CLEVE HILL SOLAR PARK

ENVIRONMENTAL STATEMENT
VOLUME 4 - TECHNICAL APPENDIX A17.1
GLINT AND GLARE ASSESSMENT REPORT

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CLEVE HILL
SOLAR PARK

Solar Photovoltaic Glint and Glare Study

Prepared for:

Arcus Consultancy Services Ltd

Cleve Hill Solar Park

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Issue	Date	Detail of Changes
1	May, 2018	Initial issue
2	8 October, 2018	Second issue – assessment of public footpaths
3	19 October, 2019	Third issue – administrative revisions and further discussion

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EXECUTIVE SUMMARY

Report Purpose

This report has assessed the potential glint and glare impacts associated with the proposed Cleve Hill Solar Park photovoltaic development upon surrounding roads, dwellings and public rights of way. Aviation concerns have been considered at a high level.

Guidance

Pager Power has produced its own guidance based on international publications, independent studies and consultation with industry stakeholders. This guidance is available via the company website or on request.

Receptors

The following receptors have been assessed:

- Dwellings within one kilometre of the panel area.
- Road users on Seasalter Road to the east of the development area.
- Locations on footpaths surrounding and passing through the development area (specifically ZR484 and ZR485).

Conclusions – Dwellings (Residential Amenity)

- Thirty-six dwelling locations could experience reflections at various times throughout the year – based on a conservative assessment of likely panel visibility.
- Impacts may not be significant because:
  - Effects would occur for a maximum of approximately 40 minutes per day.
  - Effects would coincide with direct sunlight – which is significantly more intense than glare from a solar panel.
  - The reflecting area is likely to be partially or fully obscured due to the separation distance and existing features within the environment (trees and other buildings).
- The resulting impact significance is moderate. Accordingly, mitigation is not required but could be considered[1].

Conclusions – Road Safety

- The road that requires a safety assessment is Seasalter Road to the east of the site.
- Two short stretches of Seasalter Road could experience reflections under certain conditions.
- Impacts are not significant in practice because:
  - Reflections would occur from a bearing significantly outside the direction of travel, such that a driver looking through the windscreen would not view the reflecting panels directly.
  - Effects would coincide with direct sunlight.
  - The reflecting area is likely to be partially or fully obscured by undulating terrain and vegetation.
- The overall impact is low and no mitigation requirement has been identified.

[1] The process for determining impact significance is shown in Appendix D.

Conclusions – Public Rights of Way

- Footpaths ZR484 (adjacent to the site on the western and northern boundaries) and ZR485 (which passes vertically through the centre of the development area) have been assessed.
- Reflections towards observers on these footpaths could be experienced under certain conditions.
- Impacts are not significant in practice because:
  - Effects would coincide with direct sunlight.
  - The reflection intensity is similar for solar panels and still water. Reflections from glass and steel are more intense. Overall, the reflections are likely to be comparable to those from common outdoor sources.
  - There is no safety hazard associated with reflections towards an observer on a footpath.
- The overall impact is low and no mitigation requirement has been identified.
- Similarly, low impacts would be predicted for other public rights of way in the area (see Appendix I).

Recommendations

- The results of this assessment should be made available to the planning authority.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 44 countries within Europe, Africa, America, Asia and Australia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 INTRODUCTION

1.1 Introduction

Pager Power has been retained to assess the possible effects of glint and glare from a proposed solar photovoltaic (PV) installation located at Cleve Hill Solar Park, northeast of Faversham, Kent, United Kingdom.

This assessment pertains to the possible effects upon nearby road users (safety) and dwellings (residential amenity). This report contains the following:

- Solar development details.
- Explanation of glint and glare.
- Overview of relevant guidance.
- Overview of relevant studies.
- Overview of Sun movement.
- Assessment methodology.
- Identification of receptors.
- Glint and glare assessment for identified receptors.
- Results.
- Mitigation discussion.

1.2 Pager Power's Experience

Pager Power has conducted a comprehensive industry consultation exercise with developers and industry stakeholders. This has been carried out for specific developments and, in a wider context, in order to produce comprehensive guidelines for the assessment of solar glint and glare.

Pager Power has undertaken over 300 Glint and Glare assessments in the United Kingdom and internationally. The studies have included assessment of civil and military aerodromes, railway infrastructure and other ground-based receptors including roads and dwellings.

1.3 Glint and Glare Definition

The definition of glint and glare can vary however, the definition used by Pager Power is as follows:

- Glint – a momentary flash of bright light typically received by moving receptors or from moving reflectors.
- Glare – a continuous source of bright light typically received by static receptors or from large reflective surfaces.

The term 'solar reflection' is used in this report to refer to both reflection types i.e. glint and glare.

2 PROPOSED SOLAR DEVELOPMENT LOCATION AND DETAILS

2.1 Proposed Solar Development Panel Area

The proposed panel area is shown in Figure 1 below[2].

Figure 1 *Panel area*

[2] Provided to Pager Power by Arcus Consultancy Services Ltd (cropped)

Figure 2 below[3] shows the proposed development location[4].

Figure 2 *Development location*

2.2 Photovoltaic Panel Mounting Arrangements and Orientation

The solar panels will be mounted to the ground, directed towards the east and west on diverging racks with a vertical angle of 8 degrees. This assessment has considered panels with a centre height of three metres above ground level. Figure 3 below[5] shows the panel configuration.

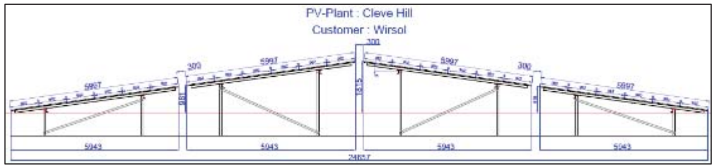

Figure 3 *Panel configuration*

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[3] Copyright © 2018 Google, Landsat, Copernicus.

[4] The roads and dwellings were assessed against a slightly larger solar panel area. The results of the previous modelling remain valid because the changes are predicted to be minimal, and the potential effects for a smaller area can only be 1) unchanged, or 2) reduced.

[5] Provided to Pager Power by Arcus Consultancy Services Ltd (cropped)

3 GLINT AND GLARE ASSESSMENT METHODOLOGY

3.1 Guidance and Studies

There are limited formal guidelines in the UK for examining reflections from solar panels with respect to residential amenity or road safety. Guidelines have been produced (by the Civil Aviation Authority) and in the USA (produced by the Federal Aviation Administration) with respect to solar developments and aviation activity. Independent studies regarding the relative reflectivity of solar panels and other materials have been undertaken (see Appendices A and B).

Pager Power's assessment methodology is based on compiled guidance from these sources, industry experience and consultation with the relevant bodies.

Key points from the literature are:

- Specular reflections of the Sun from solar panels are possible.
- The measured intensity of a reflection from solar panels can vary from 2% to 30% depending on the angle of incidence.
- The intensity of reflections from solar panels are equal to or less than those from water. Reflections from solar panels are significantly less intense than many other reflective surfaces which are common in an outdoor environment.

3.2 Background

Details of the Sun's movements and solar reflections are presented in Appendix C.

3.3 Pager Power Methodology

The glint and glare assessment methodology has been derived from the information provided to Pager Power through consultation with stakeholders and by reviewing the available guidance. The methodology for the glint and glare assessment is shown below.

- Identify receptors in the area surrounding the proposed solar development.
- Consider direct solar reflections from the proposed solar development towards the identified receptors by undertaking geometric calculations.
- Consider the visibility of the panels from the receptor's location. If the panels are not visible from the receptor then no reflection can occur.
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur.
- Consider both the solar reflection from the proposed solar development and the location of the direct sunlight with respect to the receptor's position.
- Consider the solar reflection with respect to the published studies and guidance.
- Determine whether a significant detrimental impact is expected in accordance with the methodology presented in Appendix D.

Within the Pager Power model, the solar development area is defined, as well as the relevant receptor locations. The result is a chart that shows whether a reflection can occur, the duration and the panels that can produce the solar reflection towards the receptor. See Appendix E for technical information regarding the methodology.

3.4 Assessment Limitations

The list of assumptions and limitations are presented in Appendix F.

4 IDENTIFICATION OF RECEPTORS

4.1 Ground-Based Receptors

There is no formal distance within which glint and glare should be assessed. From a technical perspective, there is no maximum distance at which potential reflections could be experienced.

The significance of a reflection decreases with distance. This is because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. The intensity of the reflection also reduces with distance. Terrain and shielding by vegetation are also more likely to obstruct an observer's view at longer distances.

The above parameters and industry experience shows that a 1km buffer is generally appropriate for glint and glare effects on ground-based receptors. Figure 4 below[6] shows an approximate 1 km buffer around the panel area. The area shown in Figures 4-6 is the larger panel area that was originally assessed.

Figure 4 *Panel area and 1km buffer*

Receptors within one kilometre are identified based on mapping and aerial photography of the region. The initial judgement is made based on high-level consideration of aerial photography and mapping i.e. receptors are excluded if it is clear from the outset that no visibility would be possible. A more detailed assessment is made if the modelling reveals a reflection would be geometrically possible.

[6] Copyright © 2018 Google, Landsat, Copernicus.

4.2 Roads

It is Pager Power's recommendation to assess through-roads, but not access roads or those with exceptionally low traffic volumes/speeds. The access roads around the panel areas are excluded because traffic volumes and speeds are likely to be low. Seasalter Road, however, requires a safety assessment. Figure 5 below[7] shows the road receptor locations that have been modelled (numbered blue icons).

Figure 5 *Road receptors*

[7] Copyright ©2018 Google

4.3 Dwellings

The assessed dwellings are shown in Figure 6 below[8].

Figure 6 *Dwelling receptors*

In some cases, it is not possible to determine the function of each building based on the available imagery. Where the status is not clear, the building has been assessed as a dwelling.

[8] Copyright ©2018 Google, Getmapping plc. Coordinate data is shown in Appendix G.

