GLINT AND GLARE ASSESSMENT

NORMANDY POOL

VERSION 1.0

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1 INTRODUCTION

Metrica Environmental Consulting Ltd ('Metrica') has been commissioned by Council of the Isles of Scilly ('the Client'), to undertake a glint and glare assessment in relation to the proposed ground mounted solar installation at the Normandy Swimming Pool, ('the Development'), located on Carn Friars Lane, St Mary's, Isles of Scilly ('the Site').

2 GLINT AND GLARE DEFINITION

'Glint' and 'Glare' are the effects caused by the reflection of sunlight from reflective surfaces such as glazing or solar photovoltaic (PV) panels. The UK Government's National Policy Statement for Renewable Energy Infrastructure (EN-3)[1] defines these terms as follows:

- Glint: *"a momentary flash of light that may be produced as a direct reflection of the sun in the solar panel";* and
- Glare: *"a continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the panel".*

It goes on to say that... " *Most commercially available solar panels are designed with anti-reflective glass or are produced with anti-reflective coating and have a reflective capacity that is generally equal to or less hazardous than other objects typically found in the outdoor environment, such as bodies of water or glass buildings".*

Further details on the guidance in EN-3 is provided in Section 4.1.2 of this report.

3 DEVELOPMENT OVERVIEW

The Development consists of a 11 kWp Solar PV array situated adjacent to the swimming pool building. Saint Mary's Airport is located 1.2 km southwest of the Development and as such the east, west, northwest and southeastern approach paths, as well as the Air Traffic Control Tower (ATCT) have been included in this assessment.

The Development's proposed solar array consists of 26 ground mounted, fixed-tilt PV panels, with a tilt angle of 30 degrees. The arrays consist of both southwest facing panels (azimuth of 225 degrees). A layout drawing showing the development is provided in Appendix 1 for reference.

[1] UK Government (November 2023). National Policy Statement for Renewable Energy Infrastructure.

4 GUIDANCE

4.1 PLANNING GUIDANCE

The following guidance and standards are pertinent to this assessment:

- The National Planning Policy Framework (NPPF)[2]; and
- National Policy Statement for Renewable Energy Infrastructure (EN-3)

4.1.1 The National Planning Policy Framework

The NPPF sets out the Government's planning policies for England, providing a framework within which local policies can be developed. The key principle of the NPPF is a presumption in favour of sustainable development, although no specific references to solar PV development or glint and glare effects are made.

4.1.2 National Policy Statement for Renewable Energy Infrastructure

EN-3 notes that solar PV panels are specifically designed to absorb, rather than reflect light, however, they may nevertheless reflect the sun's rays at certain times / angles, potentially causing glint and glare effects.

EN-3 recommends a two-stage approach to determining the potential for glint and glare impacts. As a first stage, receptors should be mapped qualitatively to identify any potential glint and glare issues and determine whether a detailed glint and glare assessment is necessary as part of the application.

When a quantitative glint and glare assessment is found to be necessary, the geometric possibility of glint and glare affecting nearby receptors should be investigated through modelling, and an assessment of potential impact provided, based on the angle and duration of incidence and the intensity of the reflection.

With specific reference to aviation, EN3-notes that…"there *is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms".*

Notwithstanding the above, EN-3 does not provide specific assessment criteria, or give guidance on what is considered to be an acceptable level of impact.

4.2 TECHNICAL GUIDANCE

UK planning guidance does not provide a specific methodology for assessing the impact of glint and glare. However, the following guidance is regularly applied to assessments in the UK and together is considered to provide a reasonable and robust approach:

- Measurement and Assessment of Light Immissions[3];

[2] UK Government (2012). National Planning Policy Framework (last updated 5th September 2023).

