Technical Appendix 6: Glint and Glare Assessment

Longhedge Solar Farm

30/11/2022

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EXECUTIVE SUMMARY

6.1. This assessment considers the potential impacts on ground-based receptors such as roads, rail and residential dwellings as well as aviation assets. A 1km study area around the Application Site is considered adequate for the assessment of ground-based receptors, whilst a 30km study area is chosen for aviation receptors. Within 1km of the Application Site, there are 84 residential receptors and 57 road receptors which were considered. As per the methodology section, where there are a number of residential receptors within close proximity, a representative dwelling or dwellings is/are chosen for full assessment as the impacts will not vary to any significant degree. Where small groups of receptors have been evident, the receptors on either end of the group have been assessed in detail. Nine residential receptors and 16 road receptors were dismissed as they are located within the no reflection zones. 18 aerodromes are located within the 30km study area; Two of which, RAF Syerston and Nottingham City Airport, required an assessment due to the Proposed Development falling within their respective safeguarding buffer zones, which are outlined in **paragraph 6.74**.

6.2. The solar panels will face south and will be inclined at an angle of between 10 and 30 degrees and at a height of 2.8m above ground level (AGL). As the panels will be fixed in this position, points at the tops of the panels have been used to determine the worst-case impacts on receptors.

6.3. Geometric analysis was conducted at 75 individual residential receptors and 41 road receptors, as well as two runway approach paths and an air traffic control tower at RAF Syerston, and four runway approach paths and an air traffic control tower at Nottingham City Airport.

6.4. Following an initial assessment, rail receptors were scoped out as assets that will be impacted upon from the Proposed Development as no rail receptors fell within the 1km study area. The assessment concludes that:

- Solar reflections are possible at 72 of the 75 residential receptors assessed within the 1km study area. The initial bald-earth scenario identified potential impacts as **High** at 61 receptors, **Medium** at two receptors, **Low** at nine receptors and **None** at the remaining three receptors. Upon reviewing the actual visibility of the receptor, glint and glare impacts remain **High** at seven receptors and reduce to **Low** at one receptor and **None** at all remaining receptors. Once mitigation measures were considered all impacts reduce to **None** at all residential receptors.

- Solar reflections are possible at 40 of the 41 road receptors assessed within the 1km study area. The initial bald-earth scenario identified potential impacts as **High** at 40 receptors and **None** at the remaining receptor. Upon reviewing the actual visibility of the receptor, glint and glare impacts remain **High** at eight receptors and reduce to

None at all remaining receptors. Once mitigation measures were considered all impacts reduce to None at all road receptors.

- No impact on train drivers or railway infrastructure is predicted.

- Green glare is predicted to impact upon the Runway 06 approach path at RAF Syerston and the Runway 03 and 09 approach paths at Nottingham City Airport. According to Federal Aviation Authority (FAA) guidance, green glare is an acceptable impact when pilots are approaching runways/helipads. Green glare is predicted to impact upon the air traffic control tower (ATCT) at Nottingham City Airport. According to FAA guidance, green glare is a not acceptable impact upon an ATCT. Upon review of the ground elevation between the Proposed Development and the ATCT, the impact reduces to None. Therefore, the impact upon aviation assets is not significant.

6.5. Further details of this review can be found in the Impact Assessment section of this report.

6.6. Mitigation is required to ensure the High impact views from Residential Receptors 9 – 12 and 73 - 75, as well as Road Receptors 15 – 17, 21, 28 and 39 – 41 into the Proposed Development are screened. This includes native hedgerows to be planted/gapped up and maintained to a height of 3 – 4m along a southern section of the western boundary of Field 1, northern boundaries of Fields 2 and 4, eastern boundaries of Fields 5, 7 and 9, western section of the southern boundary of Field 9, a northern section of the western boundary of Field 8 and woodland planting along an eastern section of the southern boundary of Field 8 and the southern boundary of Field 9 as proposed in the Landscape and Ecology Management Plan.

6.7. The effects of glint and glare and their impact on local receptors has been analysed in detail and the impact on all receptors is predicted to be Not significant once mitigation measures have been put in place.

INTRODUCTION

Background

6.8. This Glint and Glare Assessment ("G&G") has been prepared by Neo Environmental Limited, on behalf of Renewable Energy Systems (RES) Ltd ("the Applicant") in support of a planning application submitted to Rushcliffe Borough Council ("the Council") for a proposed 49.9MW solar farm development (the "Proposed Development") on lands between Hawksworth and Thoroton, circa 15.5km east of Nottingham, Nottinghamshire (the "Application Site"); the approximate centre point of which can be found at Grid Reference E476129, N343467.

6.9. Please see **Figure 4 of Volume 2: Planning Application Drawings** for the layout of the Proposed Development.

Proposed Development Description

6.10. The Proposed Development will consist of the construction of a c. 49.9MW solar farm. It will involve the construction of bi-facial ground mounted solar photovoltaic (PV) panels, new access tracks, underground cabling, perimeter fencing with CCTV cameras and access gates, 2x temporary construction compounds, substation and all ancillary grid infrastructure and associated works.

6.11. The Proposed Development will result in the production of clean energy from a renewable energy resource (daylight) and will also involve additional landscaping including hedgerow planting and improved biodiversity management.

Site Description

6.12. The Application Site is located in a semi-rural setting on lands between the settlements of Hawksworth (0.1km west) and Thoroton (0.2km southeast), circa 15.5km east of Nottingham, Nottinghamshire. (See **Figure 1** of **Volume 2: Planning Application Drawings** for further detail).

6.13. Centred at approximate Grid Reference E476129, N343467, the Proposed Development Site comprises nine fields covering a total area of c. 94.24hectares (ha), although only 37.7ha of this area is required to accommodate the solar arrays themselves, with the remaining area being used for ancillary infrastructure and mitigation and enhancement measures. The Proposed Development Site covers low lying lightly undulating agricultural land with an elevation range of c. 20m to 25m AOD. Internal field boundaries comprise, hedgerows, tree lines and several linear strips of woodland shelter belt. External boundaries largely consist of mature to lower hedgerows with individual trees and some evident gaps. In terms of existing infrastructure; electricity pylons extend north-south through fields 5, 6 & 8, whilst electricity lines pass northwest to southwest through fields 4, 5, 6 & 9.

6.14. The Application Site will be accessed via the creation of a new entrance off the linear public highway Thoroton Road. The vegetation is set back from the road verge by a few metres and therefore visibility will not be an issue. Appropriate visibility splays are included within the CTMP.

6.15. The haul route will be from the A46 to the southwest of the Application Site. The vehicles will exit the A46, signposted A6097 (Mansfield), take the 4th exit at the roundabout onto Bridgford Street followed by the 1st exit at the next roundabout onto Fosse Way. Vehicles will travel along this road for approximately 1.5km to the next roundabout, where they will take the 2nd exit onto Tenman Lane. This road will be travelled on in an eastern direction for approximately 3.2km before taking a left hand turn onto Hawksworth Road and vehicles will travel along here for approximately 2km before taking a right hand turn onto Thoroton Road. Vehicles will travel in a southeast direction for approximately 0.9km before turning left into the Application Site.

6.16. There is one recreational route located within the Proposed Development Site (Bridleway 1 & 6 that pass through the northern fields), and several located close by (**See Figure 3 of Vol 2: Planning Drawings**). National Cycle Network (NCN) route 64 shares the minor road on the east side of the Proposed Development Site.

6.17. The Proposed Development Site is mostly contained within Flood Zone 1 (at little or no risk of fluvial or tidal / coastal flooding), however there are some areas of Flood Zone 2 and 3a which follow the watercourse/drains within the site and have been carefully considered during the design phase.

Scope of Report

6.18. Although there may be small amounts of glint and glare from the metal structures associated with the solar farm, the main source of glint and glare will be from the panels themselves and this will be the focus of this assessment.

6.19. Solar panels are designed to absorb as much light as possible and not to reflect it. However, glint can be produced as a reflection of the sun from the surface of the solar PV panel. This can also be described as a momentary flash. This may be an issue due to visual impact and viewer distraction on ground-based receptors and on aviation.

6.20. Glare is significantly less intense in comparison to glint and can be described as a continuous source of bright light, relative to diffused lighting. This is not a direct reflection of the sun, but a reflection of the sky around the sun.

6.21. This report will concentrate on the effects of glint and glare and its impact on local receptors and will be supported with the following Figures and Appendices.

- Appendix 6A: Figures

- Figure 6.1: Residential Based Receptors
- Figure 6.2: Road Based Receptors
- Figure 6.3: RAF Syerston Aerodrome Chart
- Figure 6.4: Nottingham City Airport Aerodrome Chart

- Appendix 6B: Residential Receptor Glare Results (10 degrees)
- Appendix 6C: Residential Receptor Glare Results (30 degrees)
- Appendix 6D: Road Receptor Glare Results (10 degrees)
- Appendix 6E: Road Receptor Glare Results (30 degrees)
- Appendix 6F: Aviation Receptor Glare Results (10 degrees)
- Appendix 6G: Aviation Receptor Glare Results (30 degrees)
- Appendix 6H: Visibility Evidence Assessment
- Appendix 6I: Ground Elevation Profile
- Appendix 6J: Solar Module Glare and Reflectance Technical Memo[1]

Statement of Authority

6.22. This Glint and Glare Assessment has been produced by Tom Saddington, Michael McGhee and David Thomson of Neo Environmental. Having completed a civil engineering degree in 2012, Michael has produced Glint and Glare assessments for over 1GW of solar farm developments across the UK and Ireland. Tom has an undergraduate degree in Bioengineering and graduated with an MSc in Environmental and Energy Engineering in January 2020. He has been working on various technical assessments including glint and glare reports for numerous solar farms in Ireland and the UK. David has an undergraduate degree in physics, as well as a MSc in sensor design and a MSc in nanoscience. He is an Environmental Engineer currently being trained in Glint and Glare assessments.