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4.4 Public Rights of Way

It is not typical for public rights of way to be assessed for glint and glare impacts. However, Kent County Council has requested assessment of footpaths ZR484 and ZR485[9]. The location of these footpaths relative to site area is shown in Figure 7 below[10].

Figure 7 *Footpath locations*

The assessed receptor points on these footpaths are shown in Figure 8 on the following page[11]. The observer height above ground level has been taken as 1.7 metres for modelling purposes. Coordinate data is shown in Appendix G.

[9] Modelling has been undertaken for these two footpaths specifically following the council's request. A more general discussion of other footpaths in the wider area is presented in Appendix I.
[10] Copyright ©2018 Google. Footpath location data extrapolated from https://webapps.kent.gov.uk/countrysideaccesscams/standardmap.aspx, accessed October 2018.
[11] Copyright ©2018 Google.

Figure 8 *Assessed footpath receptors*

5 MODELLING THE SOLAR DEVELOPMENT

5.1 Resolution

A number of representative panel locations are selected within the proposed solar development site boundary. The number of locations is determined by the size of the proposed solar development and the assessment resolution. The bounding co-ordinates for the proposed solar development have been extrapolated from the available site maps and is considered conservative and robust. All ground heights have been taken from Pager Power's database. Boundary coordinate data is shown in Appendix G.

A resolution of 30m has been chosen for this assessment. This means a geometric calculation is undertaken for each identified receptor every 30m from within the defined solar development area. This resolution is sufficiently high to maximise the accuracy of the results – increasing the resolution further would not significantly change the modelling output. If a reflection is experienced from an assessed panel location, then it is likely that a reflection will be viewable from similarly located panels within the development.

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6 GLINT AND GLARE ASSESSMENT

6.1 Overview

Tables 1 – 3 in the following subsections summarise the months and times during which a solar reflection could be experienced by a receptor.

This does not mean that reflections would occur continuously between the times shown.

The range of times at which reflections are geometrically possible is generally greater than the length of time for any particular day. This is because the times of day at which reflections could start and stop vary throughout the days/months.

Available views are predicted based on separation distance, terrain elevation and available imagery of the site. The approach is designed to be conservative. Where it is unclear whether views would be available, it is assumed that there would be visibility. A site survey would allow confirmation of visibility from potentially affected receptors. Where effects are predicted, the impact significance is assessed in Section 7.

Appendix H presents the detailed modelling output in cases where effects are possible.

6.2 Results – Roads

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
01 – 03	None.	None.	No reflections predicted.
04	None.	Between 18:00 and 18:30 for parts of June and July.	Theoretical reflections would be from the east-facing panels only. The reflecting area would be small and more than 2 km from the road. No significant effects are predicted in practice.
05	None.	Between 17:30 and 18:30 for parts of May-July.	Theoretical reflections would be from the east-facing panels only. The reflecting area would be more than 1.6 km from the road. No significant effects are predicted in practice.
06	None.	Between 17:30 and 18:30 for parts of May-August.	Theoretical reflections would be from the east-facing panels only. It is possible that the nearest reflecting panels in the southeast of the development area would be visible. Some effects are possible.
07	None.	Between 16:30 and 18:30 for parts of April-September.	Theoretical reflections would be from the east-facing panels only. It is unlikely that views of the panels would be available due to screening from existing hedgerows and dwellings. No significant effects are predicted in practice.
08	None.	Between 16:00 and 18:30 for parts of March-September.	Theoretical reflections would be from the east-facing panels only. It is unlikely that views of the panels would be available due to screening from existing hedgerows to the west of the road.
09	None.	Between 15:30 and 18:30 for parts of March-October.	Theoretical reflections would be from the east-facing panels only. It is unlikely that a significant view of the reflecting panels would be available due to the separation distance and the undulating terrain. No significant effects are predicted in practice.
10	None.	Between 15:30 and 18:30 for parts of February-October.	Theoretical reflections would be from the east-facing panels only. It is unlikely that a significant view of the reflecting panels would be available due to the separation distance and the undulating terrain. No significant effects are predicted in practice.

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
11	None.	Between 14:45 and 18:30 for parts of February-October.	Theoretical reflections would be from the east-facing panels only. Any visible reflecting areas would be more than 1.3 km from the road. No significant effects are predicted in practice.
12	None.	Between 14:45 and 18:30 for parts of February-November.	Theoretical reflections would be from the east-facing panels only. Any visible reflecting areas would be very close to the 1 from the road. Some effects are possible.

Table 1 *Results – Seasalter Road*

6.3 Results – Dwellings

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
01	Between 05:40 and 08:30 for parts of March-May and July-September.	None.	Theoretical reflections would be from the west-facing panels only. It is possible that no view of the panel area would be available, however this cannot be definitively concluded based on the available imagery. Effects are possible.
02 – 06	Between 05:40 and 08:30 for parts of March-May and July-October.	None.	Theoretical reflections would be from the west-facing panels only. It is possible that no view of the panel area would be available, however this cannot be definitively concluded based on the available imagery. Effects are possible.
07 – 10	Between 05:30 and 08:00 from March to September.	None.	Theoretical reflections would be from the west-facing panels only. It is possible that views of the reflecting panels would be available. Effects are possible.
11 – 13	Between 05:30 and 06:30 for parts of May-August.	None.	Theoretical reflections would be from the west-facing panels only. It is possible that views of the panels would be available, however these dwellings are very close to the 1 km boundary relative to the panel area. Some effects are possible.
14	Between 05:30 and 07:30 for parts of March-September.	None.	Theoretical reflections would be from the west-facing panels only. It is likely that the nearest reflecting panels will be visible. Effects are possible.
15 – 16	Between 05:30 and 07:00 for parts of April-August.	None.	Theoretical reflections would be from the west-facing panels only. It is likely that the nearest reflecting panels will be visible. Effects are possible.
17	Between 05:30 and 07:30 for parts of April-September.	Between 17:00 and 18:30 for parts of April-August.	Theoretical reflections would be from the west-facing panels in the morning and the east facing panels in the evening. The east facing panels nearest the dwelling are likely to be visible. The west facing panels that cause reflections may be screened from view in practice, this cannot be definitively concluded based on the available imagery. Effects are possible.

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
18-20	None.	None.	No reflections predicted.
21	Between 05:30 and 06:00 for parts of June and July.	Between 17:40 and 18:30 for parts of May-July.	Theoretical reflections would be from the west-facing panels in the morning and the east facing panels in the evening. The reflecting areas are small. The west-facing reflecting panels are likely to be screened and the east facing panels reflecting panels are more than 1 km from the dwelling. No significant effects are predicted in practice.
22	None.	Between 18:00 and 18:30 for parts of June-July.	Theoretical reflections would be from the east-facing panels only. The reflecting area is small and more than 1.2 km from the dwelling. No significant effects are predicted in practice.
23 – 50	None.	None.	No effects are predicted.
51 – 58	None.	Between 17:30 and 18:30 for parts of May-July.	Theoretical reflections would be from the east-facing panels only. The reflecting area is small and more than 1.7 km from the dwellings. No significant effects are predicted in practice.
59 – 62	None.	Between 17:00 and 18:30 for parts of April-August.	Theoretical reflections would be from the east-facing panels only. It is possible that views of the nearest reflecting panels would be available. In the case of Dwelling 60, this would only be from the upper floors, which is potentially less significant. Effects are possible.
63 – 64	None.	Between 16:30 and 18:30 for parts of April-September.	Theoretical reflections would be from the east-facing panels only. It is possible that views of the nearest reflecting panels would be available. Effects are possible.
65	None.	Between 16:30 and 18:30 for parts of March-September.	Theoretical reflections would be from the east-facing panels only. Views of the panel area are likely to be screened by existing buildings and vegetation. No significant effects are predicted in practice.
66 – 72	None.	Between 16:00 and 18:30 for parts of March-September.	Theoretical reflections would be from the east-facing panels only. It is possible that views of the nearest reflecting panels would be available. Effects are possible.
73 – 76	None.	Between 16:00 and 18:30 for parts of March-September.	Theoretical reflections would be from the east-facing panels only. Views of the panel area are likely to be screened by existing buildings and vegetation. No significant effects are predicted in practice.
77	None.	Between 15:30 and 18:30 for parts of March-October.	Theoretical reflections would be from the east-facing panels only. It is possible that views of the nearest reflecting panels would be available. Effects are possible.
78	None.	Between 14:00 and 18:30 for parts of January-November.	Theoretical reflections would be from the east-facing panels only. Views of the panel area are likely to be screened by undulating terrain and vegetation. No significant effects are predicted in practice.
79 – 80	None.	Between 14:00 and 18:30 throughout the year.	Theoretical reflections would be from the east-facing panels only. It is possible that the reflecting panels would be visible – there is limited imagery available from this dwelling location. Effects are possible.
81 – 82	Between 08:30 and 09:30 for parts of January and November.	Between 14:00 and 18:30 throughout the year.	Theoretical reflections would be from the west-facing panels in the morning and the east-facing panels in the afternoon. It is possible that the reflecting panels would be visible – there is limited imagery available from this dwelling location. Effects are possible.

Table 2 *Results – Dwellings*

6.4 Results – Footpaths

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
01	Between 05:00 and 06:45 for parts of April-August.	None.	Reflections in the morning would be from the west-facing panels. Reflections in the evening would be from the east-facing panels. It is likely that views of the reflecting panels would be available from the adjacent footpaths, however the nearest panels may well screen the remainder of the development from view.
02	Between 05:30 and 07:00 for parts of April-August.	None.	
03	Between 05:30 and 09:15 for parts of January-November.	None.	
04	Between 05:30 and 08:45 for parts of February-October.	None.	
05	Between 05:30 and 09:30 for parts of January-November.	None.	
06	Between 05:30 and 09:30 for parts of January-November.	Between 18:00 and 18:30 for parts of May-July.	
07	Between 05:30 and 09:00 for parts of February-November.	Between 18:00 and 18:30 for parts of May-July.	
08	Between 05:30 and 09:00 for parts of February-October.	Between 17:45 and 18:30 for parts of May-July.	
09	Between 05:30 and 09:00 for parts of February-October.	Between 17:30 and 18:30 for parts of May-July.	

