

Glint and Glare Assessment

Abermorlais Car Park, Merthyr Tydfil



Document Control

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1 Introduction

This report summarises a glint and glare assessment carried out for the proposed solar carports at Abermorlais Carpark, Merthyr Tydfil. Section 2 provides details of the site, Section 3 the methodology applied, Section 4 the assessment results and Section 5 the conclusions.

2 Site Details

The site is located in Merthyr Tydfil, Merthyr Tydfil County Borough, Wales, which is around 34 km north of Cardiff. The site is currently a car park. The proposed development is to transform the car parking bays into solar carports. Further details of the proposed development are provided in Table 1.

Site Name / Location	Abermorlais Carpark, Merthyr Tydfil, CF47 8BH
GPS Co-ordinates (centre of proposed solar arrays)	Latitude 51.747607 °N, Longitude -3.381716 °W
Company Name	Merthyr Tydfil County Borough Council

Table 1 – Site details

The site is in an urban area, surrounded by roads, non-residential buildings and trees. The proposed development will be three solar arrays of equal size (one on the single-row, and two on the double-row carport). A site overview map is provided in Figure 1. The coordinates, heights and azimuths of the centres of the solar arrays are provided in Table 3 and the vertices of the solar arrays are provided in Table 4, both in the Appendix. The azimuth, which is the angle between north and the direction of the solar panels, was 240 degrees for arrays 1 and 3, and 60 degrees for array 2. The elevation of the panels, which is the angle above the horizontal, was 10 degrees. The heights of the bottoms of the solar panels above ground level was 2.5 m.