Definitions

6.23. This study examined the potential hazard and nuisance effects of glint and glare in relation to ground-based receptors, this includes the occupants of surrounding dwellings as well as road users. The Federal Aviation Authority (FAA) in their "*Technical Guidance for Evaluating*

1 Sunpower Corporation (September 2009), T09014 Solar Module Glare and Reflectance Technical Memo

Selected Solar Technologies on Airports"[2] have defined the terms 'Glint' and 'Glare' as meaning;

- Glint – "*A momentary flash of bright light*"
- Glare – "*A continuous source of bright light*"

6.24. Glint and glare are essentially the unwanted reflection of sunlight from reflective surfaces. This study used a multi-step process of elimination to determine which receptors have the potential to experience the effects of glint and glare. It then examined, using a computer-generated geometric model, the times of the year and the times of the day such effects could occur. This is based on the relative angles between the sun, the panels, and the receptor throughout the year.

General Nature of Reflectance from Photovoltaic Panels

6.25. In terms of reflectance, photovoltaic solar panels are by no means a highly reflective surface. They are designed to absorb sunlight and not to reflect it. Nonetheless, photovoltaic panels have a flat polished surface, which omits 'specular' reflectance rather than a 'diffuse' reflectance, which would occur from a rough surface. Several studies have shown that photovoltaic panels (as opposed to Concentrated Solar Power) have similar reflectance characteristics to water, which is much lower than the likes of glass, steel, snow and white concrete by comparison (See Appendix 6J). Similar levels of reflectance can be found in rural environments from the likes of shed roofs and the lines of plastic mulch used in cropping. In terms of the potential for reflectance from photovoltaic panels to cause hazard and/ or nuisance effects, there have been a number of studies undertaken in respect of schemes in close proximity to airports. The most recent of these was compiled by Solar Energy UK (formerly the Solar Trade Association (STA)) in April 2016 and used a number of case studies and expert opinions, including that from Neo. The summary of this report states that "*the STA does not believe that there is cause for concern in relation to the impact of glint and glare from solar PV on aviation and airports…*"[3].

Time Zones / Datum's

6.26. Locations in this report are given in Eastings and Northings using the 'British National Grid' grid reference system unless otherwise stated.

2 Harris, Miller, Miller & Hanson Inc. (November 2010). Technical Guidance for Evaluating Selected Solar Technologies on Airports; 3.1.2 Reflectivity. Technical Guidance for Evaluating Selected Solar Technologies on Airports. Available at:

https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide.pdf

3 Solar Trade Association. (April 2016). Summary of evidence compiled by the Solar Trade Association to help inform the debate around permitted development for non - domestic solar PV in Scotland. Impact of solar PV on aviation and airports. Available at: http://www.solar-trade.org.uk/wp-content/uploads/2016/04/STA-glint-and-glare-briefing-April-2016-v3.pdf

6.27. England uses British Summer Time (BST, UTC + 01:00) in the summer months and Greenwich Mean Time (UTC+0) in the winter period. For the purposes of this report all time references are in GMT.

LEGISLATION AND GUIDANCE

National Planning Policy Guidance (NPPG) on Renewable and Low Carbon Energy (UK) [4]

6.28. Paragraph 013 (Reference ID: 5-013-20150327) sets out planning considerations that relate to large scale ground-mounted solar PV farms. This determines that 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. Considerations to be taken into account by local planning authorities are;

- *"the proposal's visual impact, the effect on landscape of glint and glare 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."*

Planning Guidance for the Development of Large-Scale Ground Mounted Solar PV Systems

6.29. As outlined within the BRE document 'Planning Guidance for the Development of Large-Scale Ground Mounted Solar PV Systems'[5]

"Glint may be produced as a direct reflection of the sun in the surface of the solar PV panel. It may be the source of the visual issues regarding viewer distraction. Glare is a continuous source of brightness, relative to diffused lighting. This is not a direct reflection of the sun, but rather a reflection of the bright sky around the sun. Glare is significantly less intense than glint.

Solar PV panels are designed to absorb, not reflect, irradiation. However, the sensitivities associated with glint and glare, and the landscape/ visual impact and the potential impact on aircraft safety, should be a consideration. In some instances, it may be necessary to seek a glint and glare assessment as part of a planning application. This may be particularly

[4] NPPG Renewable and Low Carbon Energy. Available at: http://planningguidance.communities.gov.uk/blog/guidance/renewable-and-low-carbon-energy/particular-planning-considerations-for-hydropower-active-solar-technology-solar-farms-and-wind-turbines/#paragraph_013

[5] BRE (2013) *Planning Guidance for the Development of Large Scale Ground Mounted Solar PV Systems*. Available at: https://www.bre.co.uk/filelibrary/pdf/other_pdfs/KN5524_Planning_Guidance_reduced.pdf

important if 'tracking' panels are proposed as these may cause differential diurnal and/or seasonal impacts.

The potential for solar PV panels, frames and supports to have a combined reflective quality should be assessed. This assessment needs to consider the likely reflective capacity of all of the materials used in the construction of the solar PV farm."

Interim CAA Guidance – Solar Photovoltaic Systems (2010)

6.30. There is little guidance on the assessment of glint and glare from solar farms with regards to aviation safety. The Civil Aviation Authority (CAA) has published interim guidance on 'Solar Photovoltaic Systems[6]', they also intend to undertake a review of the potential impacts of solar PV developments upon aviation, however this is yet to be published.

6.31. The interim guidance identifies the key safety issues with regards to aviation, including *"glare, dazzling pilots leading them to confuse reflections with aeronautical lights."* It is outlined that solar farm developers should be aware of the requirements to comply with the Air Navigation Order (ANO), published in 2016 and amended in 2022. In particular, developers should be cognisant of the following articles of the ANO[7], including:

- *Article 240 – Endangering safety of an aircraft – "A person must not recklessly or negligently act in a manner likely to endanger an aircraft, or any person in an aircraft."*
- *Article 224 - Lights liable to endanger – "A person must not exhibit in the United Kingdom any light which:*
  - *a) by reason of its glare is liable to endanger aircraft taking off or from landing at an aerodrome; or*
  - *b) by reason of its liability to be mistaken for an aeronautical ground light liable to endanger aircraft"*
- *Article 225 – Lights which dazzle or distract – "A person must not in the United Kingdom direct or shine any light at any aircraft in flight so as to dazzle or distract the pilot of the aircraft."*

6.32. Relevant studies generally agree that there is potential for glint and glare from photovoltaic panels to cause a hazard or nuisance for surrounding receptors, but that the intensity of such

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[6] *CAA (2010) Interim CAA Guidance – Solar Photovoltaic Systems. Available at: https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&appid=11&mode=detail&id=4370*

[7] CAA (2016) Air Navigation: The Order and Regulations. Available at: https://www.caa.co.uk/media/1a2cigrq/air-navigation-order-2016-amended-april-2022-version.pdf

reflections is similar to that emanating from still water. This is considerably lower than for other manmade materials such as glass, steel or white concrete (SunPower – 2009).

6.33. These Articles are considered within the assessment of glint and glare of the Proposed Development.

CAA – CAP738: Safeguarding of Aerodromes 3rd Edition[8]

6.34. In 2003 the CAA first introduced the CAP738 document to help provide advice and guidance to ensure aerodrome safeguarding. Subsequently, there have been two updates to this document in 2006 and 2020.

6.35. Within the latest edition of CAP738, it outlines that the purpose of the document is to protect an aerodrome and to ensure safe operation. Specifically stating:

"Its purpose is to protect:

Aircraft from the risk of glint and glare e.g. solar panels."

6.36. Within the section named as "Appendix C – Solar Photovoltaic Cells", the following is stated:

"Policy

1. In 2010 the CAA published interim guidance on Solar Photovoltaic Cells (SPCs). At that time, it was agreed that we would review our policy based on research carried out by the Federal Aviation Authorities (FAA) in the United States, in addition to reviewing guidance issued by other National Aviation Authorities. New information and field experience, particularly with respect to compatibility and glare, has resulted in the FAA reviewing its original document 'Technical Guidance for Evaluating Selected Solar Technologies on Airports', which is likely to be subject to change, see link; https://www.federalregister.gov/documents/2013/10/23/2013-24729/interimpolicy-faa-review-of-solar-energy-system-projects-on-federally-obligated-airports

2. In the United Kingdom there has been a further increase in SPV cells, including some located close to aerodrome boundaries; to date the CAA has not received any detrimental comments or issues of glare at these established sites. Whilst this early indication is encouraging, those responsible for safeguarding should remain vigilant to the possibility."

