommended screening locations are shown as the pink lines

[10] Copyright © 2021 Google.

Figure 17 *Reflecting area for road receptors 12 to 15*

Figure 18 *Reflecting area for road receptors 18 and 19*

Figure 19 *Reflecting area for road receptors 65 to 69*

Figure 20 *Reflecting area for road receptor 79*

Figure 21 *Reflecting area for road receptors 111 to 115*

Figure 22 *Reflecting area for road receptors 129 and 134*

7.3 Dwelling Results

The key considerations for quantifying impact significance for dwelling receptors are:

- Whether a reflection is predicted to be experienced in practice;
- The duration of the predicted effects, relative to thresholds of:
    - 3 months per year;
    - 60 minutes per day.

Where effects occur for less than 3 months per year and less than 60 minutes per day, the impact significance is low, and mitigation is not required.

Where effects last for more than 3 months per year or for more than 60 minutes per day, the impact significance is moderate and expert assessment of the following mitigating factors is required to determine the mitigation requirement:

- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer's field of view that is affected by glare;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not;
- Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact.

Where effects last for more than 3 months per year and more than 60 minutes per day, the impact significance is high, and mitigation is required.

The modelling has shown that moderate impacts are geometrically possible for dwellings 4 – 5, 7, and 9 – 118. These dwellings are shown in Figure 23[11] on the following page.

[11] Copyright © 2021 Google.

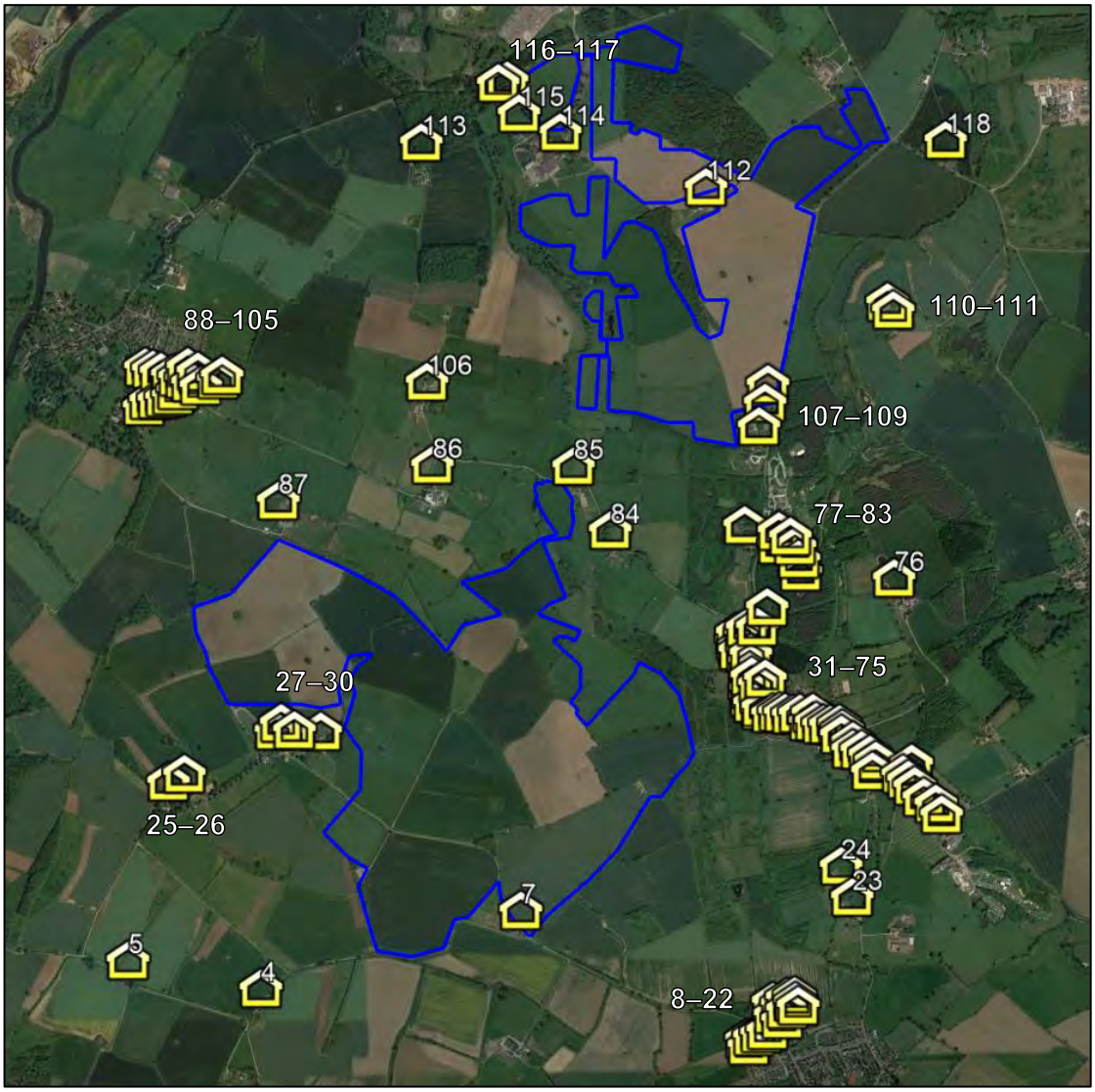


Figure 23 *Dwellings that could experience moderate impacts*

Each dwelling for which impacts are potentially moderate has been considered in turn to evaluate the mitigation requirement. Table 5 on the following page summarises the predicted impact significance and mitigation requirement based on the relevant mitigating factors.

Cases where mitigation is recommended are shown in red for ease of reference and discussed further in Section 7.3.1.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
4 – 5	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.
7	The reflecting areas are predicted to be partially obstructed by existing vegetation and surrounding buildings. Visibility from the ground floor cannot be ruled out based on the available imagery.	The nearest reflecting area is approximately 190 metres from the dwelling.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	Yes – recommended.
9 – 22	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and intervening terrain.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
23 – 24	It is possible that reflecting areas will be entirely obstructed by existing vegetation, but this cannot be reliably determined. Visibility is likely to be limited to above the ground floor of the dwellings.	The nearest reflecting area is beyond 800 metres from the dwellings.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
25 – 26	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and intervening terrain.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
27	The reflecting areas are predicted to be partially obstructed by existing vegetation and surrounding buildings. Visibility is likely to be limited to above the ground floor due to the lack of windows on the ground floor facing the reflecting area.	The nearest reflecting area is beyond 300 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
28	It is predicted that the reflecting areas will be entirely obstructed by surrounding buildings.	N/A	N/A	No impact.	No.
29	The reflecting areas are predicted to be partially obstructed by existing vegetation. Visibility from the ground floor predicted based on the available imagery.	The nearest reflecting area is beyond 200 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	Yes – recommended.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
30	The reflecting areas are unlikely to be obstructed by screening. Visibility from the ground floor predicted based on the available imagery.	The nearest reflecting area is approximately 130 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	Yes – recommended.
31 – 36	It is possible that reflecting areas will be entirely obstructed by existing vegetation, but this cannot be reliably concluded. Visibility is likely to be limited to above the ground floor of the dwellings.	The nearest reflecting area is beyond 800 metres from the dwelling.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
37	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
38 – 45	The reflecting areas are predicted to be partially or significantly obstructed by existing vegetation. Visibility is likely to be limited to above the ground floor of the dwellings.	The nearest reflecting area is beyond 620 metres from the dwellings.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
46 – 56	The closest reflecting areas are predicted to be partially obstructed by existing vegetation intervening terrain, and/or surrounding buildings. The extent of this screening cannot be reliably determined based on the available imagery and so full visibility of the panels is assumed to remain conservative.	The nearest reflecting area is beyond 300 metres from the dwellings.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
57 – 65	The closest reflecting areas are predicted to be partially obstructed by existing vegetation intervening terrain, and/or surrounding buildings. The extent of this screening cannot be reliably determined based on the available imagery and so full visibility of the panels is assumed to remain conservative.	The nearest reflecting area is at most 300 metres from the dwellings.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	Yes – recommended.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
66 – 73	The closest reflecting areas are predicted to be partially obstructed by existing vegetation intervening terrain, and/or surrounding buildings. The extent of this screening cannot be reliably determined based on the available imagery and so full visibility of the panels is assumed to remain conservative.	The nearest reflecting area is beyond 300 metres from the dwellings.	Effects would occur from the west when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
74 – 75	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and/or surrounding dwellings.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
76 – 83	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and intervening terrain.	N/A	N/A	No impact.	No.
84	The reflecting areas are predicted to be significantly obstructed by existing vegetation such that the duration of effects reduces to acceptable levels.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
85	It is predicted that the reflecting areas to the east of the dwelling will be entirely obstructed by existing vegetation. The reflecting areas to the west are likely to be visible; however, the duration of effects is sufficiently low[12].	N/A	N/A	No impact.	No.
86	The reflecting areas are predicted to be partially obstructed by existing vegetation and intervening terrain. Visibility from the ground floor cannot be ruled out based on the available imagery.	The nearest reflecting area is beyond 600 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.

[12] Although effects are scattered throughout more than 3 months, the total duration of glare is less than 3 months per year.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
87 – 105	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation, surrounding buildings, and/or intervening terrain.	N/A	N/A	No impact.	No.
106	It is predicted that the reflecting areas will be significantly or entirely obstructed by existing vegetation, surrounding buildings, and/or intervening terrain.	N/A	N/A	No impact.	No.
107	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
108	It is possible that reflecting areas will be entirely obstructed by existing vegetation, but this cannot be reliably concluded. Visibility is predicted to be limited to above the ground floor of the dwellings.	The nearest reflecting area is approximately 120 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
109	The reflecting panel areas are predicted to be entirely obstructed from the ground floor and so visibility will be limited to above the ground floor of the dwellings.	The nearest reflecting area is approximately 10 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
110 – 111	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation.	N/A	N/A	No impact.	No.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
112	It is possible that reflecting areas will be entirely obstructed by existing vegetation and surrounding buildings, but this cannot be reliably determined. Visibility is likely to be limited to above the ground floor of the dwellings.	The nearest reflecting area is approximately 20 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.
113	It is predicted that the reflecting areas will be entirely obstructed by existing vegetation and surrounding buildings.	N/A	N/A	No impact.	No.
114	It is possible that reflecting areas will be significantly or entirely obstructed by existing vegetation, but this cannot be reliably determined.	The nearest reflecting area is approximately 110 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	Yes – recommended.

Dwelling Receptor(s)	Consideration			Predicted Impact Classification	Mitigation Recommended / Required?
	Visibility	Separation Distance	Sun Position		
115 – 117	The reflecting areas are predicted to be significantly obstructed by existing vegetation and/or surrounding buildings such that the duration of effects reduces to acceptable levels.	N/A	N/A	No impact.	No.
118	The reflecting areas are unlikely to be obstructed by screening. Visibility is likely to be limited to above the ground floor due to the lack of windows on the ground floor facing the reflecting area.	The nearest reflecting area is approximately 220 metres from the dwelling.	Effects would occur from the east when the Sun is relatively low in the sky. Reflections would coincide with direct sunlight.	Moderate.	No.

Table 5 *Assessment of mitigation requirement – dwelling receptors*

7.3.1 Dwellings and Panel Areas to Mitigate

Based on the results of the assessment, mitigation is recommended for dwellings represented by dwelling receptors 7, 29, 30, 57 – 65, and 114. The reflecting panel areas associated with these dwellings are shown as the yellow areas in Figures 24 to 26[13] on the following page.

The mitigation strategy should obstruct views of the panel areas to sufficiently reduce the level of impact. The recommended screening locations are shown as the pink lines.

[13] Copyright © 2021 Google.

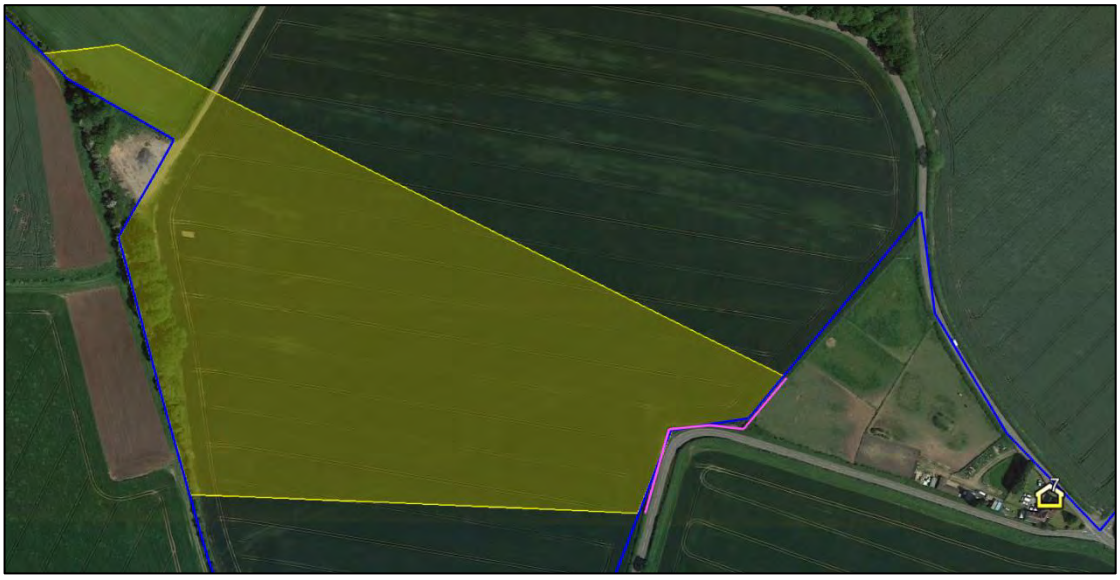


Figure 24 *Reflecting area for dwelling 7*

Figure 25 *Reflecting area for dwellings 29 and 30*

Figure 26 *Reflecting area 57 to 65*

Figure 27 *Reflecting area for dwelling 114*

7.4 Overall Conclusion

A mitigation requirement has been identified for 23 receptors over approximately 2.2km of road and 13 dwellings due to the absence of screening and lack of mitigating factors that would reduce the level of impact.