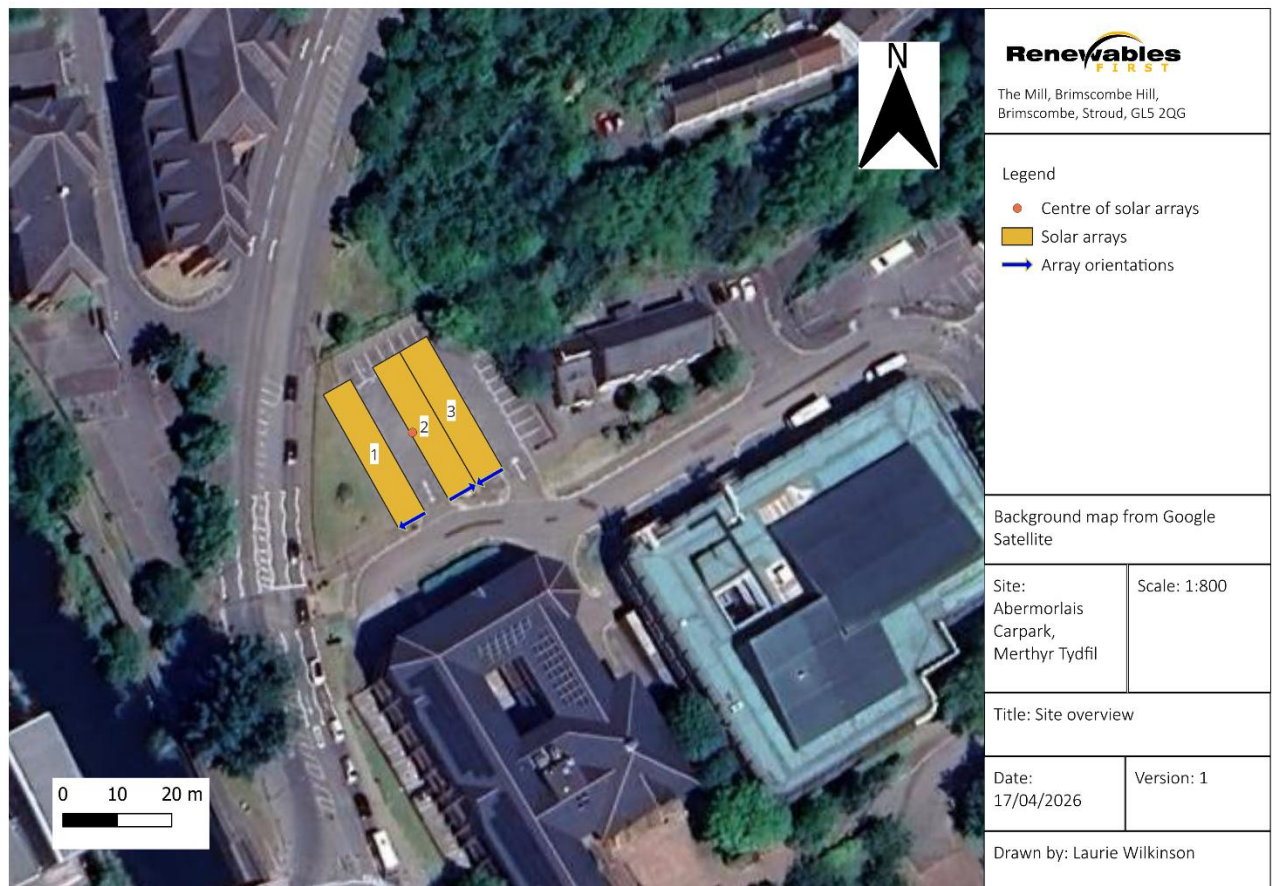


Figure 1 – Site overview map

3 Methodology

This section provides some background theory on glint and glare assessments and the methodology applied in this assessment. The information is based on industry guidance (Pager Power, 2022).

Firstly, glint and glare are defined as (Pager Power, 2022):

- Glint – a momentary flash of bright light
- Glare – a continuous source of bright light

Glint and glare occurs when light from the Sun reflects off solar panels and hits someone's eye, referred to as a "receptor". This is illustrated in Figure 2.

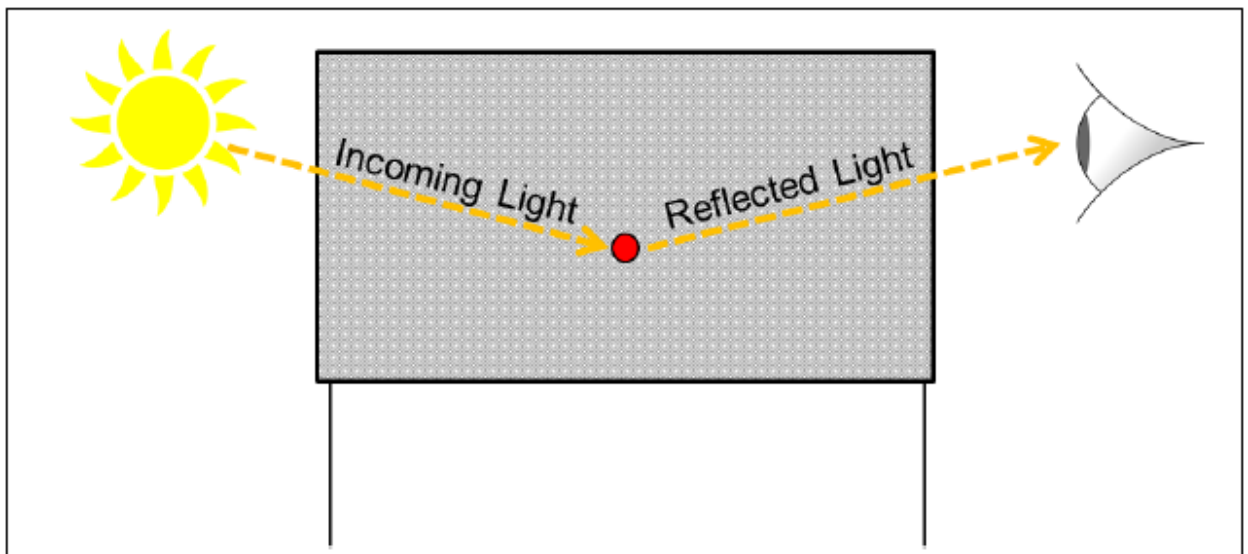


Figure 2 – Illustration showing a solar reflection from a solar panel (Pager Power, 2022)

Assessments are based on the physics principle that the angle of incidence, between the Sun and the solar panel, equals the angle of reflection, between the solar panel and the receptor. This angle is calculated relative to an imaginary line that extends from the centre of a solar panel perpendicular to its surface, called the "Normal". This is illustrated in Figure 3.