6.37. The above is stating that to date, there has not been any complications on airfields due to glare originating from solar farms across the UK.

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[8] Civil Aviation Authority (2020). CAP738 – Safeguarding of Aerodromes 3rd Edition. Available at: https://publicapps.caa.co.uk/docs/33/CAP738%20Issue%203.pdf

US Federal Aviation Administration Policy

6.38. The US Federal Aviation Administration (FAA) in their Solar Guide (Federal Aviation Authority, 2010)[9] incorporates a chapter on the impact and assessment of glint from solar panels. It concludes that (although subject to revision):

> *"…evidence suggests that either significant glare is not occurring during times of operation or if glare is occurring, it is not a negative effect and is a minor part of the landscape to which pilots and tower personnel are exposed."*

6.39. The current policy (Federal Register, 2013)[10] demands that an ocular impact assessment must be assessed at 1-minute intervals from when the sun rises above the horizon until the sun sets below the horizon. Specifically, the developer must use the 'Solar Glare Hazard Analysis Tool' (SGHAT) tool specifically and reference its results as this was developed by the FAA and Sandia National Laboratories as a standard and approved methodology for assessing potential impacts on aviation interests, although it notes other assessment methods may be considered. The SGHAT tool has since been licensed to a private organisation who were also involved in its development and it is the software model used in this assessment.

6.40. Crucially, the policy provides a quantitative threshold which is lacking in the English guidance. This outlines that a solar development will not automatically receive an objection on glint grounds if low intensity glint is visible to pilots on final approach. In other words, low intensity glint with a low potential to form a temporary after-image would be considered acceptable under US guidance. Due to the lack of legislation and guidance within England, this US document has been utilised as guidance for this report.

6.41. The FAA guidance states that for a solar PV development to obtain FAA approval or to receive no objection, the following two criteria must be met:

- No potential for glint or glare in the existing or planned Air Traffic Control Tower (ATCT); and
- No potential for glare (glint) or "low potential for after-image" along the final approach path for any existing or future runway landing thresholds (including planned or interim phases), as shown by the approved layout plan (ALP). The final approach path is defined

[9] FAA (2010), Technical Guidance for Evaluating Selected Solar Technologies on Airports. Available at https://www.faa.gov/airports/environmental/policy_guidance/media/airport-solar-guide-print.pdf

[10] FAA (2013), Interim Policy, *FAA Review of Solar Energy System Projects on Federally Obligated Airports*. Available at https://www.federalregister.gov/documents/2013/10/23/2013-24729/interim-policy-faa-review-of-solar-energy-system-projects-on-federally-obligated-airports

as 2 miles from 50 feet above the landing threshold using a standard 3-degree glide path.

6.42. The geometric analysis included later in this report, which defines the extent and time at which glint may occur, is required by the FAA as the methodology to be used when assessing glint and glare impacts on aviation receptors. This report follows the methodology required by the FAA as it offers the most robust assessment method currently available.

FAA Policy: Review of Solar Energy Systems Projects on Federally - Obligated Airports[11]

6.43. The FAA updated their Interim Policy from 2013 as part of their commitment to "*update policies and procedures as part of an iterative process as new information and technologies become available." The main development regarding Glint and Glare since the Interim Policy is the following:*

"Initially, FAA believed that solar energy systems could introduce a novel glint and glare effect to pilots on final approach. FAA has subsequently concluded that in most cases, the glint and glare from solar energy systems to pilots on final approach is similar to glint and glare pilots routinely experience from water bodies, glass-façade buildings, parking lots, and similar features. However, FAA has continued to receive reports of potential glint and glare from on-airport solar energy systems on personnel working in ATCT cabs."

6.44. This is outlining that solar panels are similar to nuisances that are already caused by other existing infrastructure, such as car parks, glass buildings and water bodies. Furthermore, the ATCT has been outlined as the key receptor to be assessed when determining Glint and Glare impacts from a solar farm.

Review of Local Plan

Rushcliffe Borough Local Plan 2011 - 2031

6.45. The Rushcliffe Local Plan Part 1: Core Strategy[12] was adopted by the district council in December 2014.

6.46. The plan states in **Introduction** section:

'The Core Strategy sets out where and when new homes, jobs and infrastructure will be delivered; the steps that will be taken to ensure that development is sustainable and to the benefit of existing communities and new communities, recognising what is special and distinctive about Rushcliffe. This includes the historic environment, the culture and heritage,

[11] FAA (2021). FAA Policy: Review of Solar Energy Systems Projects on Federally – Obligated Airports. Available at: https://www.federalregister.gov/documents/2021/05/11/2021-09862/federal-aviation-administration-policy-review-of-solar-energy-system-projects-on-federally-obligated

[12] https://www.rushcliffe.gov.uk/planningpolicy/localplan/localplanpart1corestrategy/#d.en.27398

and the relationship between Rushcliffe's towns and villages, the countryside that surrounds them and the wider Nottingham area.'

6.47. The plan states in **Policy 2 Climate Change Section 5:**

'The extension of existing or development of new decentralised, renewable and low-carbon energy schemes appropriate for Rushcliffe will be promoted and encouraged, including biomass power generation, combined heat and power, wind, solar and micro generation systems, where these are compatible with environmental, heritage, landscape and other planning considerations. In line with the energy hierarchy, adjacent new developments will be expected to utilise such energy wherever it is feasible and viable to do so'

6.48. There are no policies within the current adopted local plan which are of relevance for this report.

METHODOLOGY

6.49. A desk-based assessment was undertaken to identify when and where glint and glare may be visible at receptors within the vicinity of the Proposed Development, throughout the day and the year.

Sun Position and Reflection Model

Sun Data Model

6.50. The calculations in the solar position calculator are based on equations from Astronomical Algorithms[13]. The sunrise and sunset results are theoretically accurate to within a minute for locations between +/- 72° latitude, and within 10 minutes outside of those latitudes. However, due to variations in atmospheric composition, temperature, pressure and conditions, observed values may vary from calculations.

Solar Reflection Model

6.51. The position of the sun is calculated at one-minute intervals of a typical year, in this instance the year being assessed was 2022.

6.52. In order to determine if a solar reflection will reach a receptor the following variables are required:

- Sun position;
- Observer location, and;
- Tilt, orientation, and extent of the modules in the solar array.

6.53. The model assumes that the azimuth and horizontal angle of the sun is the same across the whole solar farm. This is considered acceptable due to the distance of the sun from the Proposed Development and the miniscule differences in location of the sun over the Proposed Development.

6.54. Once the position of the sun is known for each time interval, a vector reflection equation determines the reflected sun vector, based on the normal vector of the solar array panels. This assumes that the angle of reflection is equal to the angle of incidence reflected across a normal plane. In this instance, the plane being the vector which the solar panels are facing.

6.55. On knowing the vector of the solar reflection, the azimuth is calculated and the horizontal reflection from multiple points within the solar farm. These are then compared with the

[13] Jean Meeus, Astronomical Algorithms (Second Edition), 1999

azimuth and horizontal angle of the receptor from the solar farm to determine if it is within range to receive solar reflections.

6.56. The solar reflection in the model is considered to be specular as a worst-case scenario. In practice the light from the sun will not be fully reflected as solar panels are designed to absorb light rather than reflect it. The text above and **Appendix 6J** outlines the reflective properties of solar glass and compares it to other reflective surfaces. Although the exact figures in this report could be argued, it is included as a visual guide and it agrees with most other reports, in that solar glass has less reflective properties than other types of glass, bodies of water and snow, and that the amount of reflective energy drops as the angle of incidence decreases.

6.57. Most modern panels have a slight surface texture which should have a small effect on diffusing the solar radiation further. Although, this has not been modelled to conform with the worst-case scenario assessment.

6.58. The panel reflectivity has been modelled to assume an anti-reflective coating (ARC) which is the industry standard for photo-voltaic panels and further reduces the reflective properties of the PV panels.

Determination of Ocular Impact

6.59. The software used for this assessment is based on the Sandia Laboratories Solar Glare Hazard Analysis Tool (SGHAT). This tool is specifically mentioned in the FAA guidance as the software which should be used in this type of assessment.

6.60. Determination of the ocular impact requires knowledge of the direct normal irradiance, PV module reflectance, size and orientation of the array, optical properties of the PV module, and ocular parameters. These values are used to determine the retinal irradiance and subtended source angle used in the ocular hazard plot.

6.61. The ocular impact[14] of viewed glare can be classified into three levels based on the retinal irradiance and subtended source angle: low potential for after-image (green), potential for after-image (yellow), and potential for permanent eye damage (red).

6.62. Green glare can be ignored when looking at ground based and some aviation receptors. Green glare does not cause temporary flash blindness and happens at an instant with very slight disturbance. As per FAA guidelines mitigation is only required for green glare when affecting an Air Traffic Control Tower, but not for when affecting pilots. Therefore, it can be assumed that green glare is acceptable for ground-based receptors.

[14] Ho, C.K., C.M. Ghanbari, and R.B. Diver, 2011, Methodology to Assess Potential Glint and Glare Hazards From Concentrating Solar Power Plants: Analytical Models and Experimental Validation, Journal of Solar Energy Engineering-Transactions of the Asme, 133(3).