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
10	Between 05:30 and 08:30 for parts of March-October.	Between 18:00 and 18:30 for parts of May-July.	Reflections in the morning would be from the west-facing panels. Reflections in the evening would be from the east-facing panels. It is likely that views of the reflecting panels would be available from the adjacent footpaths, however the nearest panels may well screen the remainder of the development from view.
11	Between 05:30 and 08:15 for parts of March-October.	None.	
12	Between 05:30 and 08:00 for parts of March-October.	None.	
13	Between 05:30 and 08:15 for parts of March-October.	None.	
14	Between 05:30 and 09:30 for parts of January-November.	None.	
15	Between 05:30 and 09:30 throughout the year.	None.	
16	Between 05:30 and 09:30 throughout the year.	None.	
17	Between 05:45 and 09:30 for parts of July-May.	None.	
18	Between 05:45 and 09:30 for parts of July-May.	Between 14:00 and 15:45 for parts of October-February.	

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
19	Between 06:00 and 09:45 for parts of July-May.	Between 14:00 and 16:00 for parts of October-February.	Reflections in the morning would be from the west-facing panels. Reflections in the evening would be from the east-facing panels. It is likely that views of the reflecting panels would be available from the adjacent footpaths, however the nearest panels may well screen the remainder of the development from view.
20	Between 06:00 and 09:45 for parts of July-May.	Between 14:00 and 16:15 for parts of October-March.	
21	Between 06:00 and 09:45 for parts of July-May.	Between 14:00 and 16:30 for parts of September-March.	
22	Between 06:00 and 09:45 for parts of July-May.	Between 14:00 and 16:30 for parts of September-March.	
23	Between 06:00 and 09:45 for parts of July-May.	Between 14:00 and 16:45 for parts of September-March.	
24	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
25	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
26	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
27	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
28	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	Reflections in the morning would be from the west-facing panels. Reflections in the evening would be from the east-facing panels. It is likely that views of the reflecting panels would be available from the adjacent footpaths, however the nearest panels may well screen the remainder of the development from view.
29	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
30	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
31	Between 05:45 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
32	Between 06:00 and 09:45 for parts of July-May.	Between 14:00 and 17:00 for parts of September-April.	
33	Between 06:15 and 09:45 for parts of August-April.	Between 14:00 and 17:00 for parts of September-April.	
34	Between 07:30 and 09:45 for parts of October-March.	Between 14:00 and 17:00 for parts of September-April.	
35	None.	Between 14:00 and 17:00 for parts of September-April.	
36	None.	Between 14:00 and 17:00 for parts of September-April.	

Receptor	Approximate reflection times (GMT)		Comments
	am	pm	
37	None.	Between 14:00 and 17:15 for parts of August-April.	Reflections in the morning would be from the west-facing panels. Reflections in the evening would be from the east-facing panels. It is likely that views of the reflecting panels would be available from the adjacent footpaths, however the nearest panels may well screen the remainder of the development from view.
38	None.	Between 14:00 and 17:30 for parts of August-April.	
39	None.	Between 14:00 and 17:45 for parts of August-April.	
40	None.	Between 14:00 and 17:50 for parts of August-May.	
41 – 47	Between 05:30 and 09:45 throughout the year.	Between 14:00 and 18:30 throughout the year.	
48	Between 05:30 and 09:45 throughout the year.	Between 14:00 and 19:00 throughout the year.	
49	Between 05:45 and 09:45 throughout the year.	Between 14:00 and 17:15 for parts of August-April.	

Table 3 *Results – Footpaths*

7 RESULTS DISCUSSION

7.1 Roads

Reflections would potentially be visible from vehicles on two short stretches of Seasalter Road. These are shown in Figure 9 below[12]. The panel area and 1 km buffer are shown for reference.

Figure 9 *Potentially affected stretches of road*

[12] Copyright ©2018 Google, Getmapping plc. Coordinate data is shown in Appendix G. These modelling results are for the larger panel area.

7.2 Dwellings

The assessment has shown that reflections could be observable at thirty-six dwellings in the surrounding area. This is based on a conservative assessment of potential panel visibility. Figures 10 and 11 below[13] show the potentially affected dwellings.

Figure 10 *Potentially affected dwellings*

Figure 11 *Potentially affected dwellings (numbered)*

[13] Copyright ©2018 Google, Getmapping plc. Coordinate data is shown in Appendix G. These modelling results are for the larger panel area.

7.3 Footpaths

The assessment has shown that reflections could be observable from the assessed footpaths at each modelled location.

7.4 Impact Significance

Seasalter Road

Effects would last for up to approximately 20 minutes per day but in practice they would be fleeting for a moving receptor. The intensity of any reflection would be comparable to the intensity of a reflection from still water.

Traffic volumes on Seasalter Road are unlikely to be high. There is also a relatively large separation between the panels and a vehicular receptor.

Seasalter Road runs approximately north-south to the east of the site. Any reflections would occur from the west, which is not the direction a driver would be facing.

Overall, the impact is considered **low** and no mitigation requirement has been identified.

Dwellings

Reflections would generally coincide with direct sunlight, such that an observer looking towards a reflecting panel would also be looking towards the Sun. Direct sunlight is significantly more intense than a solar reflection from a panel.

Effects would last for up to 40 minutes per day under worst-case conditions (full visibility of all reflecting panels on a sunny day.

Based on the impact significance assessment process, presented in Appendix D, the potential impact is moderate. This classification does not imply a mitigation requirement, however options could be considered to reduce potential effects further (see Section 8).

Footpaths

Effects would last for up to approximately 40 minutes per day for a static observer (this would be a worst case of 20 minutes in the morning and 20 minutes in the afternoon/evening).

The considerations for determining impact significance are:

- The duration of effects.
- The intensity of potential reflections compared to common outdoor sources of glare.
- The relative position of the Sun and the reflection.
- Associated hazards caused by potential glare.

In practice, effects would likely be perceptible for a few minutes to a moving observer. Public footpaths, as opposed to residential dwellings, are not continually occupied and in many cases potential reflections would not be observed at all.

Where reflections are visible to an observer, their intensity will be comparable to reflections from still water. Reflections from solar panels are less intense than reflections from glass or steel.

Reflections would generally coincide with direct sunlight, such that an observer looking towards a reflecting panel would also be looking towards the Sun. Direct sunlight is significantly more intense than a reflection from a solar panel. Reflections towards an observer on a footpath do not have an associated safety hazard – the worst-case scenario would be discomfort when looking towards a reflecting panel and a potential temporary after-image[14].

Overall, the potential impact on observers using the surrounding footpaths is **low** and no mitigation requirement has been identified.

[14] Similar to the glow experienced when looking away from a bright screen in a dark room.

7.5 Baseline Conditions

The reflectivity of solar panels is relatively low, comparable to still water and less than glass and steel. The surrounding environment contains reflective materials and surfaces already, some of these are highlighted in Figure 12 below[15].

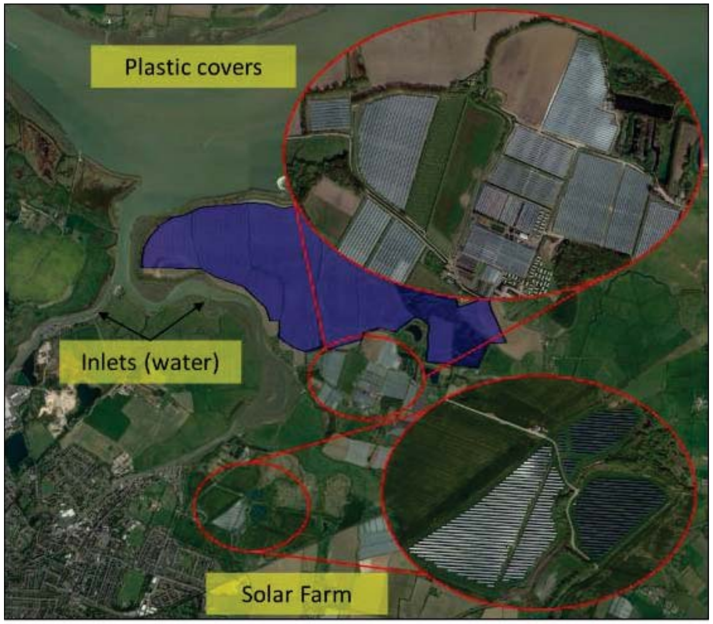

Figure 12 *Existing reflectors*

[15] ©2018 Google, Getmapping plc. Coordinate data is shown in Appendix G.

8 MITIGATION

8.1 Overview

The most practical mitigation measure for ground-based receptors such as dwellings is the provision of screening that obscures the reflecting panels from view.

If mitigation options are to be progressed for dwellings, it is recommended that a site survey is carried out. The purpose of the survey would be to:

- Determine the presence, number and precise locations of the surrounding dwellings.
- Confirm the site visibility from the dwelling locations.
- Assess the level of screening that would be required in practice.

9 OVERALL CONCLUSIONS

9.1 Conclusions – Residential Amenity

Thirty-six dwelling locations could experience reflections at various times throughout the year, based on a conservative assessment of likely panel visibility. Impacts may not be significant because:

- Effects would occur for a maximum of approximately 40 minutes per day.
- Effects would coincide with direct sunlight – which is significantly more intense than glare from a solar panel.
- The reflecting area is likely to be partially or fully obscured due to the separation distance and existing features of the environment (trees and other buildings).

9.2 Conclusions – Road Safety

Two short stretches of Seasalter Road could experience reflections under certain conditions. Impacts are not significant in practice because:

- Reflections would occur from a bearing significantly outside the direction of travel, such that a driver looking through the windscreen would not view the reflecting panels directly.
- Effects would coincide with direct sunlight.
- The reflecting area is likely to be partially or fully obscured by undulating terrain and vegetation.