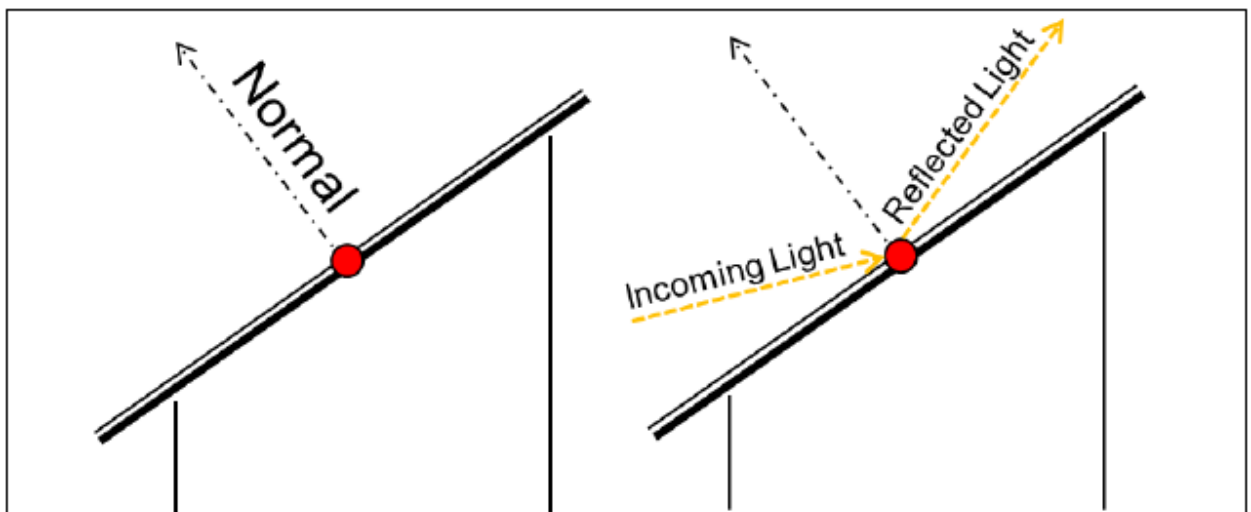


Figure 3 - Illustration showing Normal and solar reflection from a solar panel (side on) (Pager Power, 2022).

The occurrence of a solar reflection depends on the elevation and azimuth of the Sun, the solar panel and the receptor. The elevation and azimuth definitions are illustrated in Figure 4.

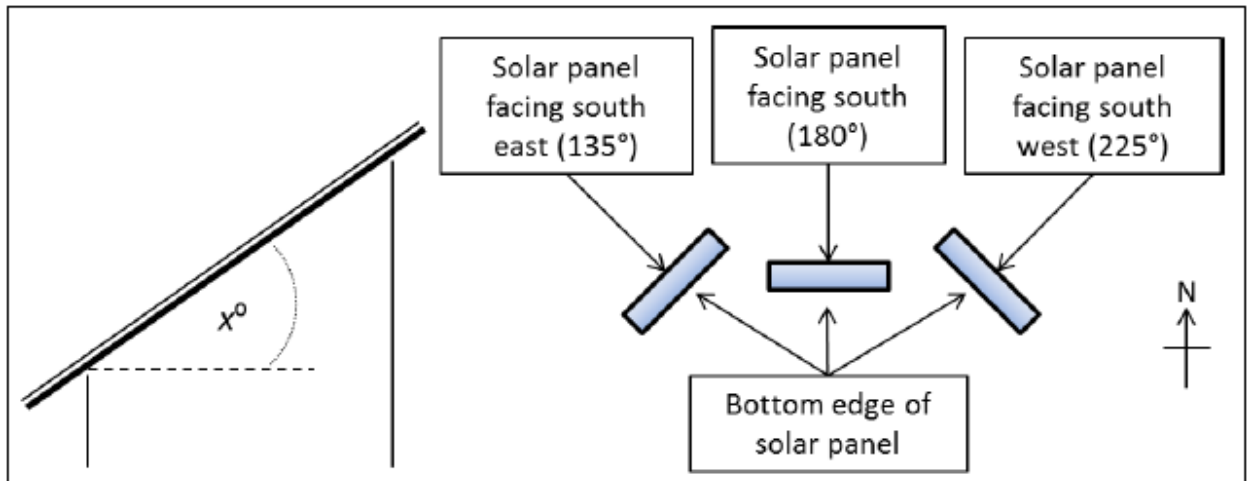


Figure 4 - Illustration showing solar panel elevation angle (side-on) and solar panel azimuth angle (top down) (Pager Power, 2022)

The theory used here is that a solar reflection is geometrically possible when the elevation and azimuth of incidence, between the Sun and the Normal are equal, within a threshold, to the elevation and azimuth between the Normal and the receptor.

The elevation and azimuth of the Sun are calculated using external software for the coordinates of the centre of the solar arrays (SunEarthTools.com, 2026). This provides a year of data, at 30 minute intervals. The elevations and azimuths are then calculated relative to the Normal. The elevation and azimuth between the receptors and the solar arrays are calculated using geometry mathematics, such as trigonometry for angles and Pythagoras' theorem for distances, using the relative distances and heights between the two objects. Diagrams for calculating all of these angles are shown in Figure 5 and Figure 6.

The durations and times of year that these angles align, making solar reflections geometrically possible, are recorded.