[3] Ministry for the Environment, Health and Consumer Protection (2014). Light Guidelines (Leitlinie des Ministeriums für Umwelt, Gesundheit und Verbraucherschutz zur Messung und Beurteilung vonm Lichtimmissionen,

- Rail Industry Standard (RIS) RIS-0737-CCS[4]
- Renewable Energy Developments: Solar Photovoltaic Developments[5]; and
- Review of Solar Energy System Projects on Federally-Obligated Airports[6].

4.2.1 Measurement and Assessment of Light Immissions

The German Ministry for Environment, Health and Consumer Protection published the *Measurement and Assessment of Light Immissions* in 1993, which was most recently updated in 2014. Paragraph 8 of the most recent version of the guidelines is dedicated to the assessment of reflections from solar PV panels.

The guidelines state that… [translated from German]*"experience has shown that immission locations that are more than approximately 100 m away from a photovoltaic system only experience short-term glare effects. Only in the case of extensive photovoltaic parks could more distant emission locations still be relevant."*

In addition, the guidelines note that where a reflection source is located in the same direction (+/- 10 degrees) as the sun itself, the direct glare from the sun masks any reflections, and can therefore be scoped out of further assessment.

For those receptors[7] within the study area described above, the guidelines state that effects are acceptable providing that glare is experienced for no more than 30 minutes on any given day, or more than 30 hours per year.

4.2.2 RIS-0737-CCS

Network Rail guidance does not provide a specific methodology for the assessment of glint and glare effects on rail infrastructure. However, Rail Industry Standard (RIS) RIS-0737-CCS states that…*"a planned change external to the railway could affect signal sighting, for example changes that affect the built environment (for example, a new structure causing obscuration, a solar farm causing reflection)."*

4.2.3 Renewable Energy Developments: Solar Photovoltaic Developments

The UK Civil Aviation Authority (CAA) issued a guidance note in July 2023. This guidance note was prepared by the Combined Aerodrome Safeguarding Team (CAST), supported by the CAA, and aims to provide safeguarding advice in relation to solar photovoltaic developments on a range of matters, including glint and glare.

With specific reference to glint and glare effects, the guidance note states that:

"In most cases, an assessment should be undertaken for a solar PV development which is being proposed within a specific distance (indicated by the aerodrome authority) from an aerodrome. For many aerodromes, 5km is the distance of choice but it could be considered out to 10 km. In exceptional circumstances, assessments may be required beyond 10km."

[4] Rail Industry Standard (RIS) RIS-0737-CCS 'Signal Sighting Assessment Requirements'

[5] CAA (2023). Solar photovoltaic Developments CAST Aerodrome Safeguarding Guidance Note

[6] Federal Aviation Administration (2021) Review of Solar Energy System Projects on Federally-Obligated Airports.

[7] In this context, 'receptors' are primarily residential dwellings, but where relevant, can also include hotels, hospitals, schools and offices.

No specific methodology or assessment criteria are defined for assessing the impact of glint and glare on aviation infrastructure.

4.2.4 Review of Solar Energy System Projects on Federally-Obligated Airports

The United States' Federal Aviation Administration (FAA) guidance states that for a solar PV development to obtain FAA approval or to receive no objection, there should be no more than a "*low potential for after-image*" along the final 2-mile approach path for any existing or proposed runway. This criterion was originally defined to relate to Sandia Laboratories' Solar Glare Hazard Analysis Tool (SGHAT). However, the FAA has since withdrawn this requirement as the SGHAT software is no longer available. Metrica therefore uses modelling software developed by Forge Solar, which applies the same methodology as SGHAT.

SGHAT, categorises glint / glare into three tiers of severity (ocular hazards) that are shown by different colours in the model output. It should be noted that these categories are a function of the intensity of the reflection and the viewing angle, rather than being duration-dependant:

- Red glare: Glare predicted with a potential for permanent eye damage (retinal burn);
- Yellow glare: Glare predicted with a potential for temporary after-image; and
- Green glare: Glare predicted with a low potential for temporary after-image.

It also notes that no significant impacts are possible for reflections located more than 50 degrees either side of the direction of travel.