6.63. The subtended source angle represents the size of the glare viewed by an observer, while the retinal irradiance determines the amount of energy impacting the retina of the observer. Larger source angles can result in glare of high intensity, even if the retinal irradiance is low.

6.64. The modelling software outputs a hazard plot for each receptor predicted to be impacted by glare from the photovoltaic (PV) array. An orange dot is plotted for each minute of glare indicating the irradiance (power density) of the reflected solar light. A yellow dot is plotted to show the irradiance of the Sun when it is viewed directly. The hazard plot shows that the irradiance of the Sun is approximately three orders of magnitude greater than the reflected irradiance, i.e., the power density of solar reflections from photovoltaic panels are approximately 0.1% that of viewing the Sun. Due to the disparity in irradiance, whenever the Sun is observed in the same frame as solar reflections from a PV array, the Sun will be main source of glare impacts upon the observer. In such a case, the impact is deemed to be **Low** as a worst-case scenario.

Relevant Parameters of the Proposed Development

6.65. The photovoltaic panels are oriented in a southwards direction to maximise solar gain and will remain in a fixed position throughout the day and during the year (i.e. they will not rotate to track the movement of the sun). The panels will face southwards and will be inclined at an angle of between 10 and 30 degrees. The panel tilt angle which will result in the worst-case impacts at the receptor point will change depending on the orientation between the receptor point and the Proposed Development. Therefore, this report considers the impacts from the minimum and maximum panel angles (10 and 30 degrees respectively) and assesses each receptor based on the worst-case effects.

6.66. The height of the panels above ground level is a maximum of 2.8m and points at the top of the panels are used to determine the potential for glint and glare generation.

Identification of Receptors

Ground Based Receptors

6.67. Glint is most likely to impact upon a ground-based receptor close to dusk and dawn, when the sun is at its lowest in the sky. Therefore, any effect would likely occur early in the day or late in the day, reflected to the west at dawn and east at dusk.

6.68. A 1km study area from the panels was deemed appropriate for the assessment of ground-based receptors as this seemed to contain a good spread of residential and road receptors in most directions from the Proposed Development. The further distance a receptor is from a solar farm, the less chance it has of being affected by glint and glare due to scattering of the reflected beam and atmospheric attenuation, in addition to obstructions from ground sources, such as any intervening vegetation or buildings.

6.69. An observer height of 2m was utilised for residential receptors, as this is a typical height for a ground-floor window. Upper floor windows are not analysed geometrically; however, are considered as part of the visual analysis. With regards to road users, a receptor height of 1.5m was employed as this is typical of eye level. Rail driver's eye level was assumed to be 2.75m above the rail for signal signing purposes and therefore this is the height used for assessment purposes.

6.70. An assessment was undertaken to determine zones where solar reflections will never be directed near ground level.

6.71. Where there are several residential receptors within close proximity, a representative dwelling or dwellings is/are chosen for full assessment as the impacts will not vary to any significant degree. Where small groups of receptors have been evident, the receptors on either end of the group have been analysed in detail with the worst-case impacts attributed to that receptor.

Aviation

6.72. Glint is only considered to be an issue with regards to aviation safety when the solar farm lies within close proximity to a runway, particularly when the aircraft is descending to land. En-route activities are not considered an issue as the flight will most likely be at a higher altitude than the solar reflection.

6.73. Should a solar farm be proposed within the safeguarded zone of an aerodrome then a full geometric study may be required which would determine if there is potential for glint and glare at key locations, most likely on the descent to land.

6.74. Buffer zones to identify aviation assets vary depending on the safeguarding criteria of that asset. All aerodromes within 30km will be identified, however generally the detailed assessments are only required within: 20km for large international aerodromes, 10km for military aerodromes and 5km for small aerodromes.

Magnitude of Impact

Static Receptors

6.75. Although there is no specific guidance set out to identify the magnitude of impact from solar reflections, the following criteria has been set out for the purposes of this report:

- High - Solar reflections impacts of over 30 hours per year or over 30 minutes per day
- Medium - Solar reflections impacts between 20 and 30 hours per year or between 20 minutes and 30 minutes per day
- Low - Solar reflections impacts between 0 and 20 hours per year or between 0 minutes and 20 minutes per day

- **None -** Effects not geometrically possible or no visibility of reflective surfaces likely due to high levels of intervening screening

Moving Receptors (Road and Rail)

6.76. Again, no specific guidance is available to identify the magnitude of impact from solar reflections on moving receptors except in aviation, however it is thought that a similar approach should be applied to moving receptors as aviation, based on the ocular impact and the potential for after-image.

6.77. The FAA guidance states that for a solar PV development to obtain FAA approval or to receive no objection the following criteria must be met:

- No potential for glare (glint) or "*low potential for after-image*" along the final approach path for any existing or future runway landing thresholds (including planned or interim phases), as shown by the approved layout plan (ALP).

6.78. The FAA produced an evaluation of glare as a hazard and concluded in their report[15] that:

"The more forward the glare is and the longer the glare duration, the greater the impairment to the pilots' ability to see their instruments and to fly the aircraft. These results taken together suggest that any sources of glare at an airport may be potentially mitigated if the angle of the glare is greater than 25 deg from the direction that the pilot is looking in. We therefore recommend that the design of any solar installation at an airport consider the approach of pilots and ensure that any solar installation that is developed is placed such that they will not have to face glare that is straight ahead of them or within 25 deg of straight ahead during final approach."

6.79. It is reasonable to assume that although this report was assessing pilots vision impairment that it can be also used to drivers of other vehicles. Therefore, the driver's field of view will also be analysed where required and if the glare is out with 25 degrees either side of their line of sight then any impacts will reduce to **low**.

Moving Receptors (Aviation)

Approach Paths

6.80. Each final approach path which has the potential to receive glint is assessed using the SGHAT model. The model assumes an approach bearing on the runway centreline, a 3-degree glide path with the origin 50ft (15.24m) above the runway threshold.

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[15] Federal Aviation Authority, Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach (2015), Available at https://libraryonline.erau.edu/online-full-text/faa-aviation-medicine-reports/AM15-12.pdf

6.81. The computer model considers the pilots field of view. The azimuthal field of view (AFOV) or horizontal field of view (HFOV) as it is sometimes referred, refers to the extents of the pilot's horizontal field of view measured in degrees left and right from directly in front of the cockpit. The vertical field of view (VFOV) refers to the extents of the pilot's vertical field of view measured in degrees from directly in front of the cockpit. The HFOV is modelled at 50 degrees left and right from the front of the cockpit whilst the VFOV is modelled at 30 degrees.

6.82. The FAA guidance states that there should be no potential for glare or '*low potential for after-image*' at any existing or future planned runway landing thresholds for the Proposed Development to be acceptable.

Air Traffic Control Tower (ATCT)

6.83. An air traffic controller uses the visual control room to monitor and direct aircraft on the ground, approaching and departing the aerodrome. It is essential that air traffic controllers have a clear unobstructed view of the aviation activity. The key areas on an aerodrome are the views towards the runway thresholds, taxiways, and aircraft bays.

6.84. The FAA guidance states that no solar reflection towards the ATCT should be produced by a proposed solar development, however this should be assessed on a site by site case and will depend on the operations at a particular aerodrome.

6.85. In order to determine the impact on the ATCT, the location and height of the tower will need to be fed into the SGHAT model and where there is any potential for glare impacts upon the ATCT, then mitigation measures will be required.

Assessment Limitations

6.86. Below is a list of assumptions and limitations of the model and methods used within this report:

- The model does not consider obstacles (either man-made or natural) between the observation points and the prescribed solar installation that may obstruct observed glare, such as trees, hills, buildings, etc;
- The model does not rigorously represent the detailed geometry of a system; detailed features such as gaps between modules, variable height of the PV array, and support structures may impact actual glare results;
- Due to variations in atmospheric composition, temperature, pressure and conditions, observed values may vary slightly from calculated positions;
- The model does not account for the effects of diffraction; however, buffers are applied as a factor of safety; and

- The model assumes clear skies at all times and does not account for meteorological effects such as cloud cover, fog, or any other weather event which may screen the sun.

6.87. Due to these assumptions and limitations the model overestimates the number of minutes of glint and glare which are possible at each receptor and presents the worst-case scenario. Where glint and glare are predicted a visibility assessment is carried out to determine a more accurate, real-world prediction of the impacts.

BASELINE CONDITIONS

Ground Based Receptors Reflection Zones

6.88. In the northern hemisphere, there will never be solar reflections due south of a solar PV development as the position of the sun is always south. Furthermore, due to the slant of a solar panel (where the sun is due south, with an azimuth angle of 180 degrees), reflections will be directed skyward and not impact on ground-based receptors. The ground-based receptor reflection zone is a procedure which eliminates certain areas in order to reduce the assessment procedure, much in the same way a zone of theoretical visibility (ZTV) map allows a Landscape Architect to focus their assessment on areas where the solar PV development will be visible.

6.89. Based on the relatively flat topography in the area, solar reflections between five degrees below the horizontal plane to five degrees above it are described as near horizontal. Reflections from the proposed solar farm within this arc have the potential to be seen by receptors at or near ground level.

6.90. Further analysis showed that this will only occur between the azimuth of 238.15 degrees and 298.73 degrees in the western direction (late day reflections) and 64.76 degrees and 129.14 degrees in the eastern direction (morning reflections) and therefore any ground-based receptor outside these arcs will not have any impact from solar reflections.