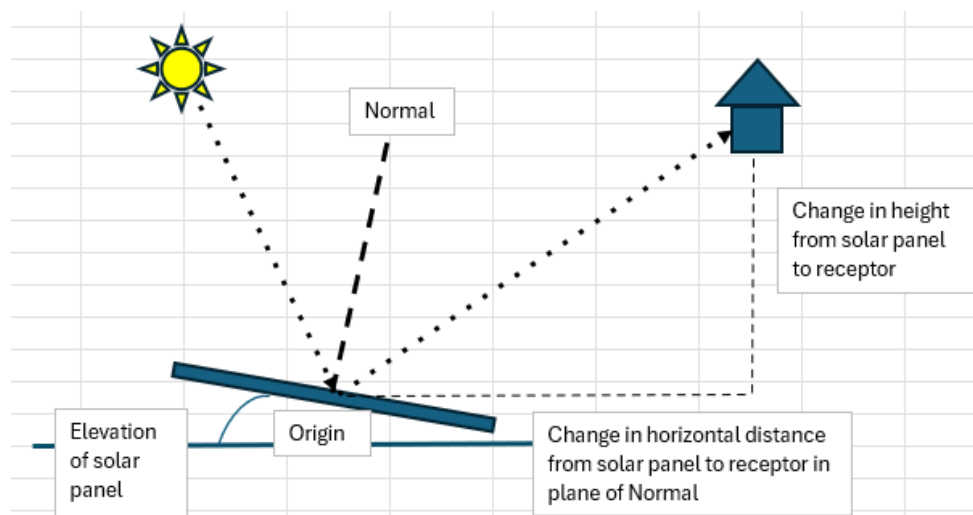


Figure 5 – Illustration of calculating elevations of Sun and receptor relative to the Normal of a solar panel

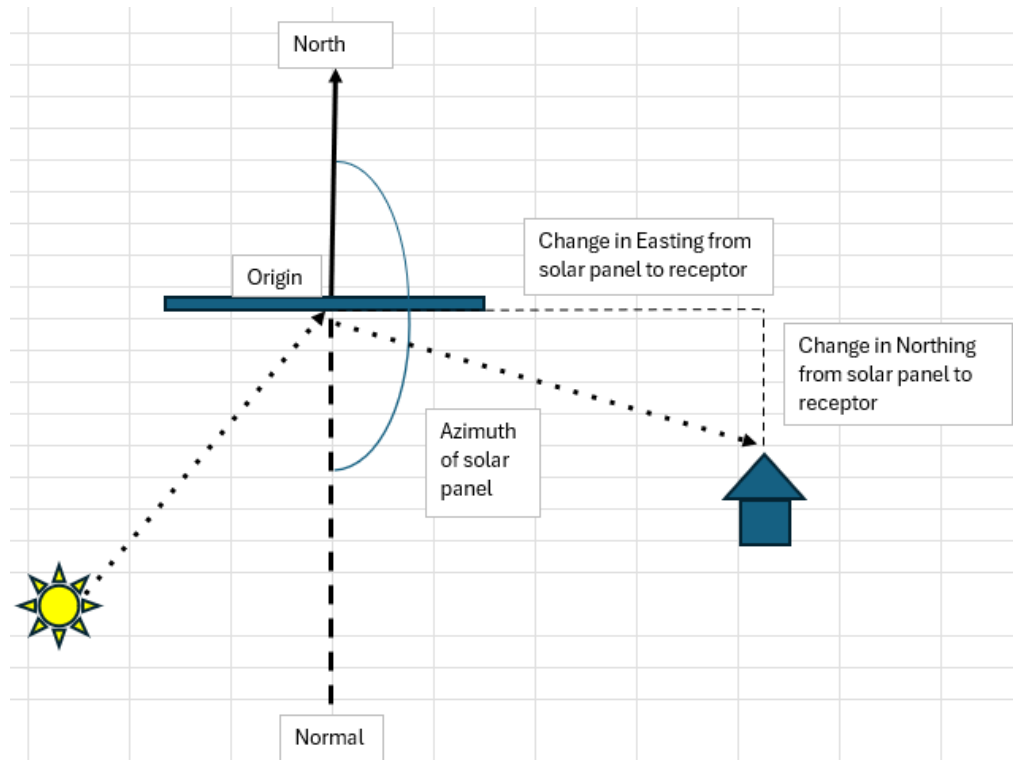


Figure 6 - Illustration of calculating azimuths of Sun and receptor relative to the Normal of a solar panel

4 Assessment

4.1 Sun elevations and azimuths

A timeseries of elevations and azimuths of the Sun was downloaded for the coordinates of the centre of the solar arrays for 2026 (SunEarthTools.com, 2026). An example of the data is shown in Figure 7. This shows that the Sun travels between 60 and 320 degrees azimuth, predominately being around the south (180 degrees), reaching a peak of around 60 degrees elevation in the summer.