In the absence of specific guidance on the assessment of glint and glare impacts on road and rail infrastructure, it is generally accepted in the UK and elsewhere that in addition to aircraft, the FAA guidance is also appropriate for drivers of other vehicles (i.e., road and rail traffic).

5 STUDY AREAS

5.1 RESIDENTIAL RECEPTORS

As stated in Section 4.2.1, glint and glare effects are unlikely to be an issue for receptors more than approximately 100 m from PV panels, due to the reduced intensity and short duration of effects beyond this distance. However, as this distance is approximate and dependent upon the extent of the Development, the residential receptor study area for this assessment has been based upon a 200 m buffer distance in order to ensure a robust approach.

5.2 ROAD AND RAIL INFRASTRUCTURE

As the assessment criteria for road and rail infrastructure relate purely to glare intensity, rather than duration of effects, it is considered that a study area of 500 m is appropriate as a conservative approach. It should be noted that in line with generally accepted best practice, local roads within the 500 m study area are not typically assessed; this is due to local roads having the reduced traffic densities and speeds, meaning the potential impact due to a temporary reflection is low.

5.3 AERODROMES AND AVIATION INFRASTRUCTURE

The study area for aerodromes recommended in CAA guidance (See section 4.2.3), is as follows:

- 10 km for safeguarded civil or military aerodromes[8]; and
- 5 km for other / non-safeguarded aerodromes.

Notwithstanding the above, the UK Government requires Local Planning Authorities to consult with safeguarded aerodromes within 13 km of a proposed development[9]. In line with this, and as a conservative approach, an initial study area of 13 km has been applied in this assessment.

Figure 1 in Appendix 2 presents the study areas applicable to this assessment, derived in accordance with the above criteria. It should be noted that in order to present Figure 1 at a readable scale, the 13 km safeguarded aerodrome buffer has been included in the inset map.

5.4 EXCLUSION AREAS

No visible reflections can occur at receptors located 'behind' the proposed PV panels. For southwest-facing panels, this covers a sector between 315 and 135 degrees, from the westernmost panel.

6 ASSESSMENT CRITERIA

6.1 RESIDENTIAL RECEPTORS

The assessment criteria for residential receptors are those described in Section 4.2.1, i.e., that the glint and glare effects are acceptable providing such effects occur for no more than 30 minutes per day, or 30 hours (equivalent to 1,800 minutes) per year.

6.2 ROAD, RAIL AND AVIATION RECEPTORS

The assessment criteria for road, rail and aviation receptors are those described in Section 4.2.4, i.e., that the glint and glare effects are acceptable providing there is found to be no more than a low potential for after-image (i.e., 'green glare') when assessing in accordance with the SGHAT methodology. As previously stated, the SGHAT methodology is based purely upon the intensity of the reflection and the viewing angle and is not duration-dependant.

7 METHODOLOGY

As discussed in Section 4.2.4, modelling and assessment of glint and glare effects has been conducted using software implementing the SGHAT methodology, which accounts for the following site-specific parameters:

- Reflection Source:
  - Latitude, longitude and elevation of the Development;
  - Panel tilt, height, and azimuth (orientation relative to north); and
  - Panel technology (fixed / tracking, and presence of anti-reflective coatings);
- Propagation path:
  - Local terrain; and
  - Existing or proposed obstructions (e.g., forestry, non-sensitive buildings, etc.)

[8] CAA (2023). Solar photovoltaic Developments CAST Aerodrome Safeguarding Guidance Note

[9] UK Government (2002). The town and country (safeguarded aerodromes, technical sites and military explosives storage areas) direction 2002 (last updated 22nd December 2016).

- Receptor:
  - Receptor type e.g. (dwelling, road, rail, flight path, ground-based aviation assets);
  - Receptor location;
  - Height above ground level (typically taken as 1.5 m for terrestrial receptors, except for rail where a height of 2.75 m is applied, or structures such as Air Traffic Control Towers (ATCT) which are modelled on a case-by case basis); and
  - Viewing angle and direction of travel (mobile receptors only).