Screening along the site boundary is recommended to obstruct views of the reflecting panels. The reflecting areas and recommended screening locations are defined in Section 7.2.1 and 7.3.1.

APPENDIX A – OVERVIEW OF GLINT AND GLARE GUIDANCE

Overview

This section presents details regarding the relevant guidance and studies with respect to the considerations and effects of solar reflections from solar panels, known as 'Glint and Glare'.

This is not a comprehensive review of the data sources, rather it is intended to give an overview of the important parameters and considerations that have informed this assessment.

UK Planning Policy

The National Planning Policy Framework under the planning practice guidance for Renewable and Low Carbon Energy[14] (specifically regarding the consideration of solar farms, paragraph 013) states:

'What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic Farms?

The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.

Particular factors a local planning authority will need to consider include:

…

- *the proposal's visual impact, the effect on landscape of glint and glare (see guidance on landscape assessment) and on **neighbouring uses and aircraft safety**;*
- *the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun;*

…

The approach to assessing cumulative landscape and visual impact of large scale solar farms is likely to be the same as assessing the impact of wind turbines. However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero.'

Assessment Process – Ground-Based Receptors

No process for determining and contextualising the effects of glint and glare are, however, provided for assessing the impact of solar reflections upon surrounding roads and dwellings. Therefore, the Pager Power approach is to determine whether a reflection from the proposed

[14] Renewable and low carbon energy, Ministry of Housing, Communities & Local Government, date: 18 June 2015, accessed on: 17/06/2020

solar development is geometrically possible and then to compare the results against the relevant guidance/studies to determine whether the reflection is significant.

The Pager Power approach has been informed by the policy presented above, current studies (presented in Appendix B) and stakeholder consultation. Further information can be found in Pager Power's Glint and Glare Guidance document[15] which was produced due to the absence of existing guidance and a specific standardised assessment methodology.

[15] Pager Power Glint and Glare Guidance, Third Edition (3.1), April 2021.

APPENDIX B – OVERVIEW OF GLINT AND GLARE STUDIES

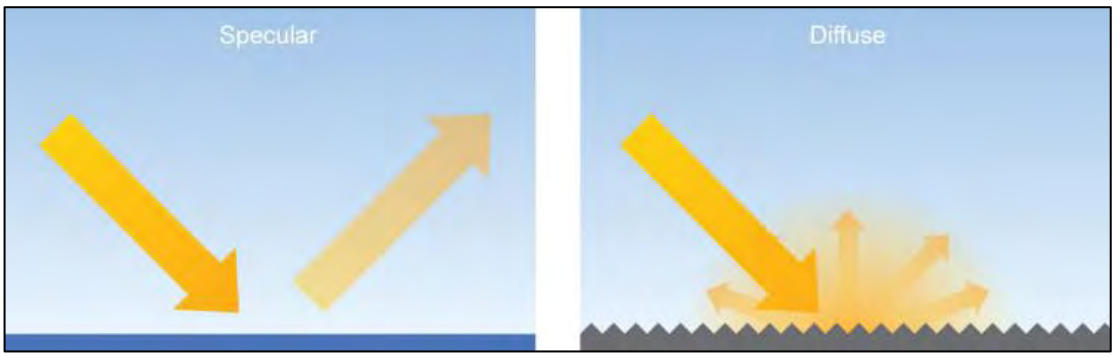
Overview

Studies have been undertaken assessing the type and intensity of solar reflections from various surfaces including solar panels and glass. An overview of these studies is presented below.

The guidelines presented are related to aviation safety. The results are applicable for the purpose of this analysis.

Reflection Type from Solar Panels

Based on the surface conditions reflections from light can be specular and diffuse. A specular reflection has a reflection characteristic similar to that of a mirror; a diffuse will reflect the incoming light and scatter it in many directions. The figure below, taken from the FAA guidance[16], illustrates the difference between the two types of reflections. Because solar panels are flat and have a smooth surface most of the light reflected is specular, which means that incident light from a specific direction is reradiated in a specific direction.



Specular and diffuse reflections

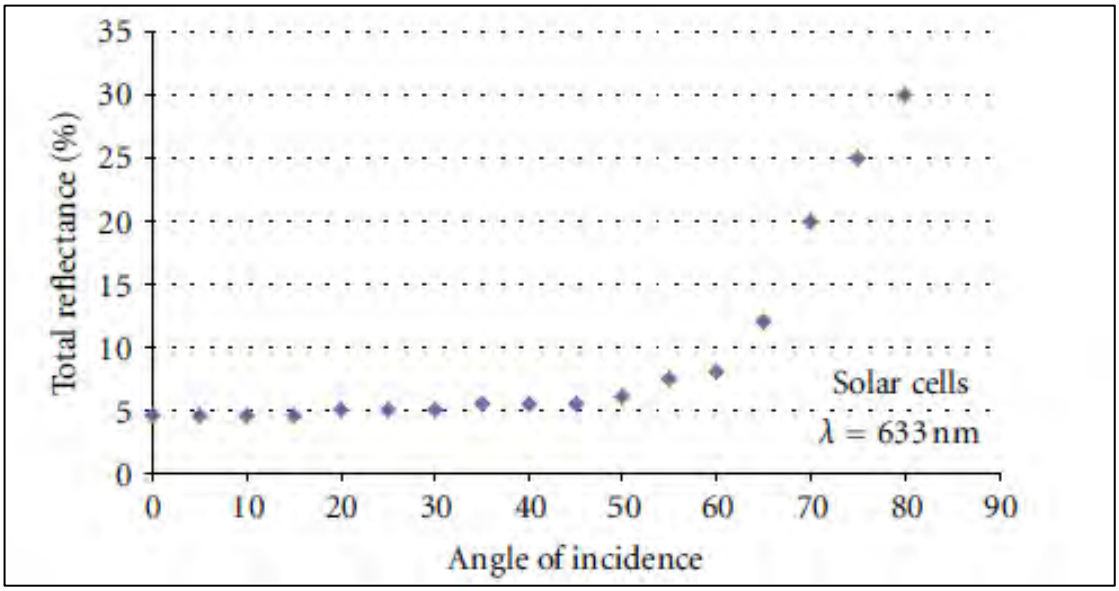
[16] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019.

Solar Reflection Studies

An overview of content from identified solar panel reflectivity studies is presented in the subsections below.

Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems"

Evan Riley and Scott Olson published in 2011 their study titled: *A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems*[17]". They researched the potential glare that a pilot could experience from a 25 degree fixed tilt PV system located outside of Las Vegas, Nevada. The theoretical glare was estimated using published ocular safety metrics which quantify the potential for a postflash glare after-image. This was then compared to the postflash glare after-image caused by smooth water. The study demonstrated that the reflectance of the solar cell varied with angle of incidence, with maximum values occurring at angles close to 90 degrees. The reflectance values varied from approximately 5% to 30%. This is shown on the figure below.



Total reflectance % when compared to angle of incidence

The conclusions of the research study were:

- The potential for hazardous glare from flat-plate PV systems is similar to that of smooth water;
- Portland white cement concrete (which is a common concrete for runways), snow, and structural glass all have a reflectivity greater than water and flat plate PV modules.

[17] Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems," ISRN Renewable Energy, vol. 2011, Article ID 651857, 6 pages, 2011. doi:10.5402/2011/651857

FAA Guidance – "Technical Guidance for Evaluating Selected Solar Technologies on Airports"[18]

The 2010 FAA Guidance included a diagram which illustrates the relative reflectance of solar panels compared to other surfaces. The figure shows the relative reflectance of solar panels compared to other surfaces. Surfaces in this figure produce reflections which are specular and diffuse. A specular reflection (those made by most solar panels) has a reflection characteristic similar to that of a mirror. A diffuse reflection will reflect the incoming light and scatter it in many directions. A table of reflectivity values, sourced from the figure within the FAA guidance, is presented below.

Surface	Approximate Percentage of Light Reflected[19]
Snow	80
White Concrete	77
Bare Aluminium	74
Vegetation	50
Bare Soil	30
Wood Shingle	17
Water	5
Solar Panels	5
Black Asphalt	2

Relative reflectivity of various surfaces

Note that the data above does not appear to consider the reflection type (specular or diffuse).

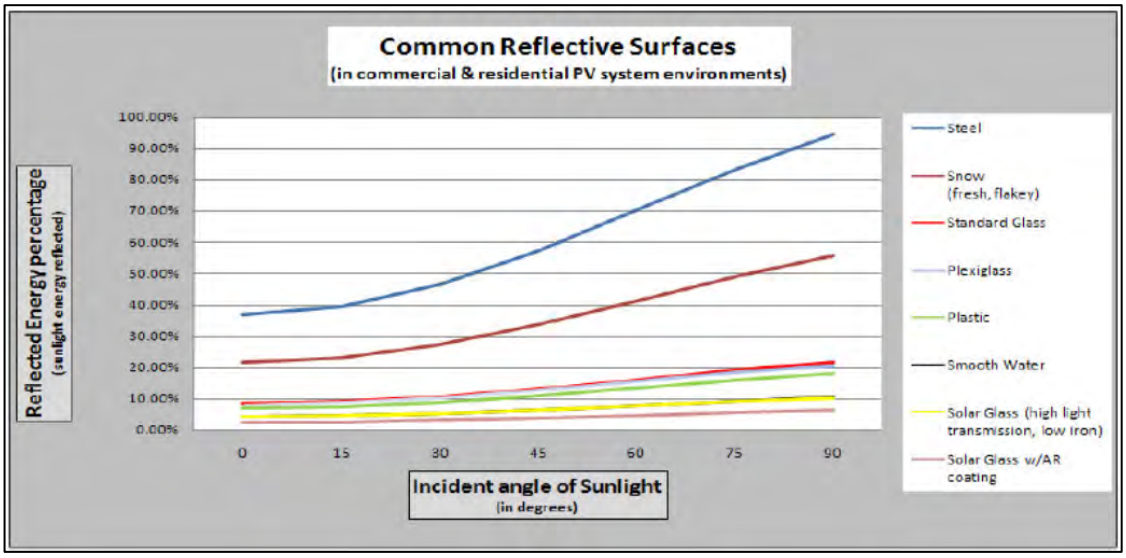
An important comparison in this table is the reflectivity compared to water which will produce a reflection of very similar intensity when compared to that from a solar panel. The study by Riley and Olsen study (2011) also concludes that still water has a very similar reflectivity to solar panels.

[18] Technical Guidance for Evaluating Selected Solar Technologies on Airports, Federal Aviation Administration (FAA), date: 04/2018, accessed on: 20/03/2019.
[19] Extrapolated data, baseline of 1,000 W/m^2 for incoming sunlight.

SunPower Technical Notification (2009)

SunPower published a technical notification[20] to '*increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment*'.

The figure presented below shows the relative reflectivity of solar panels compared to other natural and manmade materials including smooth water, standard glass and steel.



Common reflective surfaces

The results, similarly to those from Riley and Olsen study (2011) and the FAA (2010), show that solar panels produce a reflection that is less intense than those of '*standard glass and other common reflective surfaces*'.

With respect to aviation and solar reflections observed from the air, SunPower has developed several large installations near airports or on Air Force bases. It is stated that these developments have all passed FAA or Air Force standards with all developments considered "No Hazard to Air Navigation". The note suggests that developers discuss any possible concerns with stakeholders near proposed solar farms.

[20] Source: Technical Support, 2009. SunPower Technical Notification – Solar Module Glare and Reflectance.

APPENDIX C – OVERVIEW OF SUN MOVEMENTS AND RELATIVE REFLECTIONS

The Sun's position in the sky can be accurately described by its azimuth and elevation. Azimuth is a direction relative to true north (horizontal angle i.e. from left to right) and elevation describes the Sun's angle relative to the horizon (vertical angle i.e. up and down).

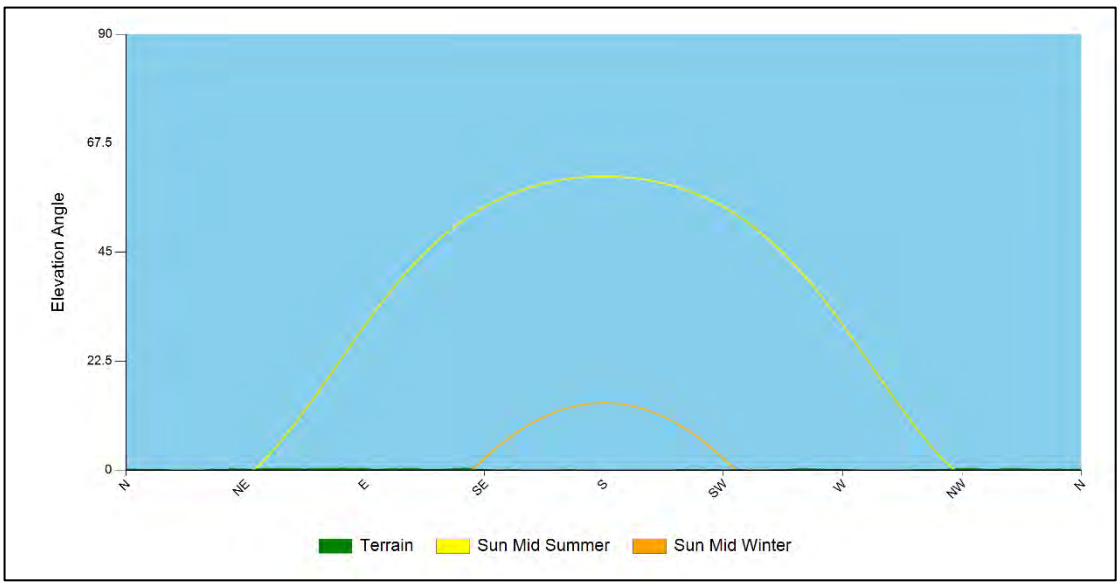
The Sun's position can be accurately calculated for a specific location. The following data being used for the calculation:

- Time;
- Date;
- Latitude;
- Longitude.