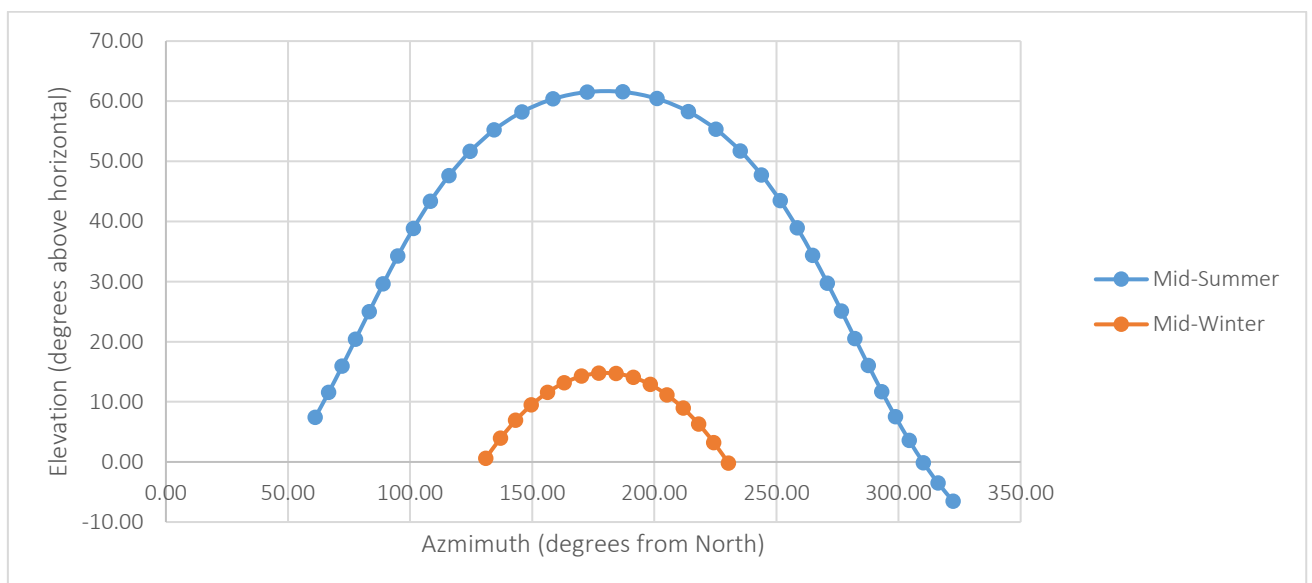


Figure 7 – Sun elevations against azimuths for the two extremes of mid-Summer and mid-Winter for the centre of the solar arrays

4.2 Height data

Height data was used to determine the relative heights between the solar arrays and the receptors. Ordnance Survey's 'OS Terrain 50' dataset was used for this. This is a 50 m spatial resolution national digital terrain model, produced from photogrammetry (Ordnance Survey, 2026). The heights are relative to Ordnance Datum Newlyn (ODN) (Ordnance Survey, 2025).

4.3 Receptor selection

The standard receptors to consider in glint and glare assessments and whether they are applicable to this site are shown in Table 2.

Table 2 shows that residential properties, roads and railways are dependent on the solar panels being visible to the receptors. However, because the site is surrounded by non-residential buildings and trees, residential properties and railways are not visible from the site due to screening. An example view looking north is shown in Figure 8. Views from the rest of the compass directions are provided in the Appendix. As can be seen from all of these views, roads are visible from the site and there were therefore included in the assessment.

Receptors within aviation operations that are sensitive to glint and glare are pilots in aircraft and air traffic controllers in Air Traffic Control Towers. An assessment for aviation operations is recommended if there are aerodromes licensed by the Civil Aviation Authority within 30 km of the site (UK Civil Aviation Authority, 2026) (UK Civil Aviation Authority, 2026). However, there are no aerodromes that meet this criteria, as shown in Figure 9.

Based on these considerations, only roads were assessed further for glint and glare.

Receptor	Applicable to site?
Residential properties	No, not visible
Roads	Yes, visible
Railways	No, not visible
Aviation operations	No, no licensed aerodromes within 30 km

Table 2 – Receptors considered for assessment, taken from industry guidance (Pager Power, 2022)



Figure 8 – View from site using Google Street View, looking north (Google, 2022)