7.1 IDENTIFICATION OF RECEPTORS

Figure 1 in Appendix 1 details the Development boundary and the study areas applicable to this assessment. Each receptor within the respective study area has then been analysed using online mapping and aerial imagery to exclude those which clearly have no line of sight to the Development, either through screening from local terrain, vegetation or other buildings/infrastructure. Where the extent of the screening is unclear / uncertain, the receptor has not been excluded, to ensure a robust assessment.

Each receptor identified within the respective study area has been analysed using online mapping and aerial imagery to exclude those which clearly have no line of sight to the Development, either through screening from local terrain, vegetation or other buildings / infrastructure. Where the extent of the screening is unclear / uncertain, the receptor has not been excluded, to ensure a robust assessment.

Following the above filtering process, all remaining receptors within the respective study areas have been assessed.

The figure in Appendix 2 shows the Development in relation to St Mary's Airport.

7.1.1 Site-specific Aerodrome Parameters

As outlined in Section 3, St Mary's Airport is located approximately 1.2 km southwest of the closest Development panel array. As such, both the Runway 09/27 and Runway 32/14 flight paths, as well as location of the Air Traffic Control Tower (ATCT) have been included in this assessment.

Effects have been predicted for both runway approaches, using the standard 2-mile approach with a 3-degree glide slope as recommended in FAA guidance (see Section 4.2.4). The airport's ATCT is located in the main terminal building, which for the purposes of this assessment is assumed to be 11 m above ground level (AGL).

8 RESULTS AND ASSESSMENT OF IMPACT

Modelling has been undertaken, and it has been found that no glint/glare effects are predicted at any of the identified receptors. The flight paths and ATCT at St Mary's Airport are also not predicted to have any glare.

As no glare is predicted to occur at any receptor. The Development is therefore compliant with the respective assessment criteria.

9 CONCLUSION

Metrica was commissioned to undertake a Glint and Glare impact assessment in relation to the proposed Solar PV Development at Normandy Swimming Pool.

The assessment has been undertaken in accordance with best practice guidance, and effects have been found to be acceptable at all receptors.

The Development is therefore acceptable in terms of glint and glare.

10 GLOSSARY OF TERMS

After-Image: An image that continues to appear in the eyes after exposure to the original image has ceased.

Axis Tracking: Motorised PV array modules which are able change their tilt and / or azimuth angle in order to face the sun as it tracks across the sky.

Azimuth: A direction or bearing defined a horizontal angle between 0° and 359° measured clockwise from North.

Elevation: height above mean sea level.

Elevation Angle: An angle that is formed between the horizontal line (0°) and the line of interest.

Glare: A continuous source of bright light typically received by static receptors or from large reflective surfaces.

Glint: A momentary flash of bright light typically received by moving receptors or from moving reflectors.

Green Glare: glare predicted with a low potential for temporary after-image.

Receptor: In this context, a receptor is a potential viewer of glint and glare effects.

Red Glare: glare predicted with a potential for permanent eye damage (retinal burn),

Tile Angle: See Elevation Angle

Yellow Glare: glare predicted with a potential for temporary after-image.