The following is true at the location of the solar development:

- The Sun is at its highest around midday and is to the south at this time;
- The Sun rises highest on 21 June reaching a maximum elevation of approximately 60-65 degrees (longest day);
- On 21 December, the maximum elevation reached by the Sun is approximately 10-15 degrees (shortest day).

The combination of the Sun's azimuth angle and vertical elevation will affect the direction and angle of the reflection from a reflector. The figure below shows terrain at the horizon as well as the sunrise and sunset curves throughout the year.



APPENDIX D – IMPACT SIGNIFICANCE DEFINITION

The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

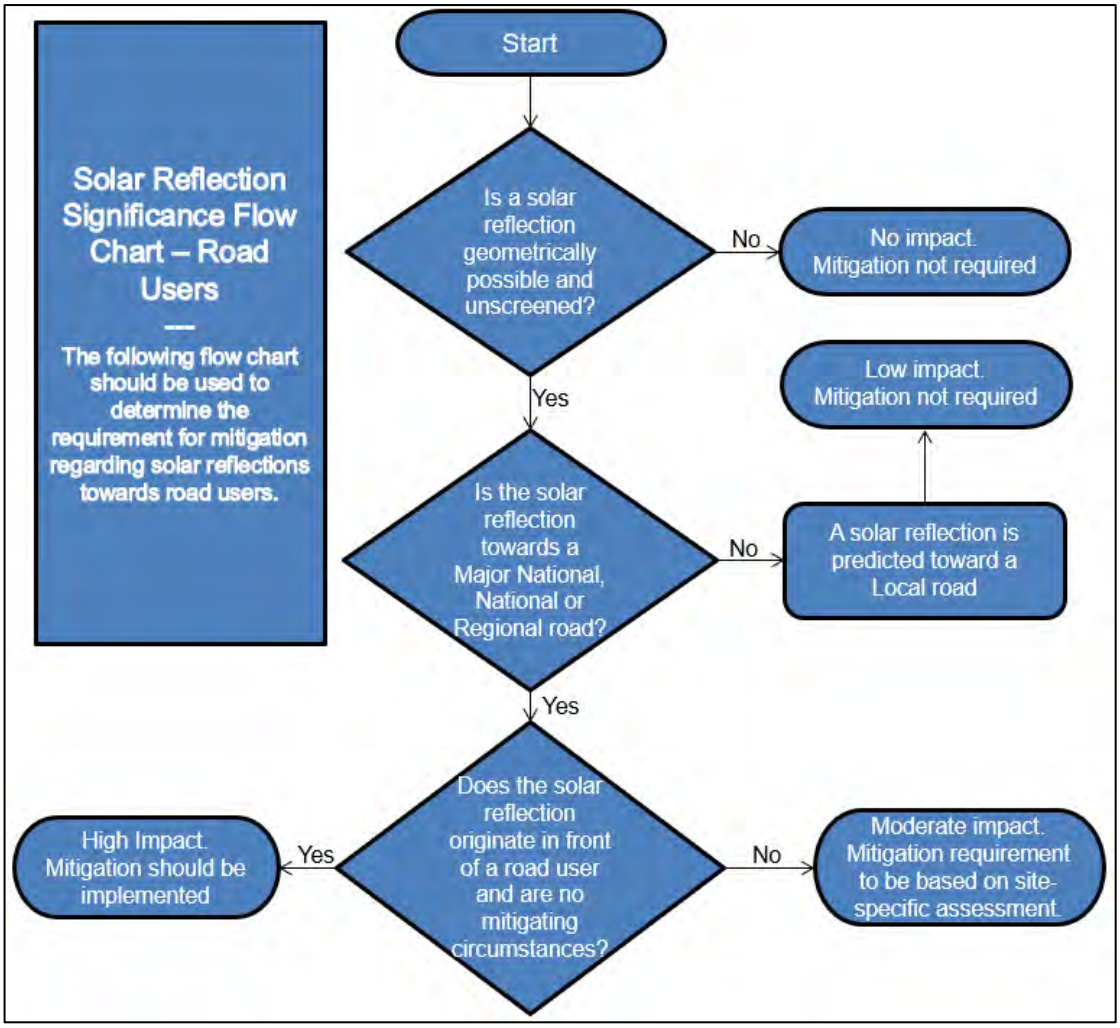
Impact Significance	Definition	Mitigation Requirement
No Impact	A solar reflection is not geometrically possible or will not be visible from the assessed receptor.	No mitigation required.
Low	A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels.	No mitigation required.
Moderate	A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case.	Whilst the impact may be acceptable, consultation and/or further analysis should be undertaken to determine the requirement for mitigation.
Major	A solar reflection is geometrically possible and visible under conditions that will produce a significant impact. Mitigation and consultation is recommended.	Mitigation will be required if the proposed solar development is to proceed.

Impact significance definition

The flow charts presented in the following sub-sections have been followed when determining the mitigation requirement for the assessed receptors.

Assessment Process for Road Receptors

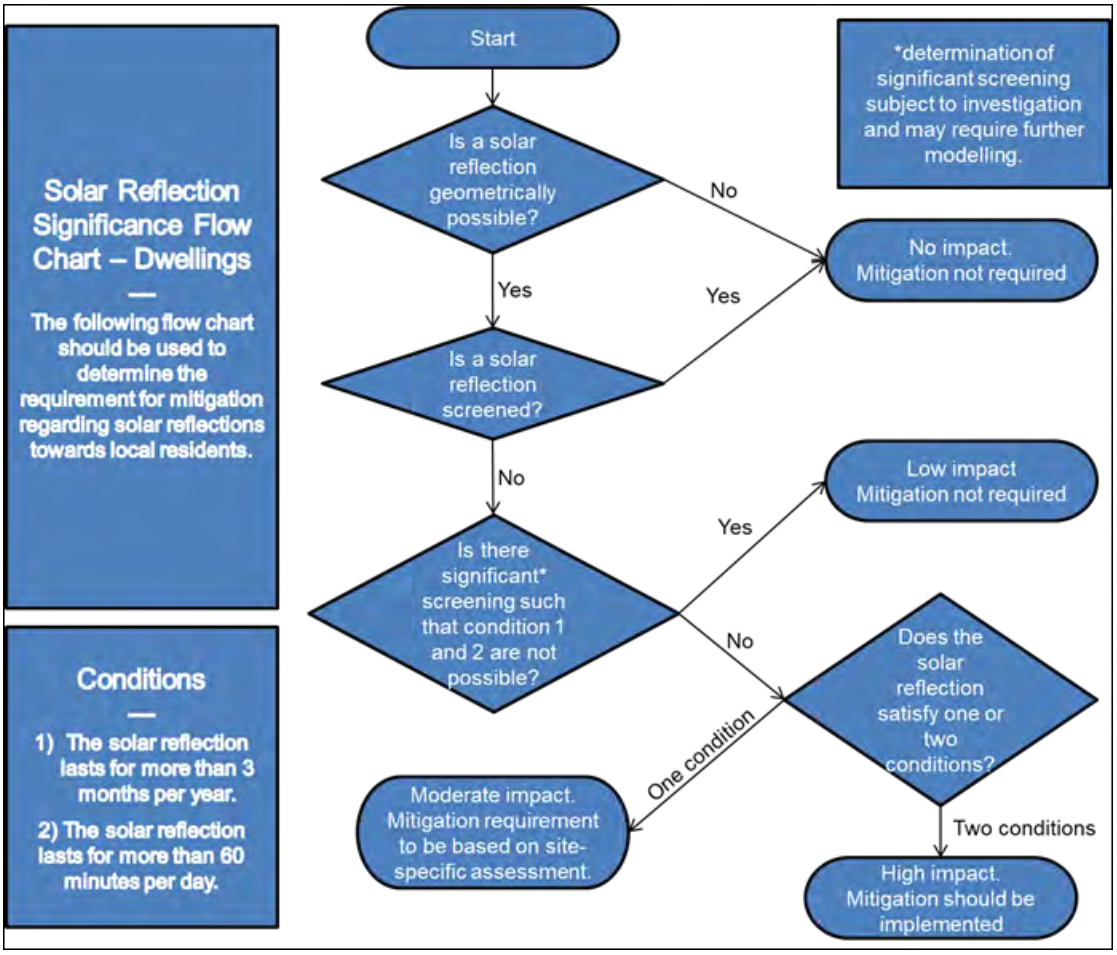
The flow chart presented below has been followed when determining the mitigation requirement for road receptors.



Road receptor mitigation requirement flow chart

Assessment Process for Dwelling Receptors

The flow chart presented below has been followed when determining the mitigation requirement for dwelling receptors.



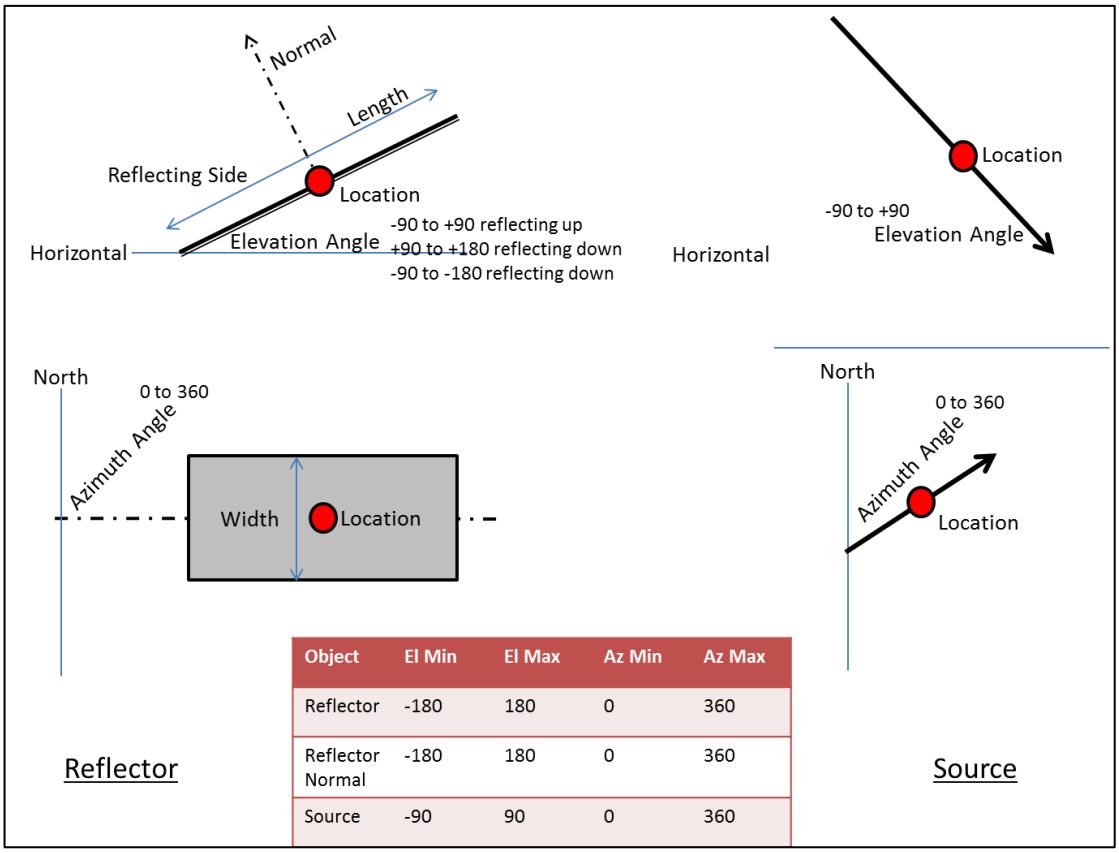
Dwelling receptor mitigation requirement flow chart

APPENDIX E – PAGER POWER'S REFLECTION CALCULATIONS METHODOLOGY

The calculations are three dimensional and complex, accounting for:

- The Earth's orbit around the Sun;
- The Earth's rotation;
- The Earth's orientation;
- The reflector's location;
- The reflector's 3D Orientation.

Reflections from a flat reflector are calculated by considering the normal which is an imaginary line that is perpendicular to the reflective surface and originates from it. The diagram below may be used to aid understanding of the reflection calculation process.



Object	El Min	El Max	Az Min	Az Max
Reflector	-180	180	0	360
Reflector Normal	-180	180	0	360
Source	-90	90	0	360

Reflection calculation process

The following process is used to determine the 3D Azimuth and Elevation of a reflection:

- Use the Latitude and Longitude of reflector as the reference for calculation purposes;
- Calculate the Azimuth and Elevation of the normal to the reflector;
- Calculate the 3D angle between the source and the normal;
- If this angle is less than 90 degrees a reflection will occur. If it is greater than 90 degrees no reflection will occur because the source is behind the reflector;
- Calculate the Azimuth and Elevation of the reflection in accordance with the following:
    - The angle between source and normal is equal to angle between normal and reflection;
    - Source, Normal and Reflection are in the same plane.