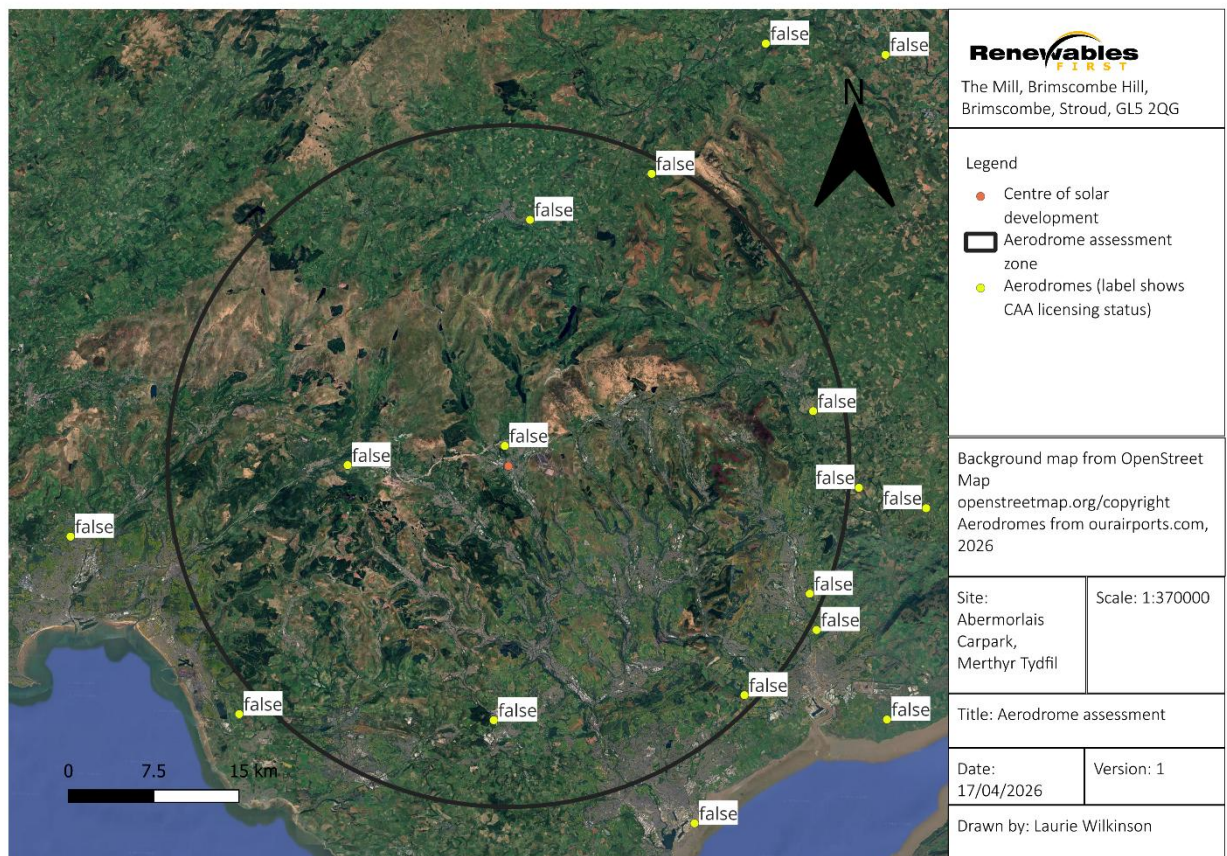


Figure 9 – Aerodromes within 30 km of site with their CAA licensing status shown (“false” means unlicensed or certificated)

4.4 Road user assessment

National Roads, such as A Roads, should be included in road assessments (Pager Power, 2022). The A4054, or Avenue De Clichy, runs north to south to the west of the site. The section of this road that would be visible from the site was assessed. Points were drawn every 25 m from the north, which is within the 200 m guidance maximum (Pager Power, 2022). The height of the road users was set at 1.5 m above the ground, as per guidance (Pager Power, 2022). The features are shown on Figure 10. Only the directions of travel where the observers were facing the solar arrays were considered, for example the direction of travel for the points north of the site was south. The details of the points are provided in Table 5 in the Appendix.