APPENDIX 1: DEVELOPMENT LAYOUT

Scale 1:200

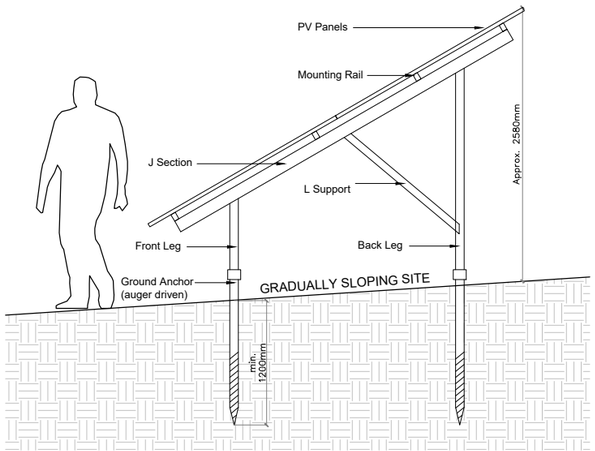
0 5 10 20

NOTES

- New Solar PV ground array to the grassed area adjacent to the swimming pool reception building.
- PV panels installed in a South-Westerly facing orientation at a 30° angle.
- Panels fixed to ground mounting system with auger driven ground connection.
- System to provide 11kWp.
- Vertex S+ Dual Glass N type i-TOPCon Modules.
- Maximum power output per panel 450W.
- Panel dimensions: (L)1762mm x (W)1134mm x (D)30mm.
- 26nr panels overall in portrait 13*2 configuration.