APPENDIX F – ASSESSMENT LIMITATIONS AND ASSUMPTIONS

Pager Power's Model

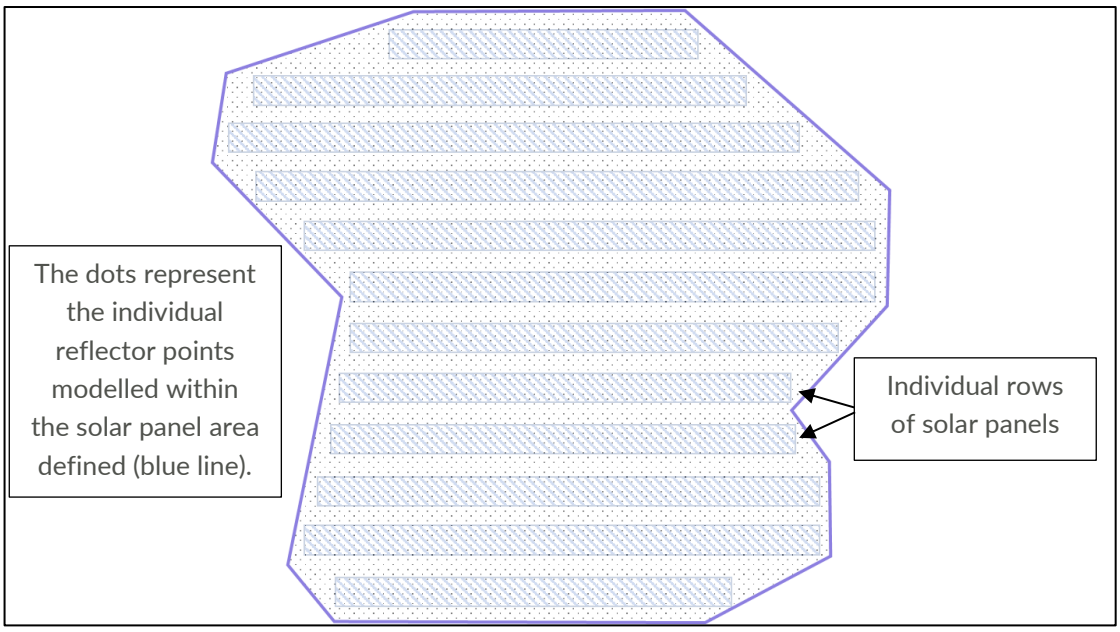
It is assumed that the panel elevation angle provided by the developer represents the elevation angle for all of the panels within each solar panel area defined.

It is assumed that the panel azimuth angle provided by the developer represents the azimuth angle for all of the panels within each solar panel area defined.

Only a reflection from the face of the panel has been considered. The frame or the reverse or frame of the solar panel has not been considered.

The model assumes that a receptor can view the face of every panel within the proposed development area whilst in reality this, in the majority of cases, will not occur. Therefore any predicted solar reflection from the face of a solar panel that is not visible to a receptor will not occur in practice.

A finite number of points within each solar panel area defined is chosen based on an assessment resolution so that a comprehensive understanding of the entire development can be formed. This determines whether a solar reflection could ever occur at a chosen receptor. The model does not consider the specific panel rows or the entire face of the solar panel within the development outline, rather a single point is defined every 'x' metres (based on the resolution) with the geometric characteristics of the panel. A panel area is however defined to encapsulate all possible panel locations. See the figure below which illustrates this process.



Solar panel area modelling overview

A single reflection point is chosen for the geometric calculations. This suitably determines whether a solar reflection can be experienced at a receptor location and the time of year and duration of the solar reflection. Increased accuracy could be achieved by increasing the number of heights assessed however this would only marginally change the results and is not considered significant.

The available street view imagery, satellite mapping, terrain and any site imagery provided by the developer has been used to assess line of sight from the assessed receptors to the modelled solar panel area, unless stated otherwise. In some cases, this imagery may not be up to date and may not give the full perspective of the installation from the location of the assessed receptor.

Any screening in the form of trees, buildings etc. that may obstruct the Sun from view of the solar panels is not within the modelling unless stated otherwise. The terrain profile at the horizon is considered if stated.

APPENDIX G – RECEPTOR AND REFLECTOR AREA DETAILS

Receptor Data – Roads

The table below presents the data for the assessed road receptors.

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-1.680455	52.738783	68	-1.634993	52.767171
2	-1.679168	52.738339	69	-1.633953	52.767813
3	-1.677931	52.737842	70	-1.633263	52.768611
4	-1.676519	52.737567	71	-1.632655	52.769433
5	-1.675099	52.737311	72	-1.632186	52.770286
6	-1.673676	52.737055	73	-1.631765	52.771151
7	-1.672253	52.736801	74	-1.644023	52.750627
8	-1.671076	52.737219	75	-1.645402	52.750945
9	-1.670113	52.737899	76	-1.646654	52.751424
10	-1.668982	52.738470	77	-1.647927	52.751890
11	-1.667564	52.738733	78	-1.648927	52.752545
12	-1.666096	52.738867	79	-1.650203	52.752957
13	-1.664635	52.739015	80	-1.651347	52.753497
14	-1.663168	52.738935	81	-1.651741	52.754364
15	-1.661837	52.738910	82	-1.652342	52.755185
16	-1.660440	52.739205	83	-1.653793	52.755302
17	-1.659989	52.740055	84	-1.655193	52.755591
18	-1.658648	52.740071	85	-1.656543	52.755913
19	-1.657232	52.739800	86	-1.658019	52.756014
20	-1.655802	52.739597	87	-1.659494	52.756070
21	-1.654500	52.739161	88	-1.660945	52.756211

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
22	-1.653180	52.738755	89	-1.661490	52.755375
23	-1.651867	52.738339	90	-1.662399	52.754871
24	-1.650562	52.737911	91	-1.663767	52.755222
25	-1.649253	52.737491	92	-1.665106	52.755604
26	-1.647863	52.737182	93	-1.666428	52.756013
27	-1.646396	52.737048	94	-1.667794	52.756360
28	-1.644916	52.737025	95	-1.669165	52.756701
29	-1.643498	52.736757	96	-1.670539	52.757042
30	-1.642054	52.736556	97	-1.671944	52.757319
31	-1.641104	52.736009	98	-1.673335	52.757635
32	-1.636407	52.738754	99	-1.674583	52.758125
33	-1.636740	52.739625	100	-1.675967	52.758448
34	-1.636570	52.740508	101	-1.677264	52.758623
35	-1.635904	52.741313	102	-1.621647	52.763478
36	-1.635490	52.742178	103	-1.623127	52.763392
37	-1.634991	52.743029	104	-1.624610	52.763373
38	-1.634768	52.743915	105	-1.626097	52.763397
39	-1.635040	52.744700	106	-1.627574	52.763454
40	-1.636093	52.745328	107	-1.628402	52.764100
41	-1.636889	52.746085	108	-1.628785	52.764966
42	-1.637706	52.746840	109	-1.629742	52.765627
43	-1.638817	52.747416	110	-1.631060	52.766039
44	-1.640135	52.747827	111	-1.632374	52.766455
45	-1.641593	52.747975	112	-1.633685	52.766876
46	-1.642184	52.748772	113	-1.634976	52.767334

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
47	-1.642455	52.749645	114	-1.635559	52.768161
48	-1.642534	52.750536	115	-1.636247	52.768958
49	-1.642768	52.751423	116	-1.636987	52.769738
50	-1.642885	52.752320	117	-1.637692	52.770527
51	-1.642498	52.753187	118	-1.638256	52.771196
52	-1.642326	52.754083	119	-1.671357	52.766808
53	-1.642174	52.754979	120	-1.670059	52.767234
54	-1.642186	52.755877	121	-1.668662	52.767540
55	-1.642007	52.756765	122	-1.667271	52.767848
56	-1.641780	52.757658	123	-1.665875	52.768153
57	-1.641446	52.758533	124	-1.664479	52.768454
58	-1.641137	52.759415	125	-1.663097	52.768773
59	-1.640816	52.760295	126	-1.661652	52.768925
60	-1.640459	52.761164	127	-1.660171	52.768895
61	-1.640132	52.762044	128	-1.658695	52.768971
62	-1.639817	52.762924	129	-1.657278	52.769238
63	-1.639504	52.763803	130	-1.655994	52.769690
64	-1.639188	52.764683	131	-1.654742	52.770172
65	-1.638353	52.765401	132	-1.653376	52.770530
66	-1.637236	52.765995	133	-1.651964	52.770810
67	-1.636112	52.766579	134	-1.650525	52.771102

Road receptor data

Receptor Data – Dwellings

The table below presents the data for the assessed dwelling receptors.

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
1	-1.671434	52.732796	65	-1.643116	52.748079
2	-1.673233	52.734682	66	-1.643101	52.748363
3	-1.672056	52.734774	67	-1.643032	52.748625
4	-1.671022	52.737044	68	-1.643665	52.748730
5	-1.678664	52.737983	69	-1.643685	52.748882
6	-1.655977	52.735834	70	-1.643843	52.749070
7	-1.656177	52.739743	71	-1.643819	52.749354
8	-1.643024	52.734844	72	-1.643322	52.749332
9	-1.643152	52.735066	73	-1.643251	52.749524
10	-1.643291	52.735299	74	-1.642668	52.749548
11	-1.642850	52.735385	75	-1.642104	52.750232
12	-1.642441	52.735498	76	-1.634836	52.751234
13	-1.642079	52.735600	77	-1.640182	52.751455
14	-1.641244	52.735974	78	-1.640285	52.751892
15	-1.641665	52.736153	79	-1.640509	52.752351
16	-1.640958	52.736327	80	-1.641420	52.752391
17	-1.641256	52.736515	81	-1.640779	52.752681
18	-1.641781	52.736589	82	-1.641433	52.752862
19	-1.640344	52.736451	83	-1.643390	52.753072
20	-1.640493	52.736594	84	-1.651079	52.752893
21	-1.640543	52.736788	85	-1.653179	52.755116
22	-1.640981	52.736727	86	-1.661262	52.755156
23	-1.637257	52.740207	87	-1.670053	52.753913
24	-1.637889	52.741283	88	-1.677765	52.757181

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
25	-1.676341	52.744174	89	-1.677393	52.757397
26	-1.675433	52.744453	90	-1.676917	52.757418
27	-1.670184	52.745954	91	-1.676485	52.757487
28	-1.669862	52.746230	92	-1.676091	52.757559
29	-1.669106	52.745981	93	-1.675810	52.757733
30	-1.667604	52.745939	94	-1.674501	52.757889
31	-1.632155	52.743067	95	-1.674985	52.758010
32	-1.632488	52.743442	96	-1.675330	52.758128
33	-1.633167	52.743656	97	-1.675729	52.758203
34	-1.633685	52.744048	98	-1.676144	52.758283
35	-1.634049	52.744267	99	-1.676801	52.758383
36	-1.634360	52.744455	100	-1.677253	52.758464
37	-1.633859	52.744825	101	-1.677691	52.758541
38	-1.636094	52.744554	102	-1.675253	52.758546
39	-1.635901	52.744924	103	-1.674672	52.758395
40	-1.636240	52.745128	104	-1.673503	52.758109
41	-1.636712	52.745291	105	-1.673281	52.758251
42	-1.637213	52.745317	106	-1.661553	52.758032
43	-1.637205	52.745596	107	-1.642567	52.756499
44	-1.637862	52.745824	108	-1.642218	52.757312
45	-1.637811	52.746004	109	-1.642056	52.757959
46	-1.637976	52.746183	110	-1.634868	52.760526
47	-1.638496	52.746166	111	-1.635199	52.760801
48	-1.638893	52.746175	112	-1.645594	52.764790
49	-1.639303	52.746269	113	-1.661901	52.766346

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
50	-1.639641	52.746274	114	-1.653944	52.766700
51	-1.639493	52.746572	115	-1.656312	52.767369
52	-1.640231	52.746551	116	-1.657505	52.768416
53	-1.640625	52.746511	117	-1.656992	52.768511
54	-1.641078	52.746574	118	-1.631845	52.766433
55	-1.641394	52.746597	119	-1.625563	52.768380
56	-1.641798	52.746554	120	-1.633041	52.769373
57	-1.642381	52.746657	121	-1.639253	52.770116
58	-1.642354	52.746771	122	-1.631190	52.770449
59	-1.642829	52.746911	123	-1.630628	52.770116
60	-1.643039	52.747122	124	-1.629805	52.770467
61	-1.643022	52.747403	125	-1.623606	52.773186
62	-1.642543	52.747572	126	-1.628760	52.776320
63	-1.642209	52.747760	127	-1.629329	52.776529
64	-1.642984	52.747836	128	-1.629734	52.776566

Dwelling receptor data

Modelled Reflector Areas

Area A

The table below presents the data for the modelled reflector area A.