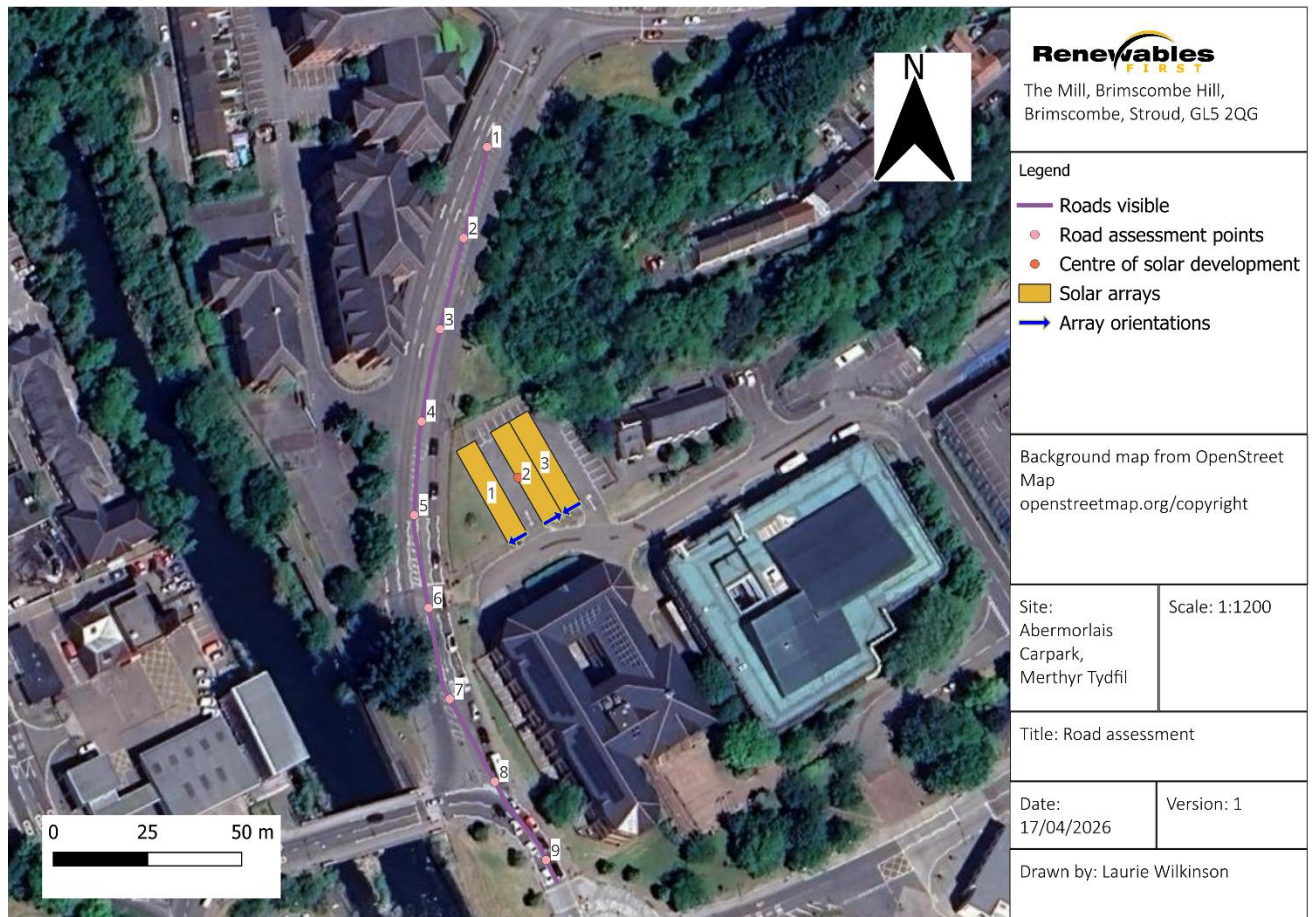


Figure 10 – Road assessment features

The worst case scenario, of road assessment point 3 viewing solar array 3, was considered first. This was the worst case because the point had low screening from buildings and trees, was higher than most of the points, the point was aligned with the south and therefore would be viewing the sun for a large proportion of the year, and it was west of the solar array, meaning that it was ahead of it relative to the array's direction and therefore it could view the solar array.

The glint and glare was first calculated by determining the elevation between the receptor and the Normal, as shown in Figure 11. This shows that the height level of the road assessment point 3 was below the centre of solar array 3. Combined with the low tilt of the solar panels, 10 degrees, this meant that the elevation between the Normal of the solar array and the receptor was greater than 90 degrees. This means that a solar reflection was not geometrically possible because all solar reflections would go above the receptor. Further assessment of the glint and glare for this combination of solar array and receptor was therefore not required. In fact, all of the road assessment points, except for number 1, were below all of the solar arrays, meaning that solar reflections for these receptors would also not be possible. The road assessment point 1 was above the solar arrays, making a solar reflection geometrically possible. However, due to the screening by the trees to the north of the solar arrays and the azimuths of the solar arrays, solar reflections at road assessment point 1 were also not geometrically possible. Hence, the glint and glare for all of the road users would be 0.