6.91. **Figure 6.1 and 6.2 of Appendix 6A** show the respective study areas whilst also subtracting from this the areas where solar reflections will not impact on ground-based receptors due to the reasons set out in **paragraphs 6.88 to 6.90.**

Residential Receptors

6.92. Residential receptors located within 1km of the Application Site have been identified (**Table 6 - 1**). Glint was assumed to be possible if the receptor is located within the ground-based receptor zones outlined previously.

6.93. There are nine residential receptors (Receptors 76 - 84) which are within the no-reflection zones and are clearly identifiable in **Figure 6.1: Appendix 6A.** The process of how these are calculated is explained in **paragraphs 6.88 to 6.90** of this report.

Table 6 - 1: Residential Based Receptors

Receptor	Easting	Northing	Glint and Glare Possible
1	476575	344442	Yes
2	477460	344225	Yes

3	477359	344154	Yes
4	477369	344140	Yes
5	477343	344135	Yes
6	477286	344109	Yes
7	477266	344098	Yes
8	477150	344017	Yes
9	477163	343309	Yes
10	477201	343224	Yes
11	477187	343209	Yes
12	477198	343199	Yes
13 (1)	476478	342726	Yes
14 (1)	476476	342718	Yes
15 (1)	476515	342620	Yes
16 (1)	476463	342649	Yes
17 (1)	476408	342661	Yes
18 (1)	476390	342609	Yes
19 (1)	476366	342572	Yes
20 (1)	476264	342592	Yes
21	474982	342993	Yes
22	474951	343014	Yes
23	474998	343066	Yes
24	475036	343095	Yes
25	475140	343113	Yes
26	475172	343267	Yes
27	475487	343316	Yes
28	475477	343355	Yes
29	475482	343399	Yes
30	475449	343388	Yes

31	475412	343397	Yes
32	475420	343363	Yes
33	475426	343330	Yes
34	475406	343321	Yes
35	475403	343345	Yes
36	475388	343355	Yes
37	475375	343360	Yes
38	475349	343350	Yes
39	475348	343369	Yes
40	475308	343409	Yes
41	475301	343430	Yes
42	475271	343407	Yes
43	475277	343372	Yes
44	475237	343384	Yes
45	475215	343365	Yes
46	475172	343387	Yes
47	475197	343395	Yes
48	475198	343422	Yes
49	475218	343456	Yes
50	475239	343473	Yes
51	475223	343488	Yes
52	475210	343498	Yes
53	475217	343511	Yes
54	475231	343527	Yes
55	475245	343518	Yes
56	475274	343527	Yes
57	475279	343506	Yes
58	475324	343516	Yes

59	475365	343503	Yes
60	475421	343501	Yes
61	475369	343534	Yes
62	475341	343544	Yes
63	475347	343563	Yes
64	475373	343569	Yes
65	475373	343592	Yes
66	475396	343600	Yes
67	475476	343576	Yes
68	475388	343629	Yes
69	475360	343623	Yes
70	475338	343645	Yes
71	475349	343658	Yes
72	475330	343673	Yes
73	475435	343686	Yes
74	475454	343689	Yes
75	475457	343703	Yes
76	475911	344979	No
77	475941	344986	No
78	476221	342531	No
79	476201	342469	No
80	476201	342402	No
81	476171	342342	No
82	476176	342255	No
83	476142	342213	No
84	476153	342155	No

6.94. The number in brackets indicates which residential area (as outlined in **paragraph 6.71**) the receptor belongs.

Road / Rail Receptors

6.95. There are six roads within the 1km study area that require a detailed Glint and Glare Assessment; Main Road, Hawksworth Lane, Hawksworth Road, Cliffhill Lane, Longhedge Lane and Thoroton Road. There are some minor roads which serve dwellings; however, these have been dismissed as vehicle users of these roads will likely be travelling at low speeds and therefore, there is a negligible risk of safety impacts resulting from glint and glare of the Proposed Development.

6.96. The ground receptor no-reflection zones are clearly identifiable on **Figure 6.2: Appendix 6A** and the process of how these are calculated is explained in **paragraphs 6.88 to 6.90** of this report.

6.97. **Table 6 - 2** shows a list of receptors points within the study area which are 200m apart.

Table 6 - 2: Road Based Receptors

Receptor	Easting	Northing	Glint and Glare Possible
1	475755	344068	Yes
2	475633	343910	Yes
3	475502	343761	Yes
4	475368	343616	Yes
5	475257	343449	Yes
6	475156	343277	Yes
7	475065	343099	Yes
8	474961	342929	Yes
9	474656	343495	Yes
10	474821	343383	Yes
11	475002	343296	Yes
12	475203	343107	Yes
13	475380	343018	Yes
14	475570	342956	Yes
15	475764	342904	Yes
16	475952	342838	Yes
17	476141	342771	Yes

18	476330	342706	Yes
19	476401	342576	Yes
20	476475	342761	Yes
21	476535	342952	Yes
22	476596	343142	Yes
23	476655	343333	Yes
24	476715	343524	Yes
25	476775	343715	Yes
26	476920	343833	Yes
27	477075	343951	Yes
28	477235	344064	Yes
29	477411	344157	Yes
30	477566	344284	Yes
31	477312	342681	Yes
32	477259	342868	Yes
33	477245	343068	Yes
34	477161	343243	Yes
35	477104	343435	Yes
36	476986	343594	Yes
37	476837	343726	Yes
38	476703	343855	Yes
39	476604	344023	Yes
40	476476	344172	Yes
41	476300	344267	Yes
42	476176	344424	No
43	476078	344595	No
44	476027	344788	No
45	475901	344933	No

46	475741	345032	No
47	475599	345173	No
48	476499	345001	No
49	476362	344855	No
50	476245	344694	No
51	476124	344536	No
52	475996	344383	No
53	475859	344238	No
54	475913	341956	No
55	476056	342096	No
56	476195	342239	No
57	476300	342407	No

6.98. There are no railway lines within the 1km study area.

Aviation Receptors

6.99. Aerodromes within 30km of the Proposed Development can be found in **Table 6 - 3.**

Table 6 - 3: Airfields within close Proximity

Airfield	Distance	Use
RAF Syerston	4.22km	Military
Langar Airfield	8.47km	Small concrete strip
Oxton Airfield	10.32km	Small grass strip
Hougham Airfield	11.43km	Small grass strip
Lambley Airfield	12.42km	Unlicensed small grass strip
Nottingham City Airport	14.41km	Licensed airport
Caunton Airfield	14.51km	Small grass strip
Nottingham Heliport	18.29km	Small grass strip
Barkston Heath Airfield	19.07km	Small concrete strip
Saltby Airfield	19.08km	Small concrete strip

Ossingotn Airfield	21.15km	Small grass strip
Grassthorpe Grange Airfield	23.20km	Small grass strip
RAF Cranwell	23.60km	Military
Wilsford Airfield	24.20km	Unlicensed small grass strip
Temple Bruer Airfield	25.04km	Small grass strip
Watnall Airfield	25.71km	Small grass strip
South Hykeham Airfield	26.64km	Unlicensed small grass strip
RAF Waddington	28.79km	Military

6.100. There are two aerodromes, RAF Syerston and Nottingham Tollerton Airport, which require detailed assessments due to these airfields being within their respective safeguarding buffer zones outlined in **paragraph 6.74.** The other 14 aerodromes have not been deemed large enough or close enough (for their size) to warrant detailed assessments.

RAF Syerston

6.101. RAF Syerston (ICAO code EGXY) is a VFR only aerodrome. It is located approximately 5NM (9.26km) southwest of Newark on Trent.

6.102. The elevation of the aerodrome is 231ft (70.41m). It has one asphalt runway, details of which are given in **Table 6 - 4.**

Table 6 - 4: Runways at RAF Syerston

Runway Designation	True Bearing (°)	Length (m)	Width (m)
06	062.44	1810	50
24	242.44	1810	50

6.103. The threshold location and height of the runways at RAF Syerston are given in **Table 6 - 5**.

Table 6 - 5: Runway Threshold Locations and Heights

Runway Designation	Threshold Latitude	Threshold Longitude	Height AOD (m)
06	53° 01′ 09.85″ N	000° 55′ 26.50″ W	67
24	53° 01′ 35.78″ N	000° 54′ 03.67″ W	57

6.104. The ARP is located south of the midpoint of Runway 06/24. The actual location of the ARP and ATCT is given in **Table 6 - 6**. The height of the ATCT is estimated to be 8m based off a Google image search.

Table 6 - 6: RAF Syerston Reference Point

	Latitude	Longitude	Eastings	Northings
ARP	53° 01’ 23.95’’ N	000° 54’ 41.90’’ W	473098	347889
ATCT	53° 01’ 12.66’’ N	000° 54’ 48.25’’ W	472985	347539

Nottingham City Airport

6.105. Nottingham City Airport (ICAO code EGBN) is an VFR only aerodrome. It is located approximately 3NM (5.56km) southeast of Nottingham

6.106. The elevation of the aerodrome is 138ft (42.06m). It has one asphalt runway and one concrete and asphalt runway, details of which are given in **Table 6 - 7**.