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-1.674773	52.750107	44	-1.652418	52.746912
2	-1.674229	52.749478	45	-1.653037	52.747345
3	-1.674014	52.748915	46	-1.652913	52.747479
4	-1.672901	52.747661	47	-1.653361	52.747718
5	-1.668790	52.747665	48	-1.652788	52.748165
6	-1.667659	52.747539	49	-1.652775	52.748984

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
7	-1.666468	52.747668	50	-1.654326	52.749836
8	-1.666594	52.748184	51	-1.654033	52.749999
9	-1.666003	52.749333	52	-1.653473	52.749991
10	-1.664656	52.749414	53	-1.653131	52.749829
11	-1.665540	52.748936	54	-1.652772	52.750200
12	-1.665939	52.748526	55	-1.655215	52.750776
13	-1.665652	52.748045	56	-1.654676	52.751097
14	-1.666238	52.746838	57	-1.653625	52.751357
15	-1.665287	52.746043	58	-1.654950	52.753294
16	-1.665329	52.744726	59	-1.653398	52.753453
17	-1.667434	52.743231	60	-1.653162	52.754061
18	-1.665978	52.742354	61	-1.653296	52.754362
19	-1.664926	52.741990	62	-1.653241	52.754778
20	-1.665470	52.741396	63	-1.653859	52.755312
21	-1.664567	52.739450	64	-1.654792	52.755402
22	-1.664378	52.739126	65	-1.654972	52.755280
23	-1.662412	52.738934	66	-1.655313	52.755335
24	-1.660585	52.739237	67	-1.655422	52.755085
25	-1.659953	52.740230	68	-1.655245	52.754862
26	-1.659180	52.740303	69	-1.655327	52.754721
27	-1.657446	52.741553	70	-1.654717	52.754048
28	-1.657316	52.740938	71	-1.654116	52.753538
29	-1.656597	52.740208	72	-1.655118	52.753369
30	-1.655661	52.739623	73	-1.656150	52.752870
31	-1.654692	52.740350	74	-1.657013	52.752366

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
32	-1.652352	52.741558	75	-1.659595	52.751880
33	-1.650695	52.742584	76	-1.657299	52.750768
34	-1.648782	52.744463	77	-1.659514	52.750393
35	-1.648133	52.744466	78	-1.660203	52.749715
36	-1.647204	52.745226	79	-1.660444	52.749501
37	-1.646680	52.745560	80	-1.661090	52.749968
38	-1.646284	52.745983	81	-1.663388	52.751405
39	-1.646696	52.747061	82	-1.666142	52.752323
40	-1.647118	52.747983	83	-1.670022	52.753357
41	-1.648182	52.748728	84	-1.672771	52.751476
42	-1.649423	52.749111	85	-1.674920	52.751018
43	-1.649745	52.748675			

Modelled reflector area A

Area B

The table below presents the data for the modelled reflector area B.

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
1	-1.639389	52.764625	53	-1.645419	52.760329
2	-1.640499	52.764903	54	-1.646125	52.760714
3	-1.636126	52.767143	55	-1.646354	52.761135
4	-1.635110	52.767201	56	-1.647748	52.762531
5	-1.636447	52.768996	57	-1.648030	52.763423
6	-1.637601	52.768991	58	-1.648578	52.764049
7	-1.637272	52.768534	59	-1.649752	52.764391
8	-1.637871	52.768284	60	-1.650284	52.764320
9	-1.636683	52.767073	61	-1.651446	52.763092
10	-1.637029	52.766887	62	-1.651209	52.765938

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
11	-1.638870	52.767363	63	-1.652282	52.765925
12	-1.639119	52.767701	64	-1.652363	52.764613
13	-1.640499	52.767664	65	-1.653150	52.764623
14	-1.641783	52.767153	66	-1.653457	52.765308
15	-1.643057	52.765865	67	-1.654495	52.765316
16	-1.646472	52.766886	68	-1.656228	52.764946
17	-1.648195	52.766888	69	-1.656240	52.764161
18	-1.648216	52.767331	70	-1.655838	52.763880
19	-1.649279	52.767610	71	-1.654558	52.763545
20	-1.649522	52.767420	72	-1.653139	52.763557
21	-1.649958	52.767508	73	-1.653347	52.762817
22	-1.649820	52.767803	74	-1.652984	52.762626
23	-1.650996	52.767833	75	-1.651142	52.762579
24	-1.650897	52.770031	76	-1.650803	52.762170
25	-1.647352	52.769602	77	-1.649848	52.762168
26	-1.647014	52.770492	78	-1.649445	52.761794
27	-1.649154	52.771215	79	-1.650750	52.761782
28	-1.650693	52.770906	80	-1.650402	52.760298
29	-1.650708	52.770500	81	-1.651608	52.760320
30	-1.651714	52.770471	82	-1.651544	52.761979
31	-1.651734	52.770211	83	-1.652081	52.761970
32	-1.654127	52.770222	84	-1.652538	52.761661
33	-1.656815	52.769155	85	-1.652556	52.761275
34	-1.654766	52.767581	86	-1.652099	52.760944
35	-1.653747	52.767582	87	-1.651642	52.760949

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
36	-1.652821	52.769672	88	-1.651679	52.760282
37	-1.652981	52.770167	89	-1.651269	52.760288
38	-1.652135	52.770167	90	-1.651269	52.759760
39	-1.652156	52.766560	91	-1.652776	52.759739
40	-1.650749	52.766568	92	-1.652971	52.757941
41	-1.650800	52.765839	93	-1.651911	52.757892
42	-1.649170	52.765023	94	-1.651717	52.759720
43	-1.647521	52.765037	95	-1.651119	52.759713
44	-1.644093	52.765666	96	-1.651188	52.757844
45	-1.643777	52.765460	97	-1.649602	52.757754
46	-1.644973	52.765012	98	-1.647838	52.757414
47	-1.644813	52.764784	99	-1.646316	52.757425
48	-1.646957	52.764163	100	-1.646303	52.756870
49	-1.645922	52.761874	101	-1.643838	52.756597
50	-1.645676	52.761649	102	-1.644154	52.757742
51	-1.644347	52.761665	103	-1.641635	52.758124
52	-1.644750	52.760485			

Modelled reflector area B

APPENDIX H – GEOMETRIC CALCULATION RESULTS

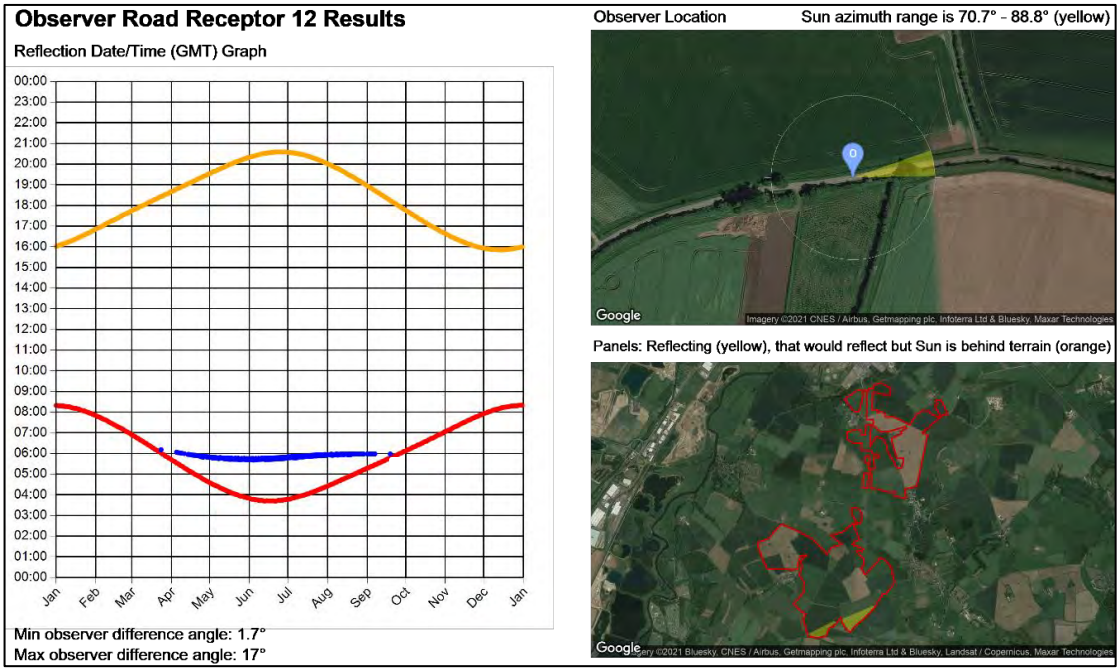
Overview

The charts for the receptors are shown on the following pages. In detail each chart shows:

- The receptor (observer) location – top right image. This also shows the azimuth range of the Sun itself at times when reflections are possible. If sunlight is experienced from the same direction as the reflecting panels, the overall impact of the reflection is reduced as discussed within the body of the report;
- The modelled reflectors/ reflection areas – bottom right image. The reflecting area is shown in yellow. If the yellow panels are not visible from the observer location, no issues will occur in practice. Additional obstructions which may obscure the reflector area from view are considered separately within the analysis;
- The reflection date/time graph – left hand side of the page. The blue line indicates the dates and times at which geometric reflections are possible.

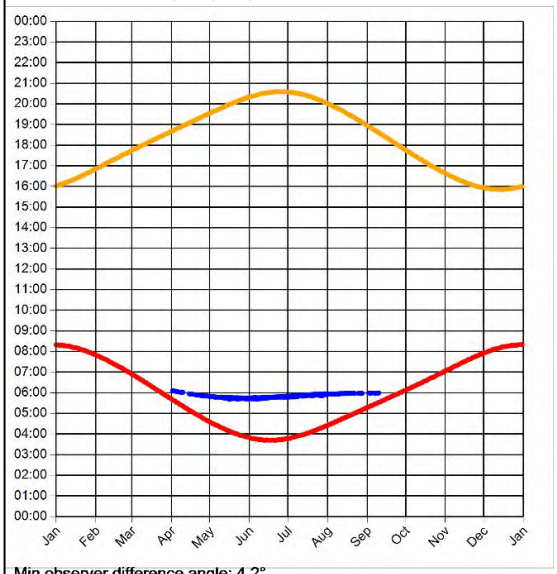
The modelling output has only been provided for receptors where effects are predicted to be experienced in practice.

Road Receptors



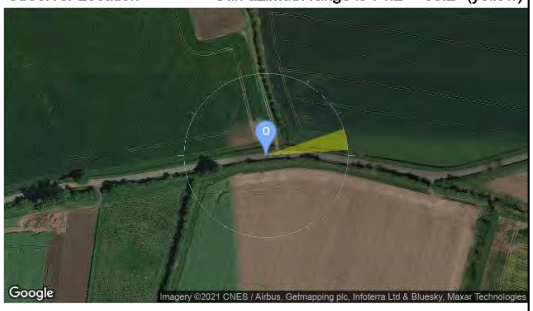
Observer Road Receptor 13 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 4.2°
Max observer difference angle: 17.1°

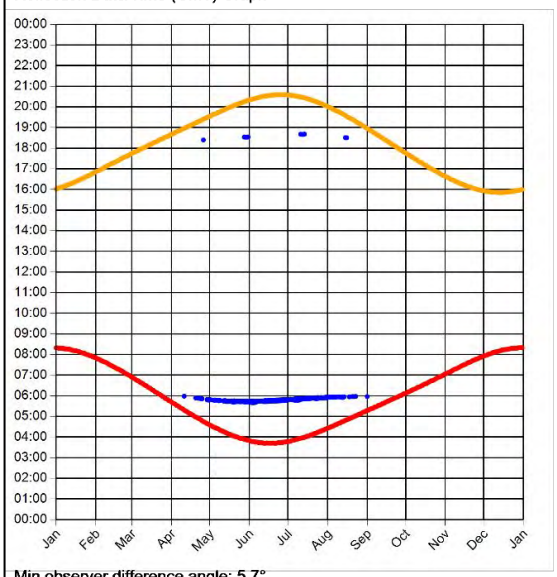
Observer Location — Sun azimuth range is 71.2° - 86.2° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

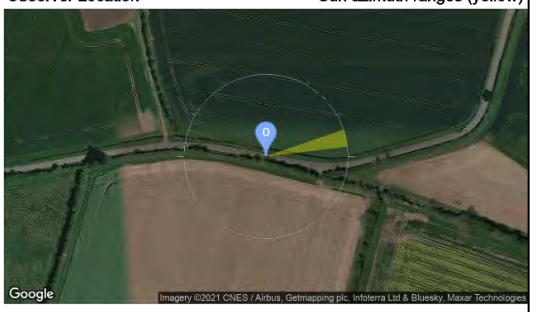
Observer Road Receptor 14 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 5.7°
Max observer difference angle: 16.9°

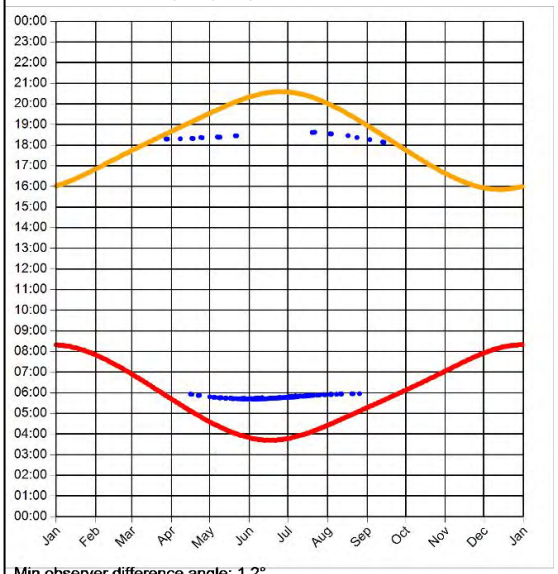
Observer Location — Sun azimuth ranges (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 15 Results