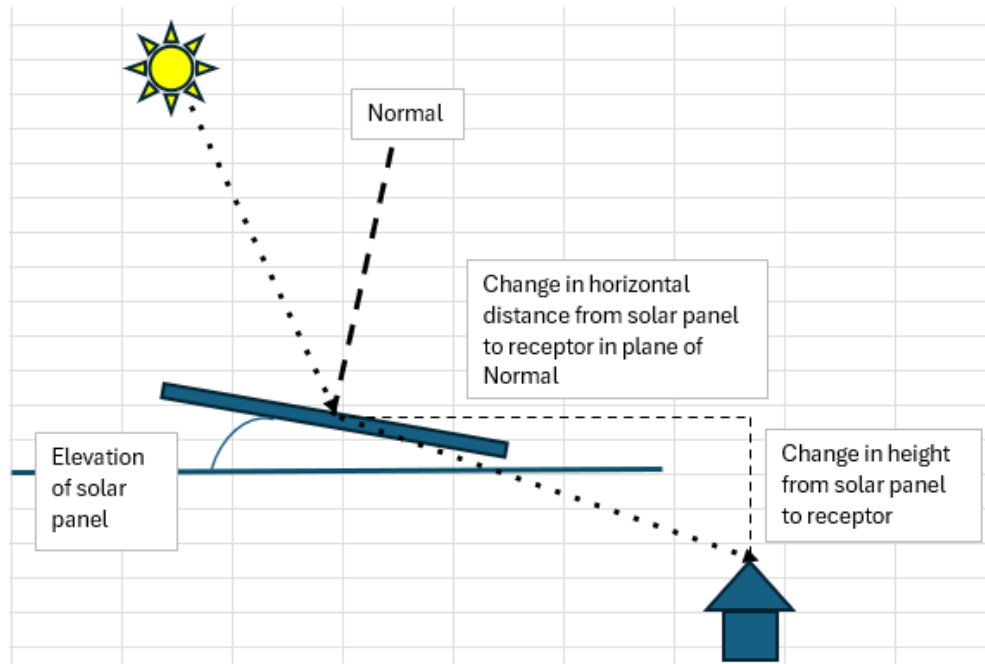


Figure 11 - Illustration of elevations of Sun and receptor relative to the Normal of the solar array, for solar array 3 relative to road assessment point 3. Not to scale

5 Conclusions

This report has assessed the possible levels of glint and glare for receptors for the proposed solar carport at Abermorlais Carpark, Merthyr Tydfil. The assessment has been carried out for the standard receptor types, residential properties, roads, railways and aviation operations. The residential properties and railways were ruled out due to screening by trees and buildings, while aviation operations were ruled out due to no licensed aerodromes being within 30 km of the site. Roads were assessed for the A4054, or Avenue De Clichy, running to the west of the site. However, due to the assessment points on the road either being lower in height than the solar arrays or screened because of the trees or azimuths of the solar arrays, no solar reflections were geometrically possible and hence glint and glare could not occur. Hence, the predicted levels of glint and glare for all standard receptors were 0 and therefore no mitigation was required.

6 Appendix

Solar array	Easting (m)	Northing (m)	Height on ground (m above ODN)	Height on panel (m above ODN)	Azimuth (deg from north)
1	304701	206334	172.4	175.40	240
2	304710	206339	172.4	175.40	60
3	304715	206342	172.4	175.40	240

Table 3 – Coordinates in British National Grid, heights and azimuths of centres of solar arrays

Solar array	Vertex name	Easting (m)	Northing (m)
1	Top 1 left	304691.86	206344.61
1	Top 2	304696.85	206347.43
1	Bot 1 left	304705.71	206320.08
1	Bot 2	304710.71	206322.9
2	Top 3	304700.93	206349.61
2	Top 4	304705.9	206352.48
2	Bot 3	304715.02	206325.21
2	Bot 4	304719.99	206328.08
3	Top 4	304705.9	206352.48
3	Top 5 right	304710.87	206355.35
3	Bot 4	304719.99	206328.08
3	Bot 5 right	304724.96	206330.95

Table 4 – Coordinates of vertices of solar arrays in British National Grid



Figure 12 - View from site using Google Street View, looking east (Google, 2022)



Figure 13 - View from site using Google Street View, looking south (Google, 2022)



Figure 14 - View from site using Google Street View, looking west (Google, 2022)

Number	Easting (m)	Northing (m)	Height of road (m above ODN)	Height of observer on road (m above ODN)	Distance from north end of road (m)	Direction of travel
1	304700	206425	177.5	179	0	South
2	304694	206401	172.6	174.1	25	South
3	304688	206377	171.8	173.3	50	South
4	304683	206353	171.8	173.3	75	South
5	304681	206328	170.8	172.3	100	N/A - West of solar development
6	304685	206303	170.8	172.3	125	North
7	304690	206279	169.4	170.9	150	North
8	304702	206257	169.7	171.2	175	North
9	304716	206236	169.2	170.7	200	North

Table 5 - Details of road assessment points. Coordinates in British National Grid

7 References

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