Table 6 - 7: Runways at Nottingham City Airport

Runway Designation	True Bearing (°)	Length (m)	Width (m)
03	028.70	821	23
21	208.70	821	23
09	088.10	1050	30
27	268.10	1050	30

6.107. The threshold location and height of the runway at Nottingham City Airport are given in **Table 6 - 8**.

Table 6 - 8: Runway Threshold Locations and Heights

Runway Designation	Threshold Latitude	Threshold Longitude	Height AOD (m)
03	52° 54′ 59.99″ N	001° 04′ 46.60″ W	35
21	52° 55′ 23.23″ N	001° 04′ 25.63″ W	27
09	52° 55′ 14.32″ N	001° 05′ 07.36″ W	38
27	52° 55′ 15.05″ N	001° 04′ 22.61″ W	27

6.108. The ARP is located south of the midpoint of Runway 09/27. The actual location of the ARP and ATCT is given in **Table 6 - 9**. The height of the ATCT is estimated to be 5m based off a Google Earth street view image.

Table 6 - 9: Nottingham City Airport Reference Point

	Latitude	Longitude	Eastings	Northings
ARP	52° 55’ 12.02’’ N	001° 04’ 45.01’’ W	462011	336247
ATCT	52° 55’ 07.19’’ N	001° 04’ 50.82’’ W	461903	336089

IMPACT ASSESSMENT

6.109. Following the methodology outlined earlier in this report, geometrical analysis comparing the azimuth and horizontal angle of the receptors from the Proposed Development and the solar reflection was conducted. Although this assessment did not take into account obstructions such as vegetation and buildings, discussion on the potentially impacted receptors is provided where necessary.

Ground Based Receptors

Residential Receptors

6.110. **Table 6 - 10** identifies the receptors that will experience solar reflections based on solar reflection modelling and whether the reflections will be experienced in the morning (AM), evening (PM), or both.

6.111. The nine receptors which were within the no-reflection zones outlined previously have been excluded from the detailed modelling as they will never receive any glint and glare impacts from the Proposed Development.

6.112. **Appendix 6B and 6C** shows the analysis with the solar panels at a tilt angle of between 10 and 30 degrees. **Table 6 - 10** shows the worst-case impact at each receptor.

Table 6 - 10: Potential for Glint and Glare impact on Residential Receptors

Receptor	Glint Possible from Site		Potential Glare Impact (per year)		Magnitude of Impact	Worst Case Tilt (degrees)
	AM	PM	Minutes	Hours		
1	No	No	0	0	None	N/A
2	No	Yes	483	8.05	Low	10
3	No	Yes	684	11.40	Low	10
4	No	Yes	751	12.52	Low	10
5	No	Yes	765	12.75	Low	10
6	No	Yes	860	14.33	Low	10
7	No	Yes	766	12.77	Low	10
8	No	Yes	1159	19.32	Low	10
9	No	Yes	2364	39.40	High	10

10	No	Yes	3281	54.68	High	10
11	No	Yes	2819	46.98	High	10
12	No	Yes	3198	53.30	High	10
13 (1)	No	Yes	1986	33.10	High	10
14 (1)	No	Yes	1812	30.20	High	10
15 (1)	No	Yes	749	12.48	Low	10
16 (1)	No	Yes	1200	20.00	Medium	10
17 (1)	No	Yes	1257	20.95	Medium	10
18 (1)	No	Yes	230	3.83	Low	10
19 (1)	No	No	0	0	None	N/A
20 (1)	No	No	0	0	None	N/A
21	Yes	No	2561	42.68	High	10
22	Yes	No	2285	38.08	High	10
23	Yes	No	2698	44.97	High	10
24	Yes	No	2799	46.65	High	10
25	Yes	No	2949	49.15	High	10
26	Yes	No	2679	44.65	High	10
27	Yes	No	3256	54.27	High	10
28	Yes	No	3076	51.27	High	10
29	Yes	No	3234	53.90	High	10
30	Yes	No	3449	57.48	High	10
31	Yes	No	3395	56.58	High	10
32	Yes	No	3050	50.83	High	10
33	Yes	No	3210	53.50	High	10
34	Yes	No	3298	54.97	High	10
35	Yes	No	3242	54.03	High	10
36	Yes	No	3301	55.02	High	10
37	Yes	No	3433	57.22	High	10

38	Yes	No	3344	55.73	High	10
39	Yes	No	3547	59.12	High	10
40	Yes	No	3536	58.93	High	10
41	Yes	No	3768	62.80	High	10
42	Yes	No	3636	60.60	High	10
43	Yes	No	3549	59.15	High	10
44	Yes	No	3464	57.73	High	10
45	Yes	No	3356	55.93	High	10
46	Yes	No	3468	57.80	High	10
47	Yes	No	3314	55.23	High	10
48	Yes	No	3529	58.82	High	10
49	Yes	No	3664	61.07	High	10
50	Yes	No	3755	62.58	High	10
51	Yes	No	3833	63.88	High	10
52	Yes	No	3771	62.85	High	10
53	Yes	No	3864	64.40	High	10
54	Yes	No	3829	63.82	High	10
55	Yes	No	3923	65.38	High	10
56	Yes	No	3972	66.20	High	10
57	Yes	No	3941	65.68	High	10
58	Yes	No	4086	68.10	High	10
59	Yes	No	4144	69.07	High	10
60	Yes	No	4106	68.43	High	10
61	Yes	No	4242	70.70	High	10
62	Yes	No	4141	69.02	High	10
63	Yes	No	4156	69.27	High	10
64	Yes	No	4366	72.77	High	10
65	Yes	No	4364	72.73	High	10

66	Yes	No	4789	79.82	**High**	10
67	Yes	No	4924	82.07	**High**	10
68	Yes	No	4883	81.38	**High**	10
69	Yes	No	4482	74.70	**High**	10
70	Yes	No	4492	74.87	**High**	10
71	Yes	No	4630	77.17	**High**	10
72	Yes	No	4489	74.82	**High**	10
73	Yes	No	5390	89.83	**High**	10
74	Yes	No	5495	91.58	**High**	10
75	Yes	No	5464	91.07	**High**	10

6.113. As can be seen in **Table 6 - 10**, there is a **High** impact at 61 receptors, **Medium** impact at two receptors, including one residential area, **Low** impact at nine receptors and **None** impact for the remaining three receptors, including one residential area. The number in brackets indicates which residential area the receptor belongs. **Appendix 6B and 6C** shows detailed analysis of when the glare impacts are possible, whilst also showing which parts of the solar farm the solar glare is reflected from.

6.114. **Appendix 6H** shows Google Earth images that give an insight into how each receptor will be impacted by glint and glare from the Proposed Development. There is a mixture of images used, which include aerial, ground level and street level. The aerial images show the location of the receptor with the solar farm drawn as a white polygon and can be seen on the images when the solar farm is theoretically visible. The area of the solar farm from where reflections may be possible has been drawn as a yellow polygon. The ground level terrain is based on the height data of the surrounding land showing no intervening vegetation or buildings. The white and yellow polygons can be seen in this view also. The street view gives a good indication as to whether the area of the solar farm where reflections are theoretically possible will be visible from the receptor point.

Receptors 2 - 5

6.115. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a northwest section of the Proposed Development can potentially impact on the receptors.

6.116. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the location from which the second image was taken (red pin). The second image is a photo taken from within Field 1 (see **Figure 3: Volume 2**) of the Application Site with a view towards the Receptors. This image confirms that the vegetation and topography are sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptors 6 and 7

6.117. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a northwest section of the Proposed Development can potentially impact on the receptors.

6.118. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the location from which the second image was taken (red pin) and shows intervening buildings between the Receptors and the Proposed Development. The second image is a street view image with a view towards the Proposed Development. This image confirms that the vegetation and intervening buildings are sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptor 8

6.119. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a northwest section of the Proposed Development can potentially impact on the receptor.

6.120. The first image in **Appendix 6H** is an aerial image showing the position of the receptor (yellow pin) in relation to the Proposed Development, and the location from which the second image was taken (red pin). The second image is a street view image with a view towards the Proposed Development. This image confirms that the vegetation is insufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact remains **Low**.

Receptors 9 - 12

6.121. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a large central section of the Proposed Development can potentially impact on the receptors.

6.122. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the location from which the second image was taken (red pin). The second image is a photo taken from within Field 6 (see **Figure 3: Volume 2**) of the Application Site with a view towards the Receptors. This image confirms that the vegetation is insufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact remains **High**.

Receptors 13 - 18

6.123. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a southern section of the Proposed Development can potentially impact on the receptors.

6.124. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed. This image shows dense vegetation between the Receptors and the Proposed Development. The second image is a photo taken from within Field 8 (see **Figure 3: Volume 2**) of the Application Site with a view towards the vegetation to the south and southeast of Field 8 in the Proposed Development. This image confirms that the current vegetation is sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptors 21 - 24

6.125. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from the eastern half of the Proposed Development can potentially impact on the receptors.

6.126. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the location from which the second image was taken (red pin). This image shows dense vegetation between the Receptors and the Proposed Development. The second image is a street view image with a view towards the Proposed Development. This image confirms that the vegetation is sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptor 25

6.127. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from the eastern half of the Proposed Development can potentially impact on the receptor.