9.3 Conclusions – Observers on Footpaths

Reflections are possible towards observers on the surrounding footpaths under certain conditions. Impacts are not significant in practice because:

- Effects would coincide with direct sunlight.
- The reflection intensity is similar for solar panels and still water. Reflections from glass and steel are more intense. Overall, the reflections are likely to be comparable to those from common outdoor sources.
- There is no safety hazard associated with reflections towards an observer on a footpath.
- Similarly, low impacts would be predicted for other public rights of way in the area.

9.4 Mitigation Requirement

No mitigation requirement has been identified, however further screening could be considered to further reduce potential effects at the dwellings.

PAGERPOWER

APPENDIX A – OVERVIEW OF GLINT AND GLARE GUIDANCE

Overview

This section presents details regarding the relevant UK planning policy with respect to the considerations and effects of solar reflections from solar panels, known as 'Glint and Glare'.

This is not a comprehensive review, rather it is intended to give an overview of the important parameters and considerations that have informed this assessment.

UK Planning Policy

UK National Planning Practice Guidance dictates that in some instances a glint and glare assessment is required however, there is no specific guidance with respect to the methodology for assessing the impact of glint and glare.

The planning policy from the Department for Communities and Local Government (paragraph 27[16]) states:

'Particular factors a local planning authority will need to consider include… the effect on landscape of glint and glare and on ***neighbouring uses and aircraft safety**.'*

The National Planning Policy Framework for Renewable and Low Carbon Energy[17] (specifically regarding the consideration of solar farms) states:

'What are the particular planning considerations that relate to large scale ground-mounted solar photovoltaic Farms?

The deployment of large-scale solar farms can have a negative impact on the rural environment, particularly in undulating landscapes. However, the visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively.

Particular factors a local planning authority will need to consider include:

- *the proposal's visual impact, the effect on landscape of glint and glare (see guidance on landscape assessment) and on* ***neighbouring uses and aircraft safety****;*
- *the extent to which there may be additional impacts if solar arrays follow the daily movement of the sun;*

The approach to assessing cumulative landscape and visual impact of large scale solar farms is likely to be the same as assessing the impact of wind turbines. However, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography the area of a zone of visual influence could be zero.'

Assessment Process

No process for determining and contextualising the effects of glint and glare are, however, provided. Therefore, the Pager Power approach is to determine whether a reflection from the proposed solar development is geometrically possible and then to compare the results against the relevant guidance/studies to determine whether the reflection is significant.

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[16] http://planningguidance.planningportal.gov.uk/blog/guidance/renewable-and-low-carbon-energy/
[17]Reference ID: 5-013-20140306, paragraph 13-13,http://planningguidance.planningportal.gov.uk/blog/guidance/renewable-and-low-carbon-energy/particular-planning-considerations-for-hydropower-active-solar-technology-solar-farms-and-wind-turbines/

APPENDIX B – OVERVIEW OF GLINT AND GLARE STUDIES

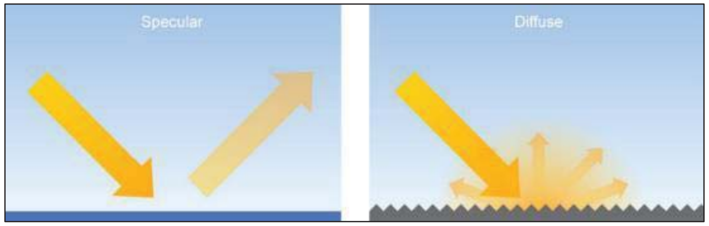
Overview

Studies have been undertaken assessing the type and intensity of solar reflections from various surfaces including solar panels. An overview of these studies is presented below.

There are no specific studies for determining the effect of reflections from solar panels with respect to roads and dwellings. The guidelines presented are related to aviation safety. The results are applicable for the purpose of this analysis.

Reflection Type from Solar Panels

Based on the surface conditions reflections from light can be specular and diffuse. A specular reflection has a reflection characteristic similar to that of a mirror; a diffuse will reflect the incoming light and scatter it in many directions. The figure below[18], taken from the FAA guidance, illustrates the difference between the two types of reflections. Because solar panels are flat and have a smooth surface most of the light reflected is specular, which means that incident light from a specific direction is reradiated in a specific direction.



Specular and diffuse reflections

Solar Reflection Studies

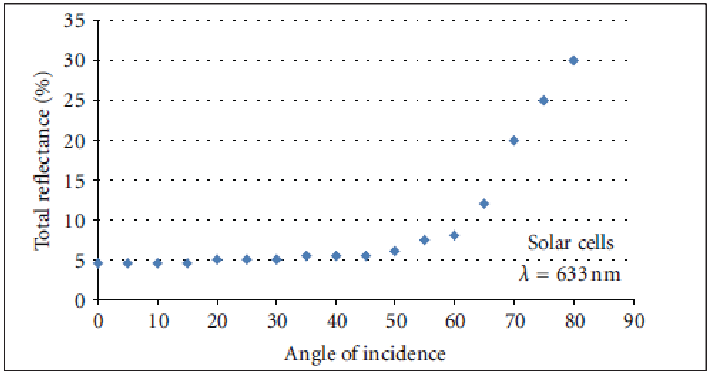
An overview of content from identified solar panel reflectivity studies is presented in the subsections below.

Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems"

Evan Riley and Scott Olson published in 2011 their study titled: *A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems*[19]". They researched the potential glare that a pilot could experience from a 25 degree fixed tilt PV system located outside of Las Vegas, Nevada. The theoretical glare was estimated using published ocular safety metrics which quantify the potential for a postflash glare after-image. This was then compared to the postflash glare after-image caused by smooth water. The study demonstrated that the reflectance of the solar cell varied with angle of incidence, with maximum values occurring at angles close to 90 degrees. The reflectance values varied from approximately 5% to 30%. This is shown on the figure on the following page.

[18] http://www.faa.gov/airports/environmental/policy_guidance/media/airport_solar_guide_print.pdf

[19] Evan Riley and Scott Olson, "A Study of the Hazardous Glare Potential to Aviators from Utility-Scale Flat-Plate Photovoltaic Systems," ISRN Renewable Energy, vol. 2011, Article ID 651857, 6 pages, 2011. doi:10.5402/2011/651857



Total reflectance % when compared to angle of incidence

The conclusions of the research study were:

- The potential for hazardous glare from flat-plate PV systems is similar to that of smooth water;
- Portland white cement concrete (which is a common concrete for runways), snow, and structural glass all have a reflectivity greater than water and flat plate PV modules.

FAA Guidance- "Technical Guidance for Evaluating Selected Solar Technologies on Airports"[20]

The 2010 FAA Guidance (discussed in section 4) included a diagram which illustrates the relative reflectance of solar panels compared to other surfaces. The figure shows the relative reflectance of solar panels compared to other surfaces. Surfaces in this figure produce reflections which are specular and diffuse. A specular reflection (those made by most solar panels) has a reflection characteristic similar to that of a mirror. A diffuse reflection will reflect the incoming light and scatter it in many directions. A table of reflectivity values, sourced from the figure[21] within the FAA guidance, is presented on the following page.

[20] FAA, November (2010): *Technical Guidance for Evaluating Selected Solar Technologies on Airports.*

[21] http://www.faa.gov/airports/environmental/policy_guidance/media/airport_solar_guide_print.pdf

Surface	Approximate Percentage of Light Reflected[22]
Snow	80
White Concrete	77
Bare Aluminium	74
Vegetation	50
Bare Soil	30
Wood Shingle	17
Water	5
Solar Panels	5
Black Asphalt	2

Relative reflectivity of various surfaces

Note that the data above does not appear to consider the reflection type (specular or diffuse).

An important comparison in this table is the reflectivity compared to water which will produce a reflection of very similar intensity when compared to that from a solar panel. The study by Riley and Olsen study (2011) also concludes that still water has a very similar reflectivity to solar panels.

SunPower Technical Notification (2009)
SunPower published a technical notification[23] to '*increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment'.* The study revealed that the reflectivity of a solar panel is considerably lower than that of '*standard glass and other common reflective surfaces'.* With respect to aviation and solar reflections observed from the air, SunPower has developed several large installations near airports or on Air Force bases. It is stated that these developments have all passed FAA or Air Force standards with all developments considered "No Hazard to Air Navigation". The note suggests that developers discuss any possible concerns with stakeholders near proposed solar farms.

Figures within the document show the relative reflectivity of solar panels compared to other natural and manmade materials including smooth water, standard glass and steel. The results, similarly to those from Riley and Olsen study (2011) and the FAA (2010), show that solar panels produce a reflection that is less intense than those produced from these surfaces.

[22] Extrapolated data, baseline of 1,000 W/m^2 for incoming sunlight.
[23] Technical Support, 2009. SunPower Technical Notification- Solar Module Glare and Reflectance.

APPENDIX C – OVERVIEW OF SUN MOVEMENTS AND RELATIVE REFLECTIONS

The Sun's position in the sky can be accurately described by its azimuth and elevation. Azimuth is a direction relative to true north (horizontal angle i.e. from left to right) and elevation describes the Sun's angle relative to the horizon (vertical angle i.e. up and down).

The Sun's position can be accurately calculated for a specific location. The following data being used for the calculation:

- Time.
- Date.
- Latitude.
- Longitude.

The combination of the Sun's azimuth angle and vertical elevation will affect the direction and angle of the reflection from a solar panel.

APPENDIX D – GLINT AND GLARE IMPACT SIGNIFICANCE

Overview

The significance of glint and glare will vary for different receptors. The following section presents a general overview of the significance criteria with respect to experiencing a solar reflection.