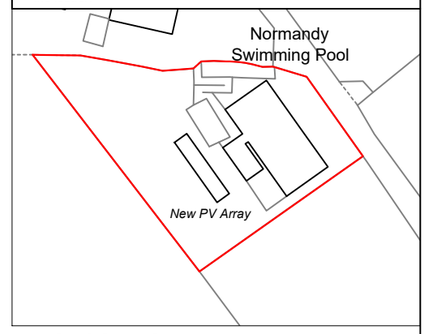
PV GROUND ARRAY - SIDE VIEW

NOT TO SCALE



PROPOSED SITE PLAN

1:200

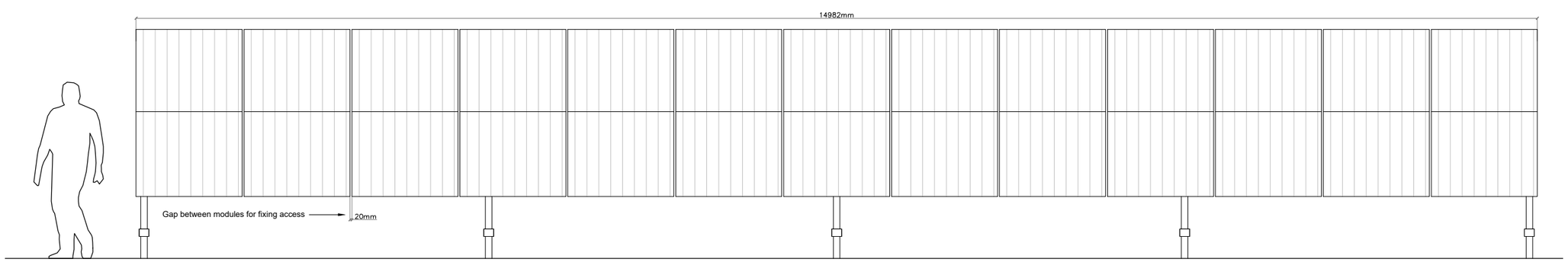


PROPOSED SITE PLAN

1:1250

PV GROUND ARRAY - FRONT VIEW

NOT TO SCALE



Rev	Date	Description
A	26.04.24	Change to proposed PV module

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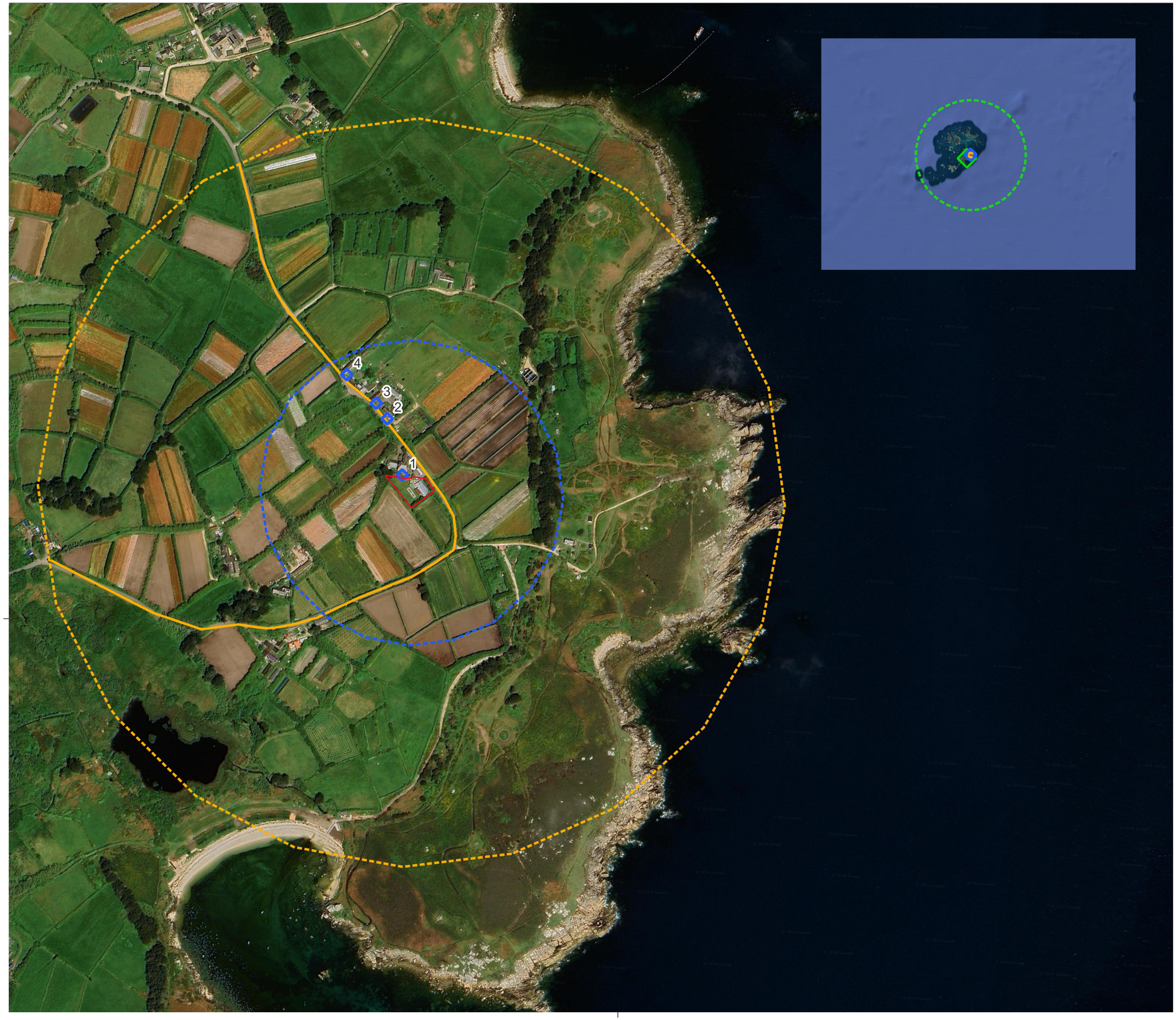
Project
Normandy Pool Solar PV

Title
Proposed Site Plan

Client
Council of the Isles of Scilly

Date 13.03.2024	Drawn AH
Scale 1:200@A3	Checked KC
Drwg No. PL4101565_NP_01_01	Rev A

APPENDIX 2: STUDY AREAS AND RECEPTORS



Metrica
ENVIRONMENTAL CONSULTING

- Development Boundary
- Aerodrome Study Area
- 0338_RouteStudy area
- 0338_ResidentialStudyArea
- 0338_PV Extent
- Assessed Residential Receptor
- Assessed Road
- Air Traffic Control Tower

N

0 0.1 0.2 0.3 km

1:5,000

Date: 29/05/2024
Drawing Number: 0338/1
Version Number: 1

Figure 1
Glint and Glare Study Areas

Normandy Pool
Glint and Glare Assessment