Reflection Date/Time (GMT) Graph



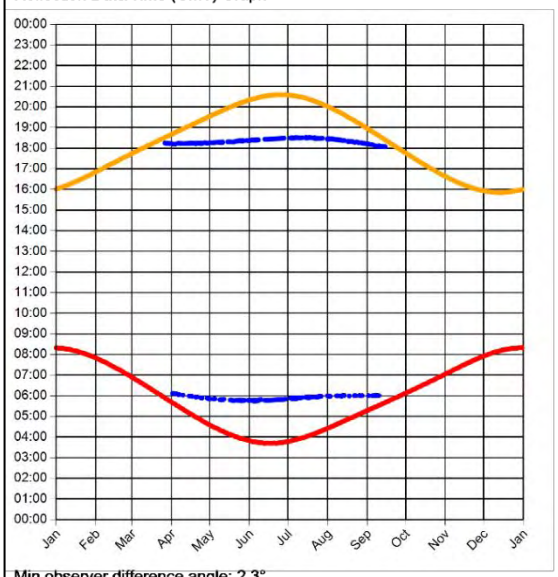
Min observer difference angle: 1.2°
Max observer difference angle: 16.5°

Observer Location — Sun azimuth ranges (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 18 Results

Reflection Date/Time (GMT) Graph



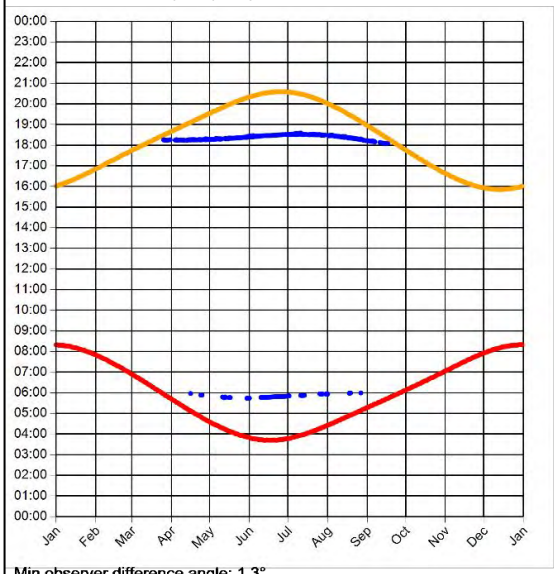
Min observer difference angle: 2.3°
Max observer difference angle: 17.8°

Observer Location — Sun azimuth ranges (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 19 Results

Reflection Date/Time (GMT) Graph



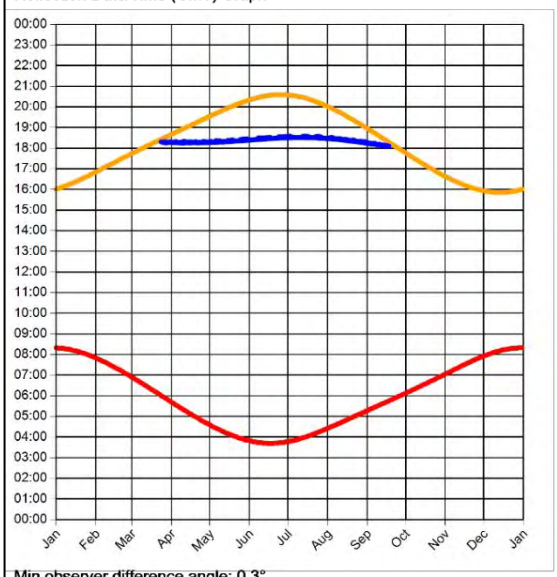
Min observer difference angle: 1.3°
Max observer difference angle: 17.3°

Observer Location — Sun azimuth ranges (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 65 Results

Reflection Date/Time (GMT) Graph



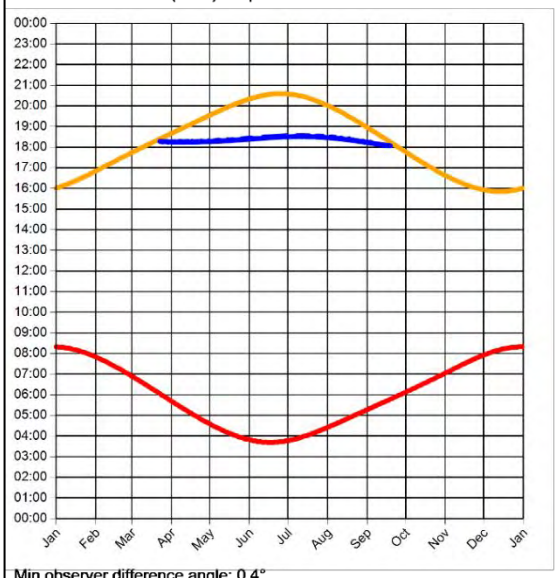
Min observer difference angle: 0.3°
Max observer difference angle: 16.9°

Observer Location — Sun azimuth range is 272.1° - 289.2° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

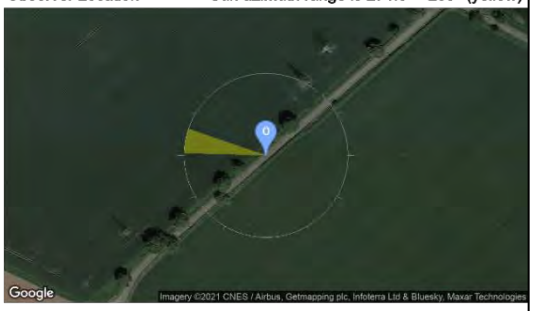
Observer Road Receptor 66 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.4°
Max observer difference angle: 16.8°

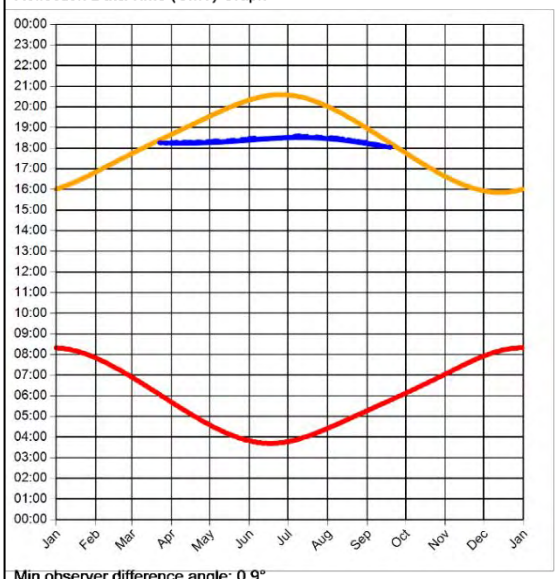
Observer Location — Sun azimuth range is 271.5° - 289° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 67 Results

Reflection Date/Time (GMT) Graph



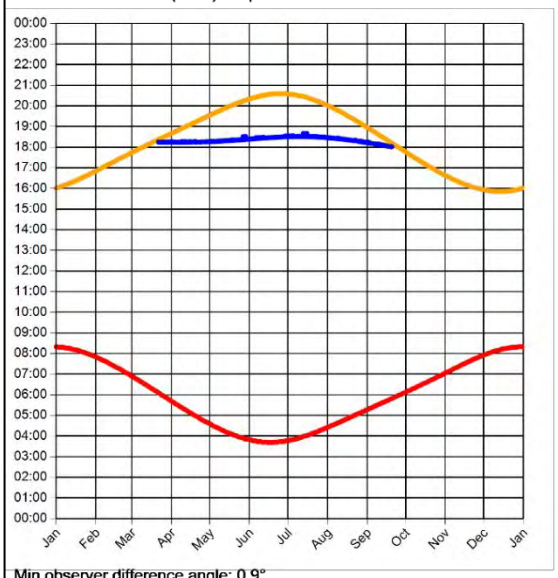
Min observer difference angle: 0.9°
Max observer difference angle: 16.8°

Observer Location — Sun azimuth range is 271.3° - 288.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 68 Results

Reflection Date/Time (GMT) Graph



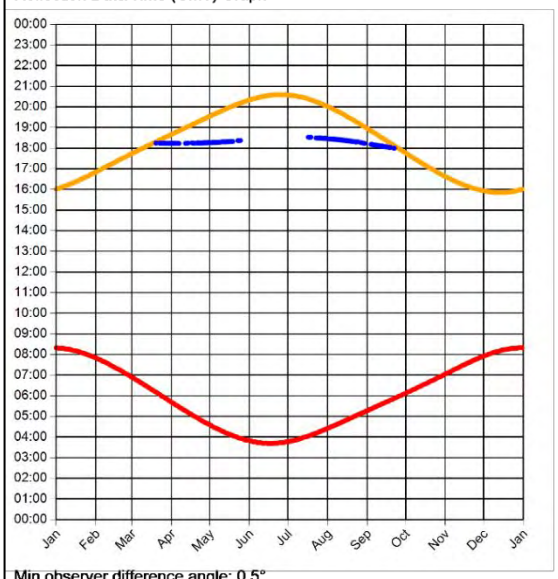
Min observer difference angle: 0.9°
Max observer difference angle: 16.9°

Observer Location — Sun azimuth range is 270.8° - 288.8° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 69 Results

Reflection Date/Time (GMT) Graph



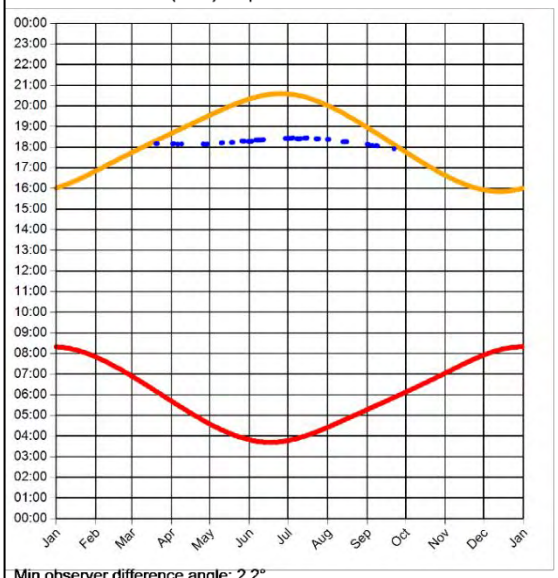
Min observer difference angle: 0.5°
Max observer difference angle: 14.7°

Observer Location — Sun azimuth range is 270.2° - 286.8° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 79 Results

Reflection Date/Time (GMT) Graph



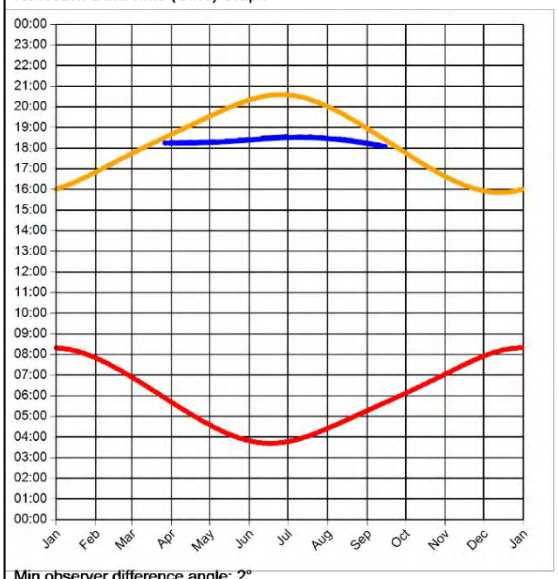
Min observer difference angle: 2.2°
Max observer difference angle: 18.6°

Observer Location — Sun azimuth range is 269.3° - 287.4° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 111 Results

Reflection Date/Time (GMT) Graph



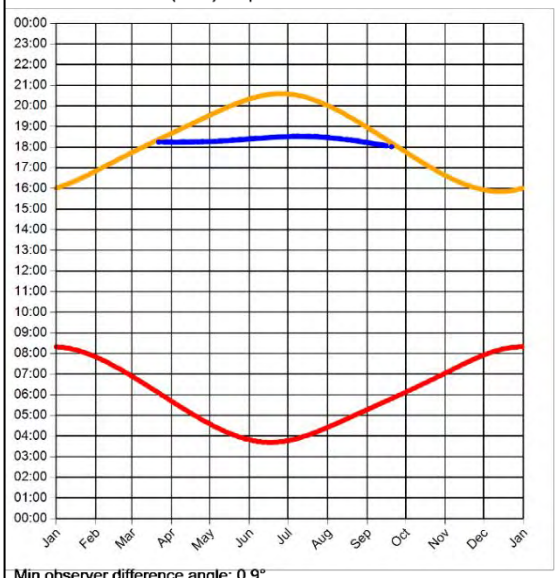
Min observer difference angle: 2°
Max observer difference angle: 16.7°

Observer Location — Sun azimuth range is 272.3° - 289° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 112 Results

Reflection Date/Time (GMT) Graph



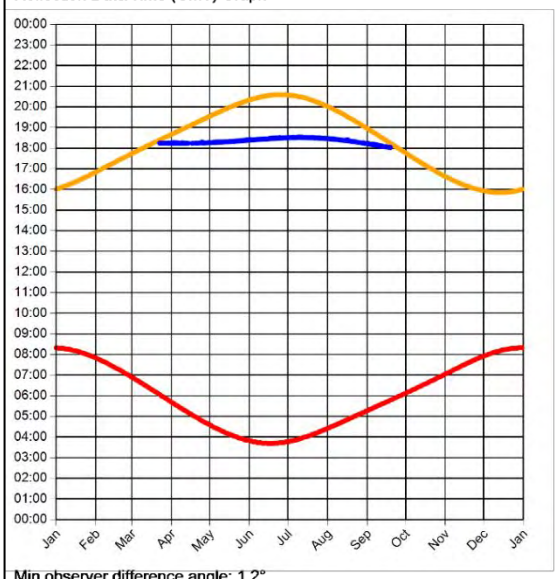
Min observer difference angle: 0.9°
Max observer difference angle: 16.7°