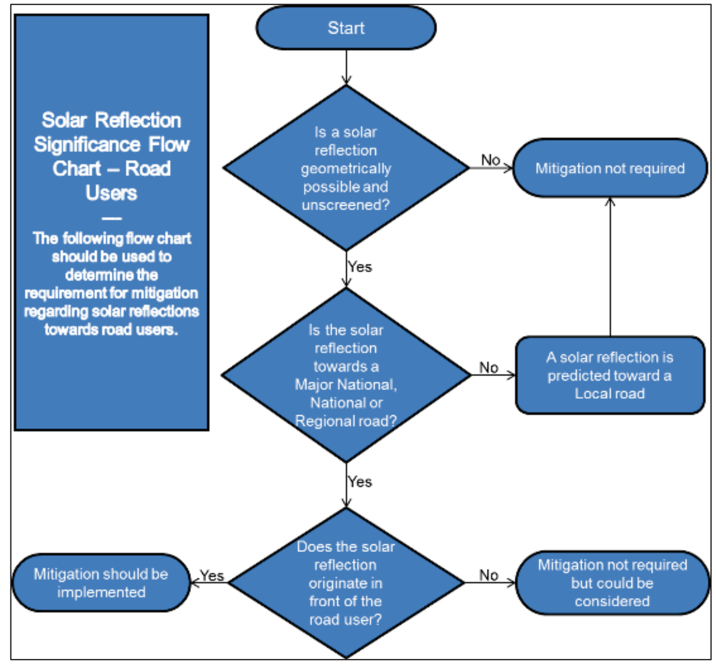
Impact significance definition

The table below presents the recommended definition of 'impact significance' in glint and glare terms and the requirement for mitigation under each.

Impact Significance	Definition	Mitigation Requirement
No Impact	A solar reflection is not geometrically possible or will not be visible from the assessed receptor.	No mitigation required.
Low	A solar reflection is geometrically possible however any impact is considered to be small such that mitigation is not required e.g. intervening screening will limit the view of the reflecting solar panels.	No mitigation required.
Moderate	A solar reflection is geometrically possible and visible however it occurs under conditions that do not represent a worst-case.	Whilst the impact may be acceptable, consultation and/or further analysis should be undertaken to determine the requirement for mitigation.
Major	A solar reflection is geometrically possible and visible under conditions that will produce a significant impact. Mitigation and consultation is recommended.	Mitigation will be required if the proposed solar development is to proceed.

Impact significance definition

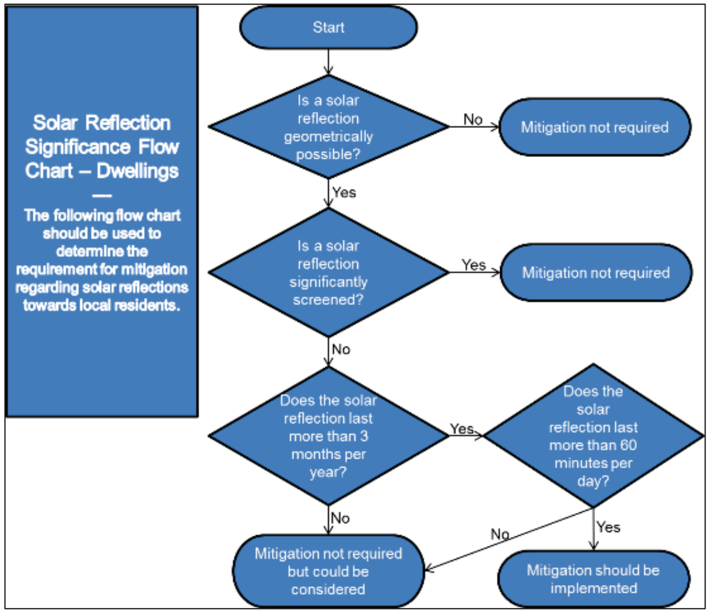
Assessment process for road users



Road user mitigation requirement flow chart

Assessment process for dwelling receptors

The flow chart presented below has been followed when determining the mitigation requirement for dwelling receptors.



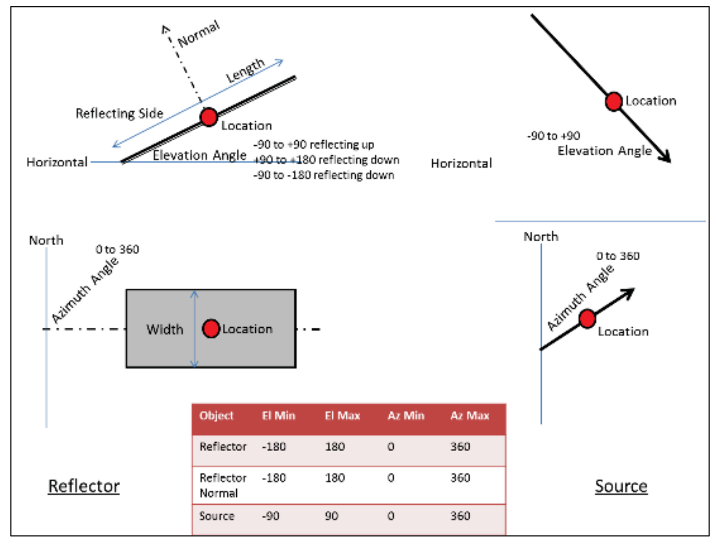
Dwelling receptor mitigation requirement flow chart

APPENDIX E – PAGER POWER'S REFLECTION CALCULATIONS METHODOLOGY

The calculations are three dimensional and complex, accounting for:

- The Earth's orbit around the Sun;
- The Earth's rotation;
- The Earth's orientation;
- The reflector's location;
- The reflector's 3D Orientation.

Reflections from a flat reflector are calculated by considering the normal which is an imaginary line that is perpendicular to the reflective surface and originates from it. The diagram below may be used to aid understanding of the reflection calculation process.



The following process is used to determine the 3D Azimuth and Elevation of a reflection:

- Use the Latitude and Longitude of reflector as the reference for calculation purposes;
- Calculate the Azimuth and Elevation of the normal to the reflector;
- Calculate the 3D angle between the source and the normal;
- If this angle is less than 90 degrees a reflection will occur. If it is greater than 90 degrees no reflection will occur because the source is behind the reflector;
- Calculate the Azimuth and Elevation of the reflection in accordance with the following:
  - o The angle between source and normal is equal to angle between normal and reflection;
  - o Source, Normal and Reflection are in the same plane.

APPENDIX F – ASSESSMENT LIMITATIONS AND ASSUMPTIONS

Pager Power's Model

It is assumed that the panel elevation angle provided by the developer represents the elevation angle for all of the panels within the solar development.

It is assumed that the panel azimuth angle provided by the developer represents the azimuth angle for all of the panels within the solar development.

Only a reflection from the face of the panel has been considered. The frame or the reverse of the solar panel has not been considered.

The model assumes that a receptor can view the face of every panel within the proposed solar development area whilst in reality this, in the majority of cases, will not occur.

Therefore any predicted reflection from the face of a solar panel that is not visible to a receptor will not occur.

A finite number of points within the proposed solar development are chosen based on an assessment resolution so we can build a comprehensive understanding of the entire development. This will determine whether a reflection could ever occur at a chosen receptor. The calculations do not incorporate all of the possible panel locations within the development outline.

A single reflection point on the panel has been chosen for the geometric calculations. This will suitably determine whether a reflection can be experienced at a location and the general time of year and duration of this reflection. Increased accuracy could be achieved by increasing the number of heights assessed however this would only marginally change the results and is not considered significant.

Whilst line of sight to the development from receptors has been considered, only available street view imagery and satellite mapping has been used. In some cases this imagery may not be up to date and may not give the full perspective of the installation from the location of the assessed receptor.

Any screening in the form of trees, buildings etc. that may obstruct the Sun from view of the solar panels is not considered unless stated.

APPENDIX G – COORDINATE DATA

Panel Area (original)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
01	0.897281	51.337586	30	0.940878	51.335930
02	0.904708	51.337594	31	0.939161	51.335823
03	0.906704	51.336926	32	0.939300	51.335446
04	0.910115	51.336212	33	0.936898	51.334898
05	0.912908	51.334594	34	0.936853	51.335292
06	0.913466	51.333583	35	0.936570	51.335575
07	0.914658	51.333568	36	0.935811	51.335941
08	0.914553	51.332393	37	0.935663	51.336176
09	0.915289	51.331976	38	0.935702	51.336477
10	0.916483	51.331517	39	0.935636	51.336684
11	0.917858	51.331254	40	0.934866	51.337403
12	0.920392	51.331711	41	0.934909	51.338066
13	0.920800	51.331441	42	0.934325	51.341155
14	0.924934	51.332262	43	0.940128	51.341588
15	0.925240	51.332861	44	0.940730	51.345081
16	0.927233	51.333224	45	0.940563	51.345889
17	0.928982	51.332861	46	0.939463	51.346204
18	0.931610	51.334100	47	0.936434	51.346149
19	0.932067	51.334018	48	0.931505	51.345040
20	0.932801	51.333796	49	0.924969	51.343661
21	0.933308	51.333451	50	0.914870	51.342436
22	0.933069	51.330620	51	0.912870	51.342745
23	0.939435	51.330227	52	0.910146	51.342800
24	0.940813	51.332127	53	0.904428	51.342349
25	0.943037	51.332213	54	0.902522	51.341755
26	0.942533	51.332753	55	0.901034	51.341572
27	0.941656	51.333978	56	0.899376	51.340911
28	0.941127	51.334618	57	0.898218	51.340017
29	0.940860	51.335172	58	0.897471	51.339071

Panel Area (Issue 2)