6.128. The first image in **Appendix 6H** is an aerial image showing the position of the receptor (yellow pin) in relation to the Proposed Development, and the location from which the second image was taken (red pin). This image shows dense vegetation between the Receptor and the Proposed Development. The second image is a street view image with a view towards the Receptor. This image confirms that the vegetation and topography are sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptor 26

6.129. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a large central section of the Proposed Development can potentially impact on the receptor.

6.130. The first image in **Appendix 6H** is an aerial image showing the position of the receptor (yellow pin) in relation to the Proposed Development, and the location from which the second image was taken (red pin). This image shows dense vegetation between the Receptor and the Proposed Development. The second image is a street view image with a view towards the Proposed Development. This image confirms that the vegetation is sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptors 27 - 30

6.131. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a large central section of the Proposed Development can potentially impact on the receptors.

6.132. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the locations from which the second and third images were taken (red pins 1 and 2 respectively). This image shows dense vegetation between the Receptors and the Proposed Development. The second and third images are photos taken from within Fields 4 and 6 (see **Figure 3: Volume 2**) of the Application Site respectively with a view towards the Receptors. These images confirm that the vegetation is sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptors 31 - 72

6.133. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from the northern half of the Proposed Development can potentially impact on the receptors.

6.134. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the location from which the second image was taken (red pin). This image shows dense vegetation and intervening buildings between the Receptors and the Proposed Development. The second image is a photo from within Field 1 (see **Figure 3: Volume 2**) of the Application Site with a southwest view towards the Receptors. This image confirms that the vegetation and intervening buildings are sufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact reduces to **None**.

Receptors 73 - 75

6.135. The 'Glare Reflections on PV Footprint' chart in **Appendix 6B** shows that reflections from a northern section of the Proposed Development can potentially impact on the receptors.

6.136. The first image in **Appendix 6H** is an aerial image showing the position of the receptors (yellow pins) in relation to the Proposed Development, and the location from which the second image was taken (red pin). The second image is a photo from within Field 1 (see **Figure 6.3: Appendix 6A**) of the Application Site with a westwards view towards the Receptors. This image confirms that the vegetation is insufficient to screen all views of the Proposed Development where glint and glare is possible. Therefore, the impact remains **High**.

Residential Area 1

6.137. This encompasses a number of residential receptors including those at Receptors 13 - 20 (assessed previously) (See **Figure 6.1: Appendix 6A**). Each receptor assessed represents multiple receptors as they are in close proximity of each other, so the worst-case scenario is assumed for the impact of glint and glare. All receptors were considered within the visibility analysis and it was concluded their impacts were similar. As per the assessments of these eight receptors, the impacts on the other receptors within this area are assessed as being **None (worst case scenario)**.

Road Receptors

6.138. **Table 6 - 11** shows a summary of the modelling results for each of the Road Receptor Points whilst the detailed results and ocular impact charts can be viewed in **Appendix 6D and 6E**.

6.139. The 16 receptors within the no-reflection zones outlined previously have been excluded from the detailed modelling as they will never receive glint and glare impacts from the Proposed Development.

Table 6 - 11: Potential for Glint and Glare impact on Road Receptors

Receptor	Green Glare (mins)	Yellow Glare (mins)	Red Glare (mins)	Magnitude of Impact	Worst Case Tilt (degrees)
1	0	15844	0	High	10
2	0	12400	0	High	10
3	0	6209	0	High	10
4	0	4374	0	High	10
5	0	3671	0	High	10
6	0	3003	0	High	10
7	0	2591	0	High	10
8	0	0	0	None	N/A
9	0	1614	0	High	30
10	0	2169	0	High	30
11	0	1875	0	High	10
12	0	16	0	High	10
13	0	1568	0	High	30

14	0	1160	0	High	30
15	0	6972	0	High	10
16	0	3390	0	High	10
17	0	3574	0	High	10
18	0	1060	0	High	10
19	0	36	0	High	10
20	0	1336	0	High	10
21	0	4552	0	High	30
22	0	4696	0	High	30
23	0	3069	0	High	30
24	0	17687	0	High	10
25	0	4866	0	High	10
26	0	4184	0	High	10
27	0	1624	0	High	10
28	0	813	0	High	10
29	0	618	0	High	10
30	0	326	0	High	10
31	0	33	0	High	30
32	0	1298	0	High	30
33	0	16	0	High	30
34	0	2618	0	High	10
35	0	31	0	High	10
36	0	2850	0	High	10
37	0	4347	0	High	10
38	0	6299	0	High	10
39	0	1415	0	High	10
40	0	968	0	High	10
41	0	120	0	High	10

6.140. As can be seen in **Table 6 - 11**, there are 40 receptor points which have potential glare impacts with the "potential for after-image" (yellow glare), which is a **High** impact. **Appendix 6D and 6E** shows detailed analysis of when the glint and glare impacts are possible, whilst also showing from which parts of the solar farm the solar glare is reflected from.

6.141. **Appendix 6H** shows Google Earth images that give an insight into how each receptor will be impacted by glint and glare from the Proposed Development. There is a mixture of images used, which include aerial, ground level and street level. The aerial images show the location of the receptor with the solar farm drawn as a white polygon and can be seen on the images when the solar farm is theoretically visible. The area of the solar farm from where reflections may be possible has been drawn as a yellow polygon. The ground level terrain is based on the height data of the surrounding land showing no intervening vegetation or buildings. The white and yellow polygons can be seen in this view also. The street view gives a good indication as to whether the area of the solar farm where reflections are theoretically possible will be visible from the receptor point.

6.142. As can be seen in **Appendix 6H**, views of the Proposed Development from all receptors, except receptors 15 – 17, 21, 28 and 39 – 41, are blocked by a mixture of intervening vegetation, topography and buildings. Therefore, impacts upon these receptors reduce to **None**.

Aviation Receptors

6.143. **Table 6 - 12** shows a summary of the modelling results for the runway approach paths as well as the ATCTs whilst the detailed results and ocular impact charts can be viewed in **Appendix 6F and 6G**.

Table 6 - 12: Summary of Glare Results

Component	Green Glare (mins)	Yellow Glare (mins)	Red Glare (mins)	Worst Case Tilt (degrees)
RAF Syerston				
Runway 06	3	0	0	10
Runway 24	0	0	0	N/A
ATCT	0	0	0	N/A
Nottingham City Airport				
Runway 03	622	0	0	10
Runway 21	0	0	0	N/A
Runway 09	1414	0	0	10
Runway 27	0	0	0	N/A

ATCT	1	0	0	10

6.144. As can be seen in **Table 6 - 12**, only glare impacts are predicted to impact the approach paths to Runway 06 at RAF Syerston and Runways 03 and 09 and the air traffic control tower (ATCT) at Nottingham City Airport. Green glare is described as 'Low Potential for After Image' which is an **acceptable impact** when pilots are approaching runways/helipads, according to the FAA guidance. Green glare is a **not acceptable** impact on the ATCT. The impact on approach for the runways at RAF Syerston and Nottingham City Airport is therefore deemed as **not significant** and the impact on the ATCT at Nottingham City Airport is deemed as **significant**.

6.145. As can be seen in **Appendix 6I**, there is a terrain feature in the form of a hill with a height of 70m above ground level (AGL) which will block all views of the Proposed Development from the ATCT at Nottingham City Airport. Therefore, the impact on the ATCT at Nottingham City Airport reduces to **None** and the impact on aviation assets is **not significant**.

GROUND BASED RECEPTOR MITIGATION

6.146. Mitigation is required to ensure the **High** impact views from Residential Receptors 9 – 12 and 73 - 75, as well as Road Receptors 15 – 17, 21, 28 and 39 – 41 into the Proposed Development are screened. This includes:

- Native hedgerows to be planted/infilled along a southern section of the western boundary of Field 1 (see **Figure 3: Volume 2**) and maintained to height of at least 3 – 4m as proposed in the LEMP (see **Figure 1.12: Appendix 1A**). This will screen views from Residential Receptors 73 – 75. Therefore, reducing to impact to **None**.
- Native hedgerows to be planted/infilled along the eastern boundaries of Fields 5, 7 and 9 (see **Figure 3: Volume 2**) and maintained to height of at least 3 – 4m as proposed in the LEMP (see **Figure 1.12: Appendix 1A**). This will screen views from Residential Receptors 9 – 12 and Road Receptor 21. Therefore, reducing to impact to **None**.
- Native hedgerows to be planted/infilled along a western section of the southern boundary of Field 8 (see **Figure 3: Volume 2**) and maintained to height of at least 3 – 4m and woodland planting along an eastern section of the southern boundary of Field 8 and the southern boundary of Field 9 as proposed in the LEMP (see **Figure 1.12: Appendix 1A**). This will screen views from Road Receptors 15 – 17. Therefore, reducing to impact to **None**.
- Native hedgerows to be planted/infilled along the northern boundaries of Fields 2 and 4 (see **Figure 3: volume 2**) and maintained to height of at least 3 – 4m as proposed in the LEMP (see **Figure 1.12: Appendix 1A**). This will screen views from Road Receptors 28 and 39 – 41. Therefore, reducing to impact to **None**.

6.147. **Table 6 - 13 and The number in brackets** indicates which residential area the receptor belongs.

6.148. Table 6 - 14 show the impacts at each stage of the glint and glare analysis, with the final residual impacts considered once the mitigation is in place.