Observer Location — Sun azimuth range is 270.8° - 288.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 113 Results

Reflection Date/Time (GMT) Graph



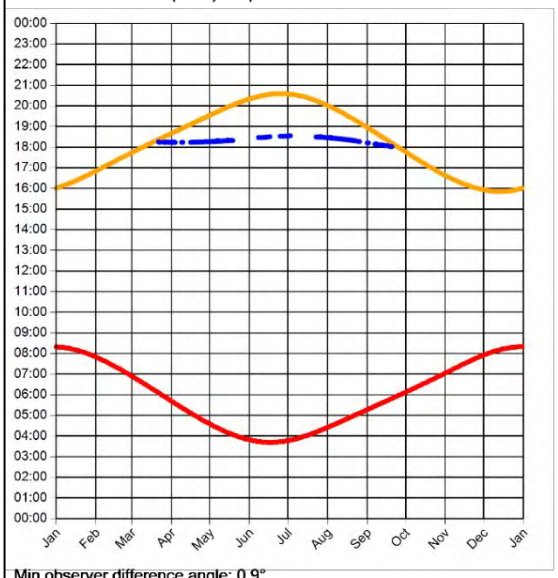
Min observer difference angle: 1.2°
Max observer difference angle: 16.9°

Observer Location — Sun azimuth range is 271° - 288.8° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 114 Results

Reflection Date/Time (GMT) Graph



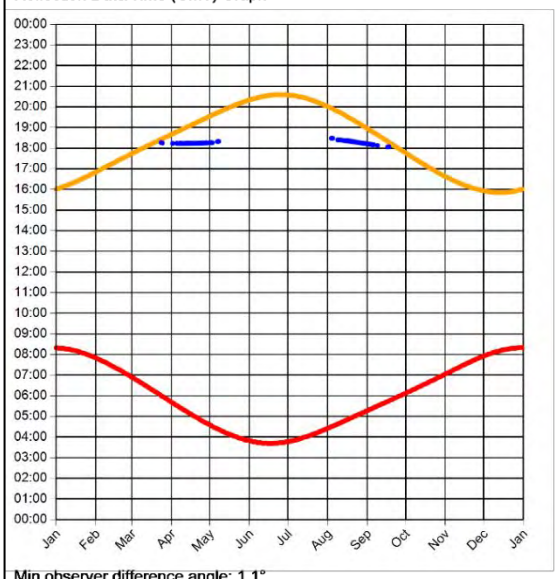
Min observer difference angle: 0.9°
Max observer difference angle: 15.8°

Observer Location — Sun azimuth range is 270.9° - 289° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 115 Results

Reflection Date/Time (GMT) Graph



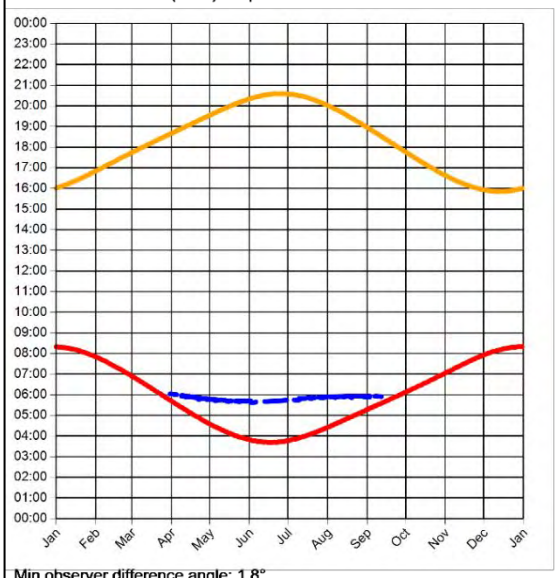
Min observer difference angle: 1.1°
Max observer difference angle: 11.8°

Observer Location — Sun azimuth range is 271.7° - 283.9° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 129 Results

Reflection Date/Time (GMT) Graph



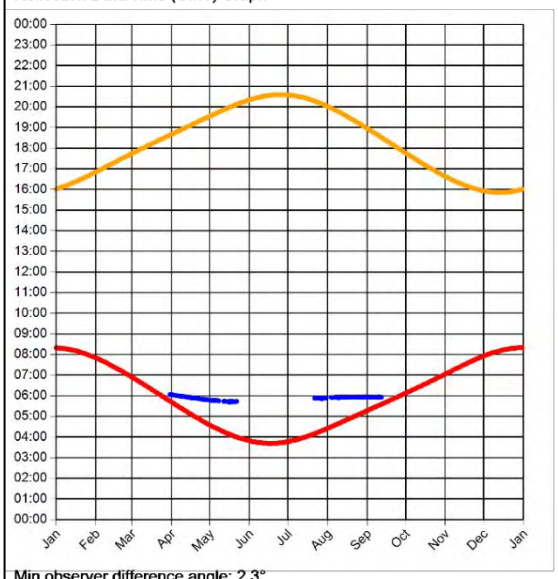
Min observer difference angle: 1.8°
Max observer difference angle: 15°

Observer Location — Sun azimuth range is 70.4° - 85.8° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 130 Results

Reflection Date/Time (GMT) Graph



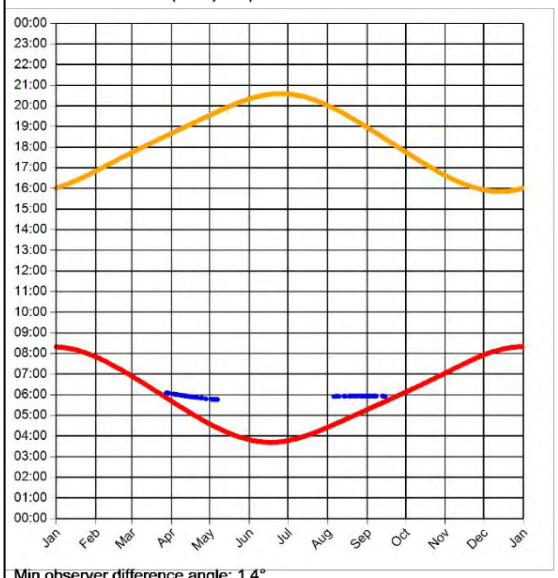
Min observer difference angle: 2.3°
Max observer difference angle: 14°

Observer Location — Sun azimuth range is 73.6° - 86.1° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 131 Results

Reflection Date/Time (GMT) Graph



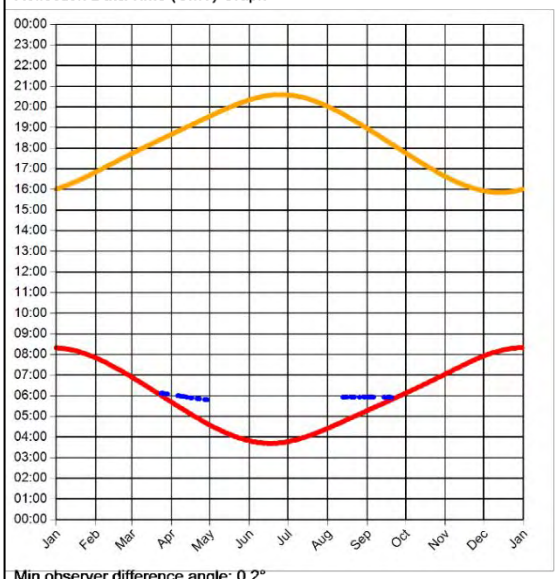
Min observer difference angle: 1.4°
Max observer difference angle: 11.4°

Observer Location — Sun azimuth range is 76.4° - 86.9° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 132 Results

Reflection Date/Time (GMT) Graph



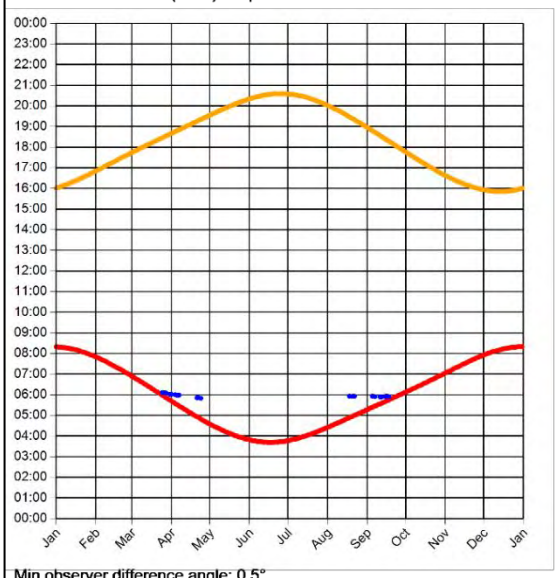
Min observer difference angle: 0.2°
Max observer difference angle: 9.7°

Observer Location — Sun azimuth range is 78° - 88.4° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 133 Results

Reflection Date/Time (GMT) Graph



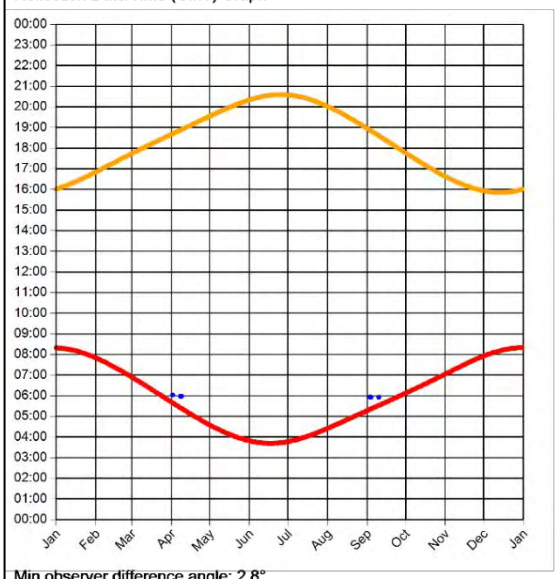
Min observer difference angle: 0.5°
Max observer difference angle: 8.4°

Observer Location — Sun azimuth range is 79.2° - 87.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Road Receptor 134 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 2.8°
Max observer difference angle: 4.7°

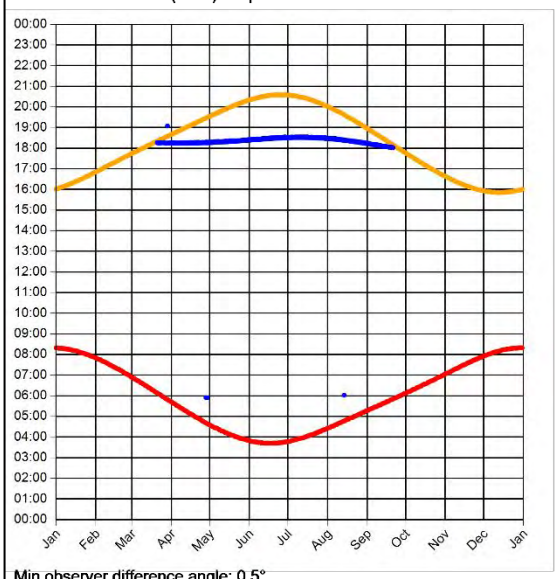
Observer Location — Sun azimuth range is 83.6° - 85.5° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Dwelling Receptors

Observer Dwelling 07 Results

Reflection Date/Time (GMT) Graph



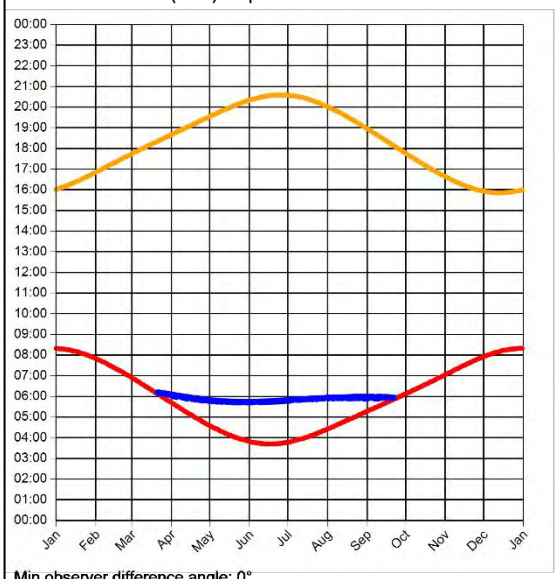
Min observer difference angle: 0.5°
Max observer difference angle: 16.8°

Observer Location — Sun azimuth ranges (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 29 Results

Reflection Date/Time (GMT) Graph



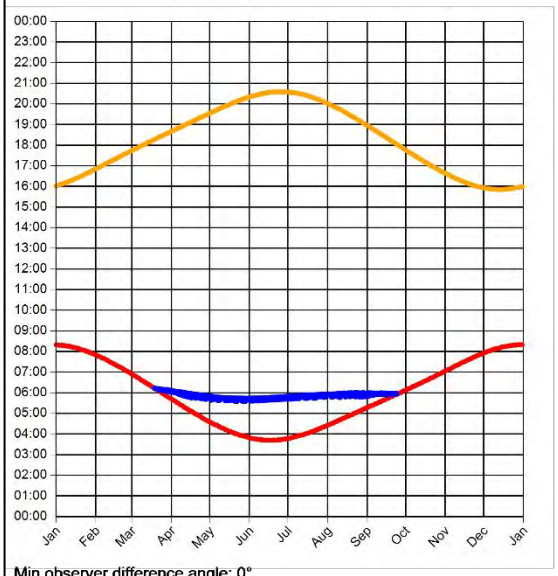
Min observer difference angle: 0°
Max observer difference angle: 17.2°

Observer Location — Sun azimuth range is 70.7° - 89.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 30 Results