No.	Longitude (°)	Latitude (°)	No.	Longitude (°)	Latitude (°)
01	0.897281	51.337586	28	0.941101	51.333051
02	0.904708	51.337594	29	0.939813	51.335037
03	0.906704	51.336926	30	0.939658	51.335511
04	0.910115	51.336212	31	0.939300	51.335446
05	0.912908	51.334594	32	0.936898	51.334898
06	0.913466	51.333583	33	0.936853	51.335292
07	0.914658	51.333568	34	0.936570	51.335575
08	0.914553	51.332393	35	0.935811	51.335941
09	0.915289	51.331976	36	0.935663	51.336176
10	0.916483	51.331517	37	0.935702	51.336477
11	0.917858	51.331254	38	0.935636	51.336684
12	0.920392	51.331711	39	0.934866	51.337403
13	0.920800	51.331441	40	0.934909	51.338066
14	0.924934	51.332262	41	0.934325	51.341155
15	0.925240	51.332861	42	0.937353	51.341383
16	0.927233	51.333224	43	0.936991	51.346151
17	0.928982	51.332861	44	0.936434	51.346149
18	0.931610	51.334100	45	0.931505	51.345040
19	0.932067	51.334018	46	0.924969	51.343661
20	0.932801	51.333796	47	0.914870	51.342436
21	0.933308	51.333451	48	0.912870	51.342745
22	0.933069	51.330620	49	0.910146	51.342800
23	0.939435	51.330227	50	0.904428	51.342349
24	0.940813	51.332127	51	0.902522	51.341755
25	0.941186	51.332437	52	0.901034	51.341572
26	0.941547	51.332561	53	0.899376	51.340911
27	0.897281	51.337586	54	0.898218	51.340017

Road receptors

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
01	0.941481	51.321363	07	0.948009	51.331116
02	0.942225	51.323102	08	0.949557	51.332632
03	0.943443	51.324731	09	0.951517	51.333960
04	0.945406	51.326047	10	0.951951	51.335734
05	0.946772	51.327631	11	0.952831	51.337448
06	0.947777	51.329322	12	0.954814	51.338751

Dwelling receptors

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
01	0.888068	51.340538	42	0.942680	51.323198
02	0.887749	51.340553	43	0.942719	51.323308
03	0.887731	51.340483	44	0.942755	51.323423
04	0.887712	51.340407	45	0.942932	51.323569
05	0.887696	51.340327	46	0.942996	51.323672
06	0.887683	51.340254	47	0.943147	51.323801
07	0.894977	51.335755	48	0.943201	51.323878
08	0.894789	51.335646	49	0.943366	51.324032
09	0.894848	51.335485	50	0.943613	51.324329
10	0.894852	51.335298	51	0.943767	51.324971
11	0.896355	51.327925	52	0.944867	51.326676
12	0.898164	51.327137	53	0.946540	51.326603
13	0.899801	51.327086	54	0.946692	51.326735
14	0.914096	51.331841	55	0.946774	51.326879
15	0.914681	51.330971	56	0.946796	51.327043
16	0.915048	51.330973	57	0.947072	51.327254
17	0.924234	51.331562	58	0.946932	51.327387
18	0.926121	51.326400	59	0.946837	51.327481
19	0.926099	51.326233	60	0.947864	51.330265
20	0.926112	51.325866	61	0.948494	51.330304
21	0.932785	51.328956	62	0.947923	51.330614
22	0.935045	51.328030	63	0.947903	51.330742
23	0.934790	51.327383	64	0.947696	51.330870
24	0.934766	51.327086	65	0.947844	51.331217
25	0.934923	51.326865	66	0.947993	51.331416

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
26	0.935354	51.326894	67	0.948033	51.331596
27	0.933969	51.326137	68	0.947692	51.331685
28	0.934146	51.326026	69	0.947600	51.331776
29	0.937273	51.326565	70	0.947737	51.331885
30	0.937456	51.326574	71	0.947778	51.332009
31	0.939273	51.322343	72	0.947651	51.332119
32	0.940540	51.322382	73	0.947506	51.332177
33	0.940827	51.322393	74	0.948270	51.331820
34	0.940982	51.322343	75	0.948626	51.332219
35	0.941166	51.322291	76	0.948742	51.332329
36	0.942200	51.322630	77	0.948957	51.332418
37	0.942238	51.322707	78	0.947580	51.332600
38	0.942296	51.322834	79	0.947040	51.335384
39	0.942440	51.322927	80	0.941525	51.336243
40	0.942538	51.323023	81	0.941456	51.336359
41	0.888068	51.340538	82	0.939833	51.336677

Footpath receptors

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
01	0.916604	51.330190	26	0.918821	51.343542
02	0.915085	51.331146	27	0.920907	51.343865
03	0.914534	51.332452	28	0.923017	51.344189
04	0.912677	51.333145	29	0.925103	51.344510
05	0.911904	51.334410	30	0.927192	51.344862
06	0.910430	51.335403	31	0.929224	51.345236
07	0.908390	51.335841	32	0.931287	51.345615
08	0.906428	51.336401	33	0.933548	51.346090
09	0.904606	51.337121	34	0.935594	51.346527
10	0.902590	51.336621	35	0.937751	51.346609
11	0.900446	51.336436	36	0.939909	51.346515
12	0.898298	51.336565	37	0.942030	51.346254
13	0.896362	51.337180	38	0.944136	51.345992
14	0.896630	51.338521	39	0.946255	51.345725
15	0.897006	51.339855	40	0.948366	51.345428
16	0.898183	51.340989	41	0.914687	51.333806

ID	Longitude (°)	Latitude (°)	ID	Longitude (°)	Latitude (°)
17	0.899963	51.341755	42	0.915132	51.335132
18	0.901983	51.342232	43	0.914983	51.336483
19	0.903935	51.342799	44	0.916134	51.337615
20	0.906048	51.343072	45	0.918036	51.338260
21	0.908174	51.343284	46	0.919688	51.339131
22	0.910286	51.343577	47	0.919300	51.340463
23	0.912440	51.343619	48	0.918728	51.341767
24	0.914530	51.343278	49	0.918705	51.343121
25	0.916685	51.343356			

APPENDIX H – GEOMETRIC CALCULATION RESULTS

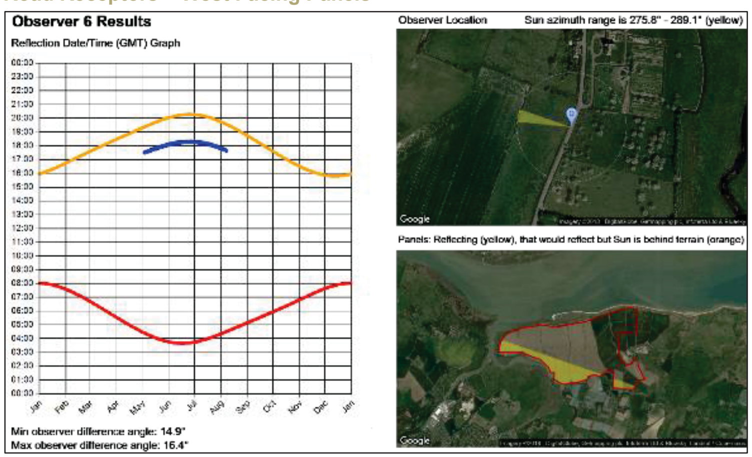
Overview

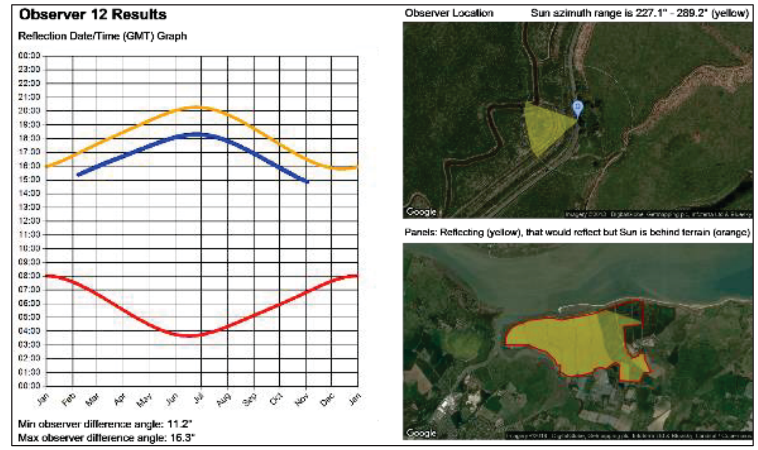
The charts for the receptors are shown below and on the following pages. Each chart shows:

- The receptor (observer) location – top right image. This also shows the azimuth range of the Sun itself at times when reflections are possible.
- The reflecting panels within the site boundary – bottom right image. Reflections are geometrically possible from the yellow areas only, the visibility of these areas is critical.
- The reflection date/time graph – left hand side of the image. The blue line indicates the dates and times that reflections are possible (without considering intervening screening).
- The sunrise and sunset times throughout the year – represented by the red and yellow curves on the main chart respectively.

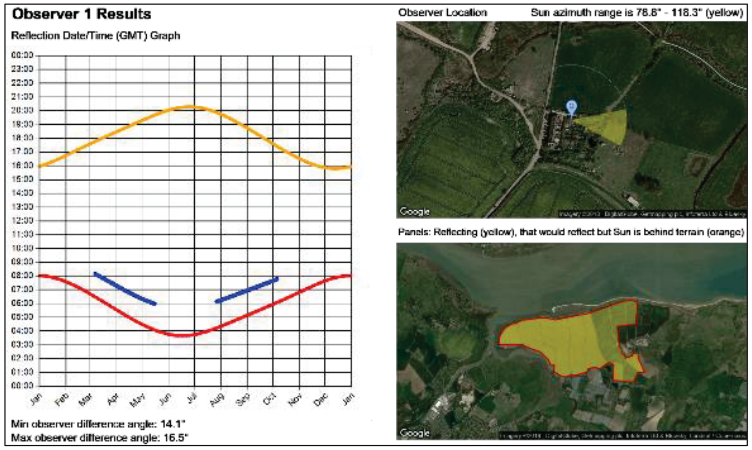
Results are presented where effects are considered possible. This excludes locations that are screened, following a desk-based assessment of terrain elevations and vegetation/foliage levels.