Table 6 - 13: Potential Residual Glint and Glare Impacts on Residential Receptors

	Magnitude of Impact		
Receptor	After Geometric Analysis	After Visibility Analysis	Residual Impacts (Post Mitigation)
1	None	None	**None**

2	Low	None	None
3	Low	None	None
4	Low	None	None
5	Low	None	None
6	Low	None	None
7	Low	None	None
8	Low	Low	None
9	High	High	None
10	High	High	None
11	High	High	None
12	High	High	None
13 (1)	High	None	None
14 (1)	High	None	None
15 (1)	Low	None	None
16 (1)	Medium	None	None
17 (1)	Medium	None	None
18 (1)	Low	None	None
19 (1)	None	None	None
20 (1)	None	None	None
21	High	None	None
22	High	None	None
23	High	None	None
24	High	None	None
25	High	None	None
26	High	None	None
27	High	None	None
28	High	None	None
29	High	None	None

30	High	None	None
31	High	None	None
32	High	None	None
33	High	None	None
34	High	None	None
35	High	None	None
36	High	None	None
37	High	None	None
38	High	None	None
39	High	None	None
40	High	None	None
41	High	None	None
42	High	None	None
43	High	None	None
44	High	None	None
45	High	None	None
46	High	None	None
47	High	None	None
48	High	None	None
49	High	None	None
50	High	None	None
51	High	None	None
52	High	None	None
53	High	None	None
54	High	None	None
55	High	None	None
56	High	None	None
57	High	None	None

58	High	None	None
59	High	None	None
60	High	None	None
61	High	None	None
62	High	None	None
63	High	None	None
64	High	None	None
65	High	None	None
66	High	None	None
67	High	None	None
68	High	None	None
69	High	None	None
70	High	None	None
71	High	None	None
72	High	None	None
73	High	High	None
74	High	High	None
75	High	High	None

6.149. The number in brackets indicates which residential area the receptor belongs.

Table 6 - 14: Potential Residual Glint and Glare Impacts on Road Receptors

	Magnitude of Impact		
Receptor	After Geometric Analysis	After Visibility Analysis	Residual Impacts (Post Mitigation)
1	High	None	None
2	High	None	None
3	High	None	None
4	High	None	None
5	High	None	None

6	High	None	None
7	High	None	None
8	None	None	None
9	High	None	None
10	High	None	None
11	High	None	None
12	High	None	None
13	High	None	None
14	High	None	None
15	High	High	None
16	High	High	None
17	High	High	None
18	High	None	None
19	High	None	None
20	High	None	None
21	High	High	None
22	High	None	None
23	High	None	None
24	High	None	None
25	High	None	None
26	High	None	None
27	High	None	None
28	High	High	None
29	High	None	None
30	High	None	None
31	High	None	None
32	High	None	None
33	High	None	None

34	High	None	None
35	High	None	None
36	High	None	None
37	High	None	None
38	High	None	None
39	High	High	None
40	High	High	None
41	High	High	None

6.150. **Table 6 - 15 and Table 6 - 16** show the overall impacts for all residential and road receptors.

Table 6 - 15: Solar Reflections: Residential Receptors

Magnitude	Theoretical Visibility	Actual Visibility (No Mitigation)	Actual Visibility with Mitigation
High	61	7	0
Medium	2	0	0
Low	9	1	0
None	3	67	75

- **High –** Solar reflections impacts of over 30 hours per year or over 30 minutes per day
- **Medium -** Solar reflections impacts between 20 and 30 hours per year or between 20 minutes and 30 minutes per day
- **Low -** Solar reflections impacts between 0 and 20 hours per year or between 0 minutes and 20 minutes per day
- **None -** Effects not geometrically possible or no visibility of reflective surfaces likely due to high levels of intervening screening

Table 6 - 16: Solar Reflections: Road Receptors

Magnitude	Theoretical Visibility	Actual Visibility (No Mitigation)	Actual Visibility with Mitigation
High	40	8	0
Medium	0	0	0
Low	0	0	0
None	1	33	41

- High - Solar reflections impacts of over 30 hours per year or over 30 minutes per day
- Medium - Solar reflections impacts between 20 and 30 hours per year or between 20 minutes and 30 minutes per day
- Low - Solar reflections impacts between 0 and 20 hours per year or between 0 minutes and 20 minutes per day
- None - Effects not geometrically possible or no visibility of reflective surfaces likely due to high levels of intervening screening

SUMMARY

6.151. There is little guidance or policy available in the UK at present in relation to the assessment of glint and glare from Proposed Development developments. However, it is recognised as a potential impact which needs to be considered for a Proposed Development, therefore this assessment considers the potential impacts on ground-based receptors such as roads, rail, and residential dwellings as well as aviation assets.

6.152. This assessment considers the potential impacts on ground-based receptors such as roads, rail and residential dwellings as well as aviation assets. A 1km study area around the Application Site is considered adequate for the assessment of ground-based receptors, whilst a 30km study area is chosen for aviation receptors. Within 1km of the Application Site, there are 84 residential receptors and 57 road receptors which were considered. As per the methodology section, where there are a number of residential receptors within close proximity, a representative dwelling or dwellings is/are chosen for full assessment as the impacts will not vary to any significant degree. Where small groups of receptors have been evident, the receptors on either end of the group have been assessed in detail. Nine residential receptors and 16 road receptors were dismissed as they are located within the no reflection zones. 18 aerodromes are located within the 30km study area; Two of which, RAF Syerston and Nottingham City Airport, required an assessment due to the Proposed Development falling within their respective safeguarding buffer zones, which are outlined in **paragraph 6.74**.

6.153. Geometric analysis was conducted at 75 individual residential receptors and 41 road receptors, as well as two runway approach paths and an air traffic control tower at RAF Syerston, and four runway approach paths and an air traffic control tower at Nottingham City Airport.

6.154. Following an initial assessment, rail receptors were scoped out as assets that will be impacted upon from the Proposed Development as no rail receptors fell within the 1km study area. The assessment concludes that:

- Solar reflections are possible at 72 of the 75 residential receptors assessed within the 1km study area. The initial bald-earth scenario identified potential impacts as **High** at 61 receptors, **Medium** at two receptors, **Low** at nine receptors and **None** at the remaining three receptors. Upon reviewing the actual visibility of the receptor, glint and glare impacts remain **High** at seven receptors and reduce to **Low** at one receptor and **None** at all remaining receptors. Once mitigation measures were considered all impacts reduce to **None** at all residential receptors.

- Solar reflections are possible at 40 of the 41 road receptors assessed within the 1km study area. The initial bald-earth scenario identified potential impacts as **High** at 40 receptors and **None** at the remaining receptor. Upon reviewing the actual visibility of the receptor, glint and glare impacts remain **High** at eight receptors and reduce to **None** at all remaining receptors. Once mitigation measures were considered all impacts reduce to **None** at all road receptors.

- **No impact** on train drivers or railway infrastructure is predicted.
- Green glare is predicted to impact upon the Runway 06 approach path at RAF Syerston and the Runway 03 and 09 approach paths at Nottingham City Airport. According to FAA guidance, green glare is an **acceptable impact** when pilots are approaching runways/helipads. Green glare is predicted to impact upon the ATCT at Nottingham City Airport. According to FAA guidance, green glare is a **not acceptable impact** upon an ATCT. Upon review of the ground elevation between the Proposed Development and the ATCT, the impact reduces to **None**. Therefore, the impact upon aviation assets is **not significant**.

6.155. Mitigation is required to ensure the **High** impact views from Residential Receptors 9 – 12 and 73 - 75, as well as Road Receptors 15 – 17, 21, 28 and 39 – 41 into the Proposed Development are screened. This includes native hedgerows to be planted/gapped up and maintained to a height of 3 – 4m along a southern section of the western boundary of Field 1, northern boundaries of Fields 2 and 4, eastern boundaries of Fields 5, 7 and 9, western section of the southern boundary of Field 9, a northern section of the western boundary of Field 8 and woodland planting along an eastern section of the southern boundary of Field 8 and the southern boundary of Field 9 as proposed in the Landscape and Ecology Management Plan.

6.156. The effects of glint and glare and their impact on local receptors has been analysed in detail and the impact on all receptors is predicted to be **Not significant** once mitigation measures have been put in place.

APPENDICES

Appendix 6A: Figures

- Figure 6.1: Residential Based Receptors
- Figure 6.2: Road Based Receptors
- Figure 6.3: RAF Syerston Aerodrome Chart
- Figure 6.4: Nottingham City Airport Aerodrome Chart

Appendix 6B: Residential Receptor Glare Results (10 degrees)

Appendix 6C: Residential Receptor Glare Results (30 degrees)

Appendix 6D: Road Receptor Glare Results (10 degrees)

Appendix 6E: Road Receptor Glare Results (30 degrees)

Appendix 6F: Aviation Receptor Glare Results (10 degrees)

Appendix 6G: Aviation Receptor Glare Results (30 degrees)

Appendix 6H: Visibility Assessment Evidence

Appendix 6I: Ground Elevation Profile

Appendix 6J: Solar Module Glare and Reflectance Technical Memo[16]

16 Sunpower Corporation (September 2009), T09014 Solar Module Glare and Reflectance Technical Memo