Reflection Date/Time (GMT) Graph



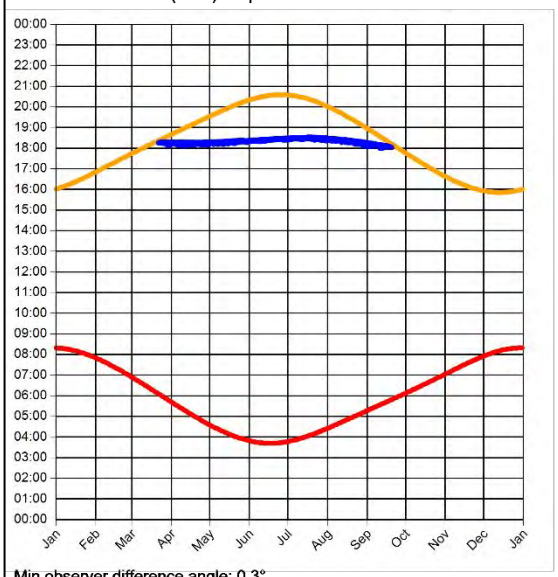
Min observer difference angle: 0°
Max observer difference angle: 16.9°

Observer Location — Sun azimuth range is 69.9° - 90.2° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 57 Results

Reflection Date/Time (GMT) Graph



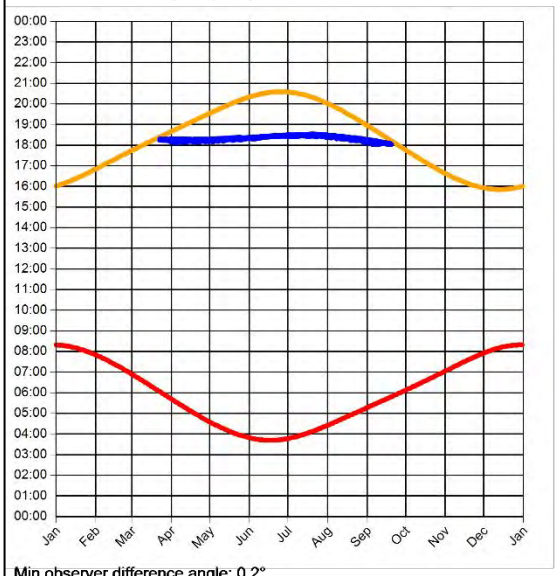
Min observer difference angle: 0.3°
Max observer difference angle: 19.2°

Observer Location — Sun azimuth range is 270.9° - 288.3° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 58 Results

Reflection Date/Time (GMT) Graph



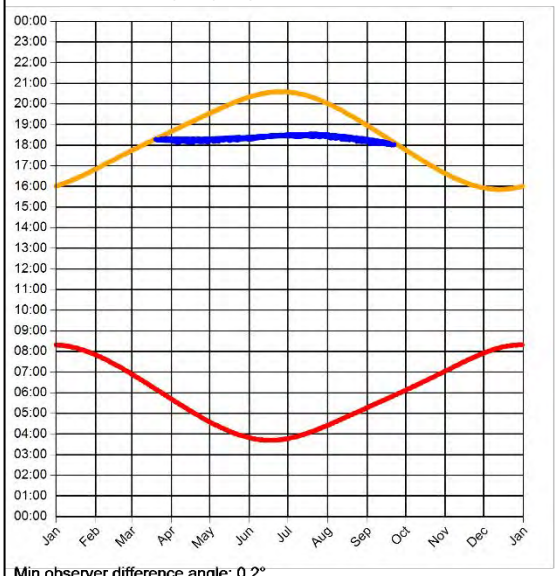
Min observer difference angle: 0.2°
Max observer difference angle: 18.8°

Observer Location — Sun azimuth range is 271° - 288.4° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

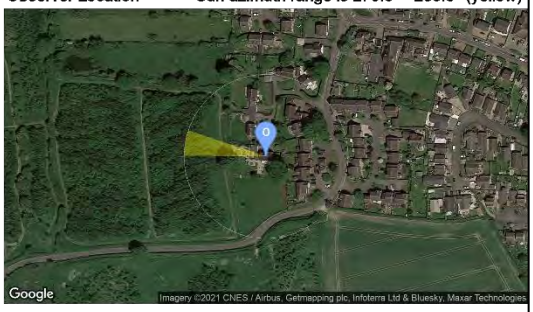
Observer Dwelling 59 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.2°
Max observer difference angle: 18.4°

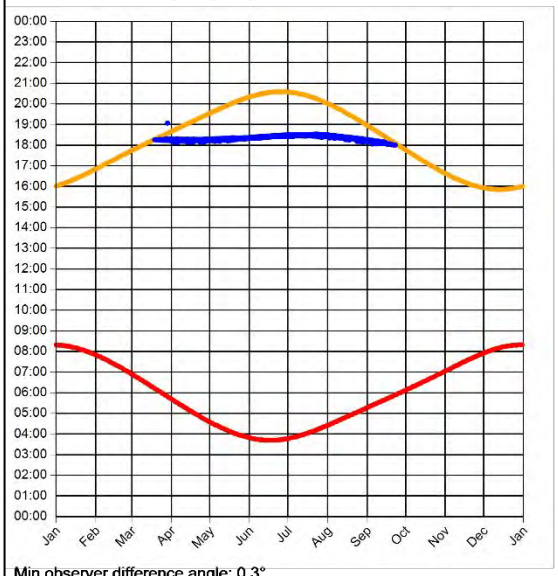
Observer Location — Sun azimuth range is 270.5° - 288.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 60 Results

Reflection Date/Time (GMT) Graph



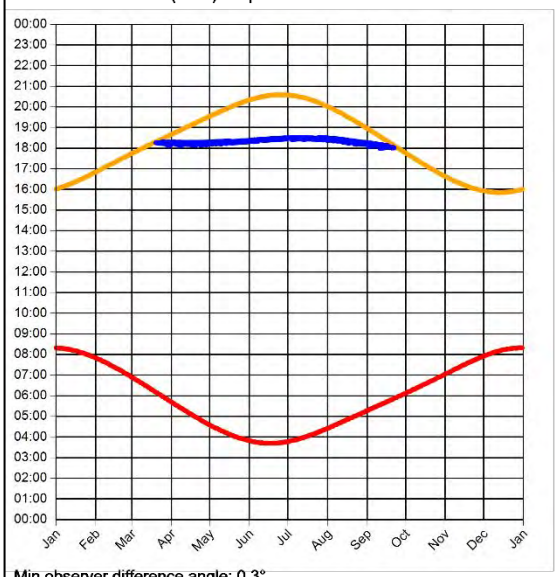
Min observer difference angle: 0.3°
Max observer difference angle: 18.6°

Observer Location — Sun azimuth range is 270.1° - 288.5° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

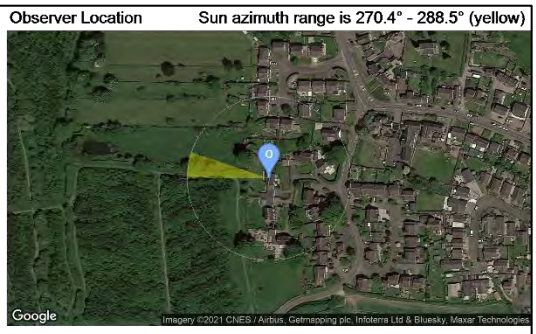
Observer Dwelling 61 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.3°
Max observer difference angle: 18.4°

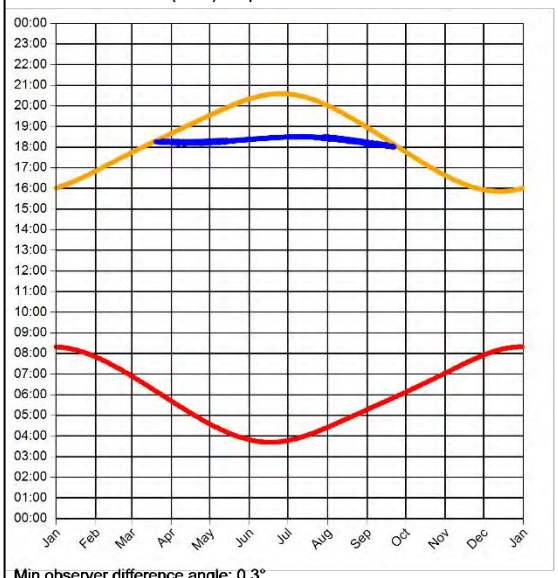
Observer Location — Sun azimuth range is 270.4° - 288.5° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 62 Results

Reflection Date/Time (GMT) Graph



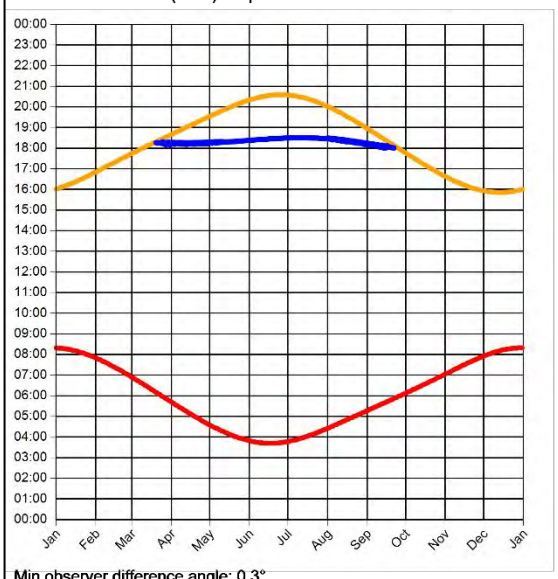
Min observer difference angle: 0.3°
Max observer difference angle: 17.3°

Observer Location — Sun azimuth range is 270.4° - 288.5° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 63 Results

Reflection Date/Time (GMT) Graph



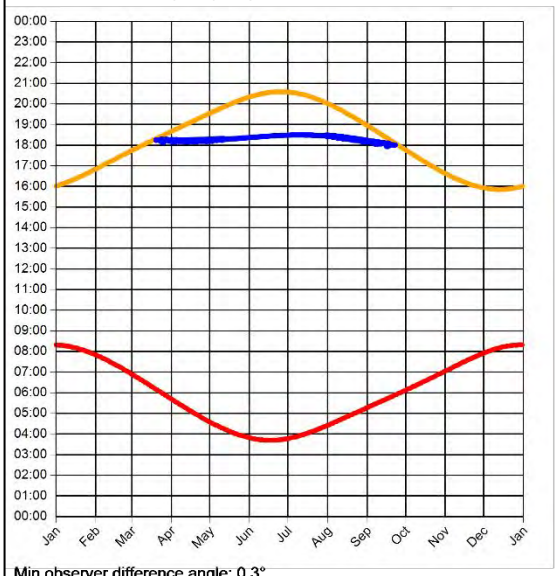
Min observer difference angle: 0.3°
Max observer difference angle: 17.2°

Observer Location — Sun azimuth range is 270.3° - 288.5° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 64 Results

Reflection Date/Time (GMT) Graph



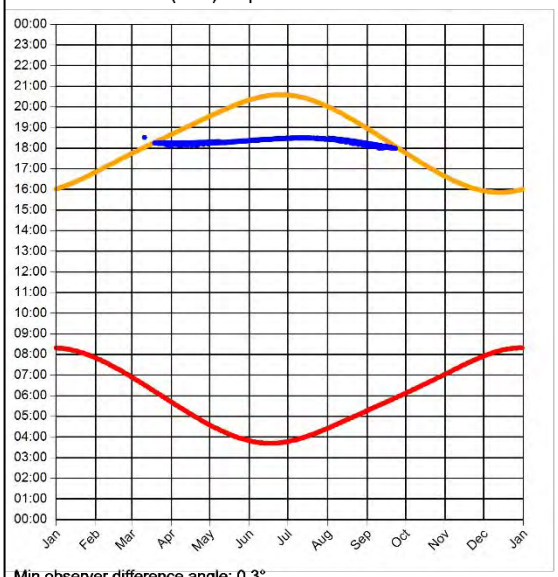
Min observer difference angle: 0.3°
Max observer difference angle: 17.4°

Observer Location — Sun azimuth range is 270.1° - 288.4° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 65 Results

Reflection Date/Time (GMT) Graph



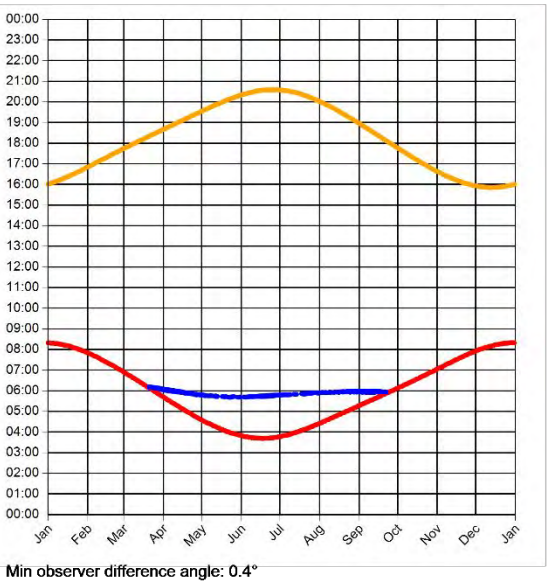
Min observer difference angle: 0.3°
Max observer difference angle: 17.6°

Observer Location — Sun azimuth range is 269.9° - 288.3° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer Dwelling 114 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 0.4°
Max observer difference angle: 16.3°

Observer Location — Sun azimuth range is 70.8° - 89.4° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

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