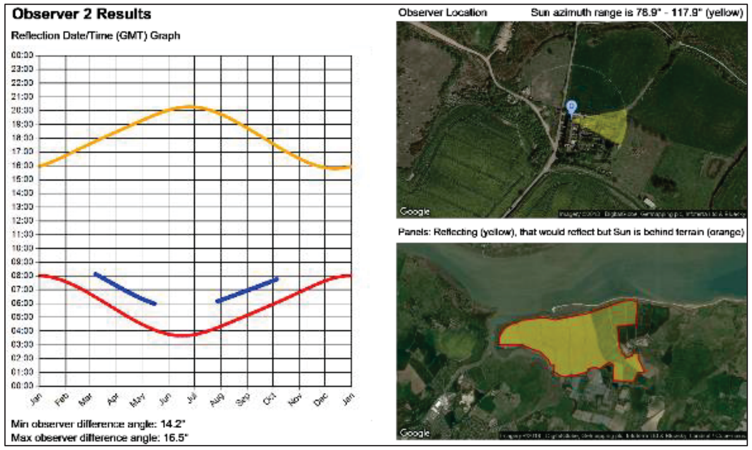
Road Receptors – West Facing Panels

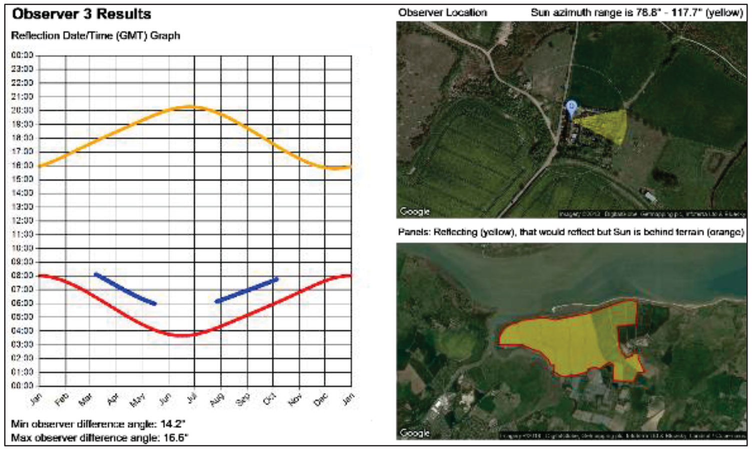


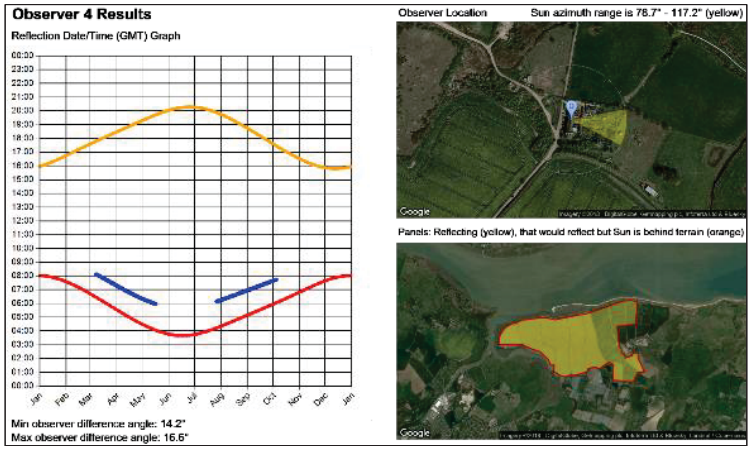


Dwelling Receptors – West Facing Panels



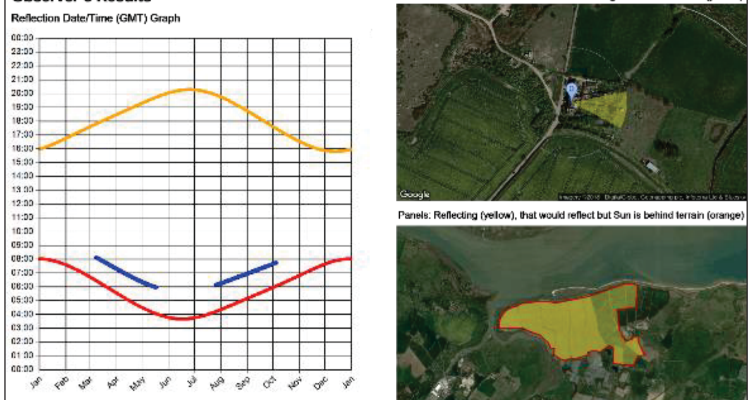






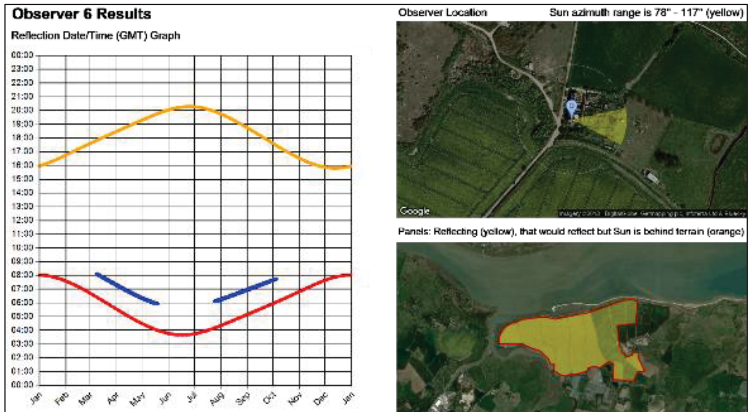
PAGERPOWER

Observer 5 Results



Min observer difference angle: 14.3°
Max observer difference angle: 16.7°

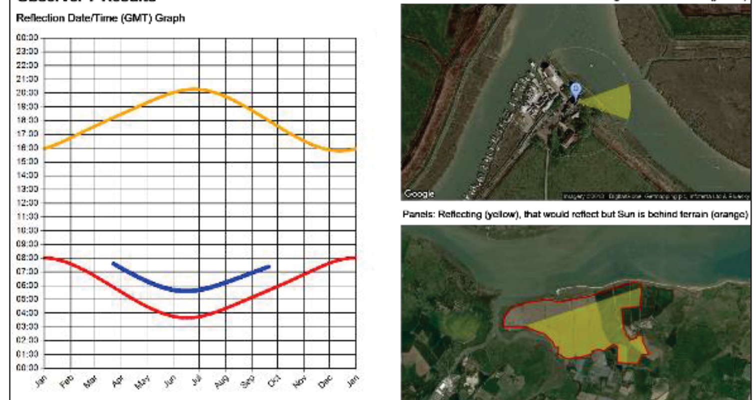
Observer 6 Results



Min observer difference angle: 14.3°
Max observer difference angle: 16.7°

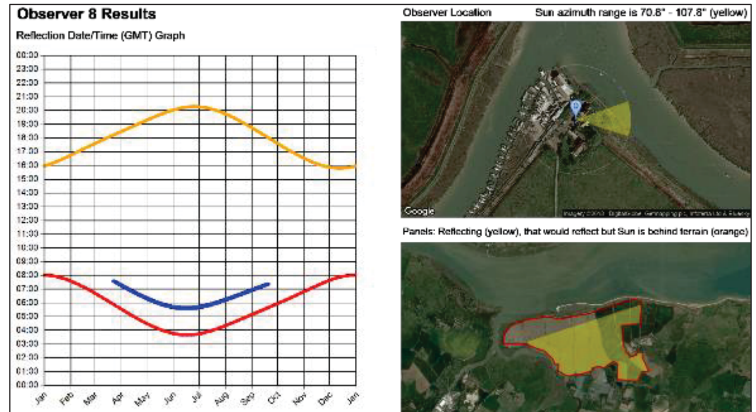
PAGERPOWER

Observer 7 Results

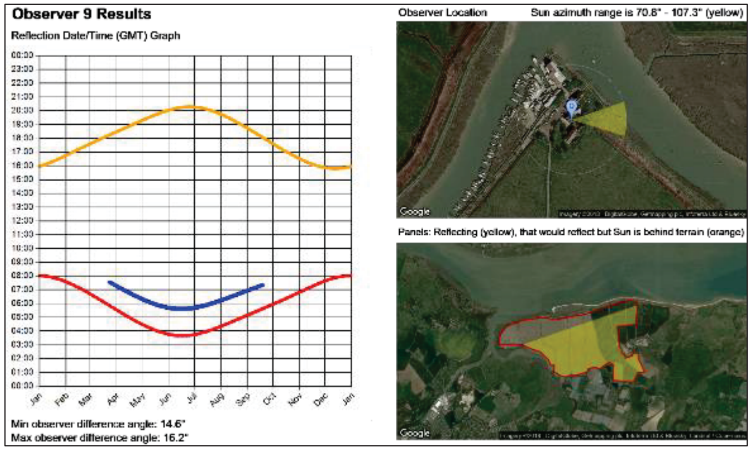


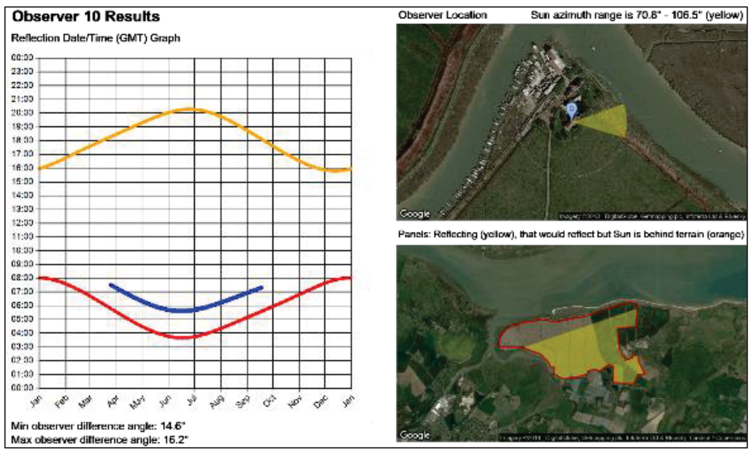
Min observer difference angle: 14.5°
Max observer difference angle: 16.1°

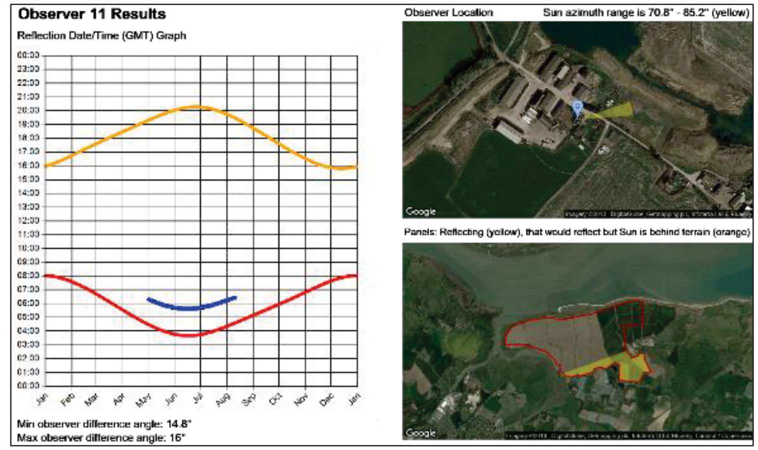
Observer 8 Results

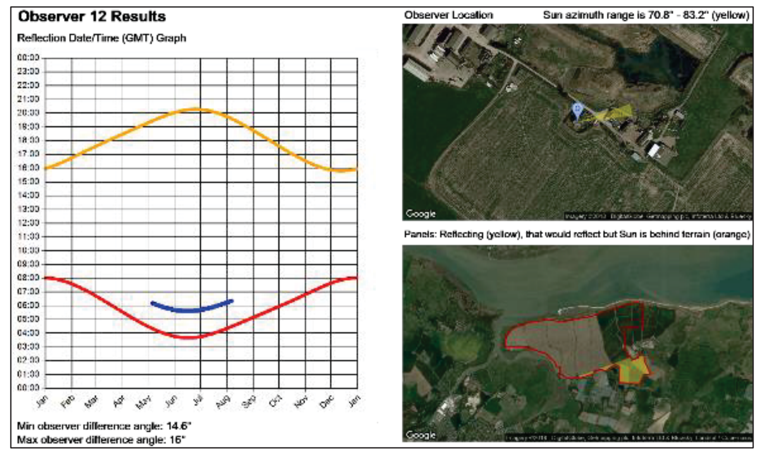


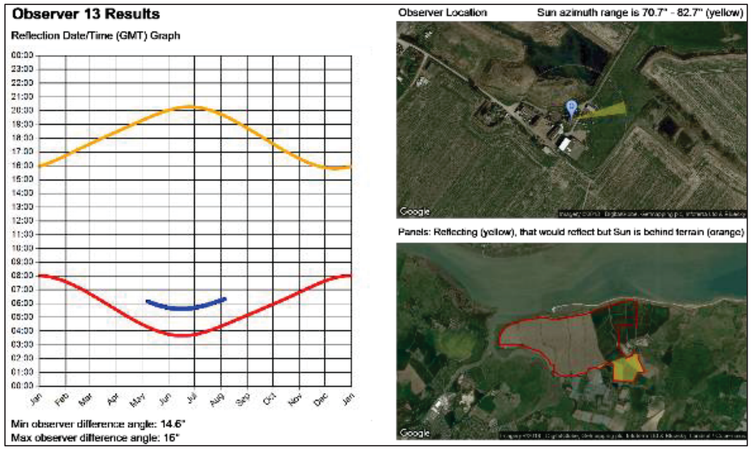
Min observer difference angle: 14.6°
Max observer difference angle: 16.1°

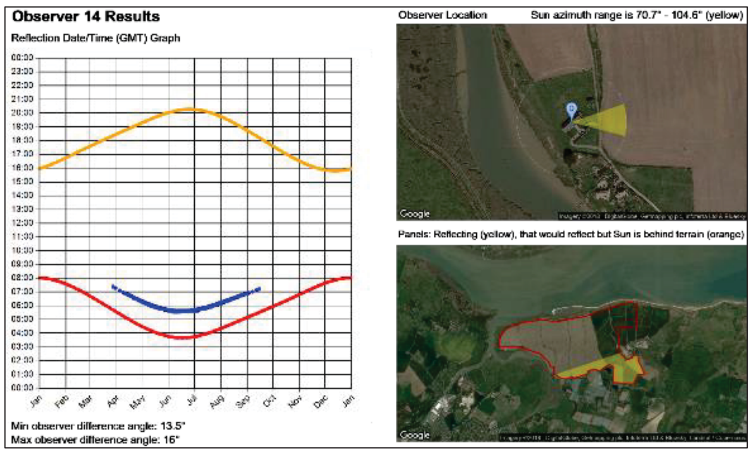

Observer 9 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.6°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 70.8° - 107.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

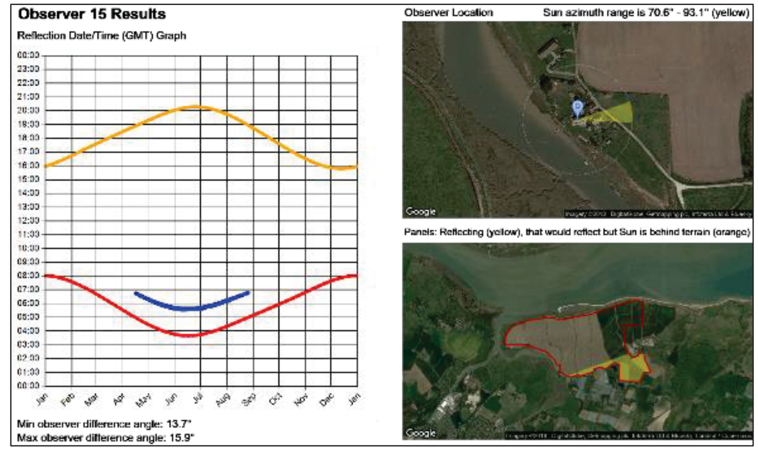

Observer 10 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.6°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 70.8° - 106.5° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

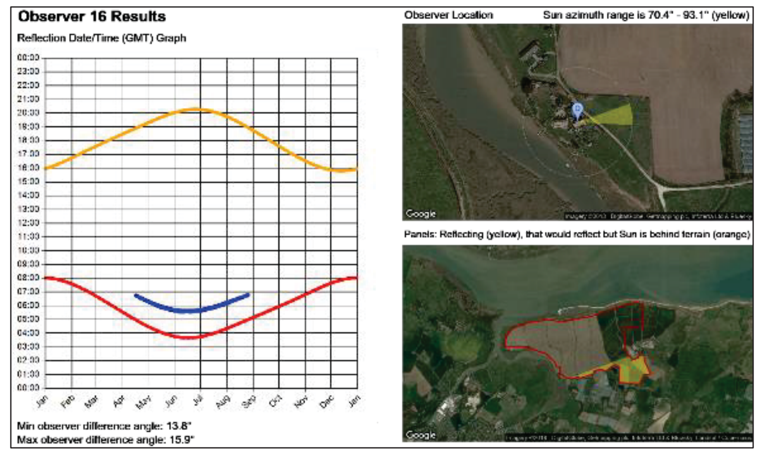

Observer 11 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.8°
Max observer difference angle: 16°
Observer Location
Sun azimuth range is 70.8° - 85.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

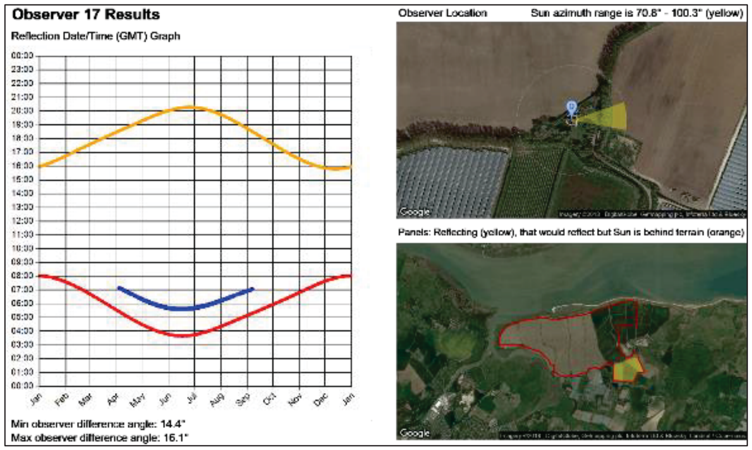

Observer 12 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.6°
Max observer difference angle: 16°
Observer Location
Sun azimuth range is 70.8° - 83.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

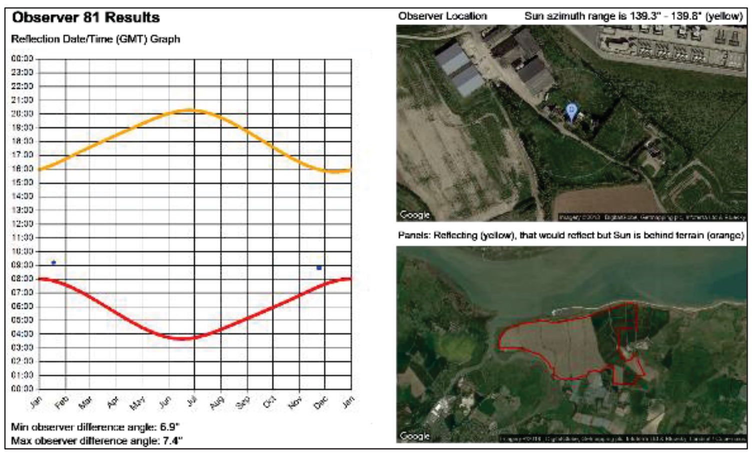

Observer 13 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.6°
Max observer difference angle: 16°
Observer Location
Sun azimuth range is 70.7° - 82.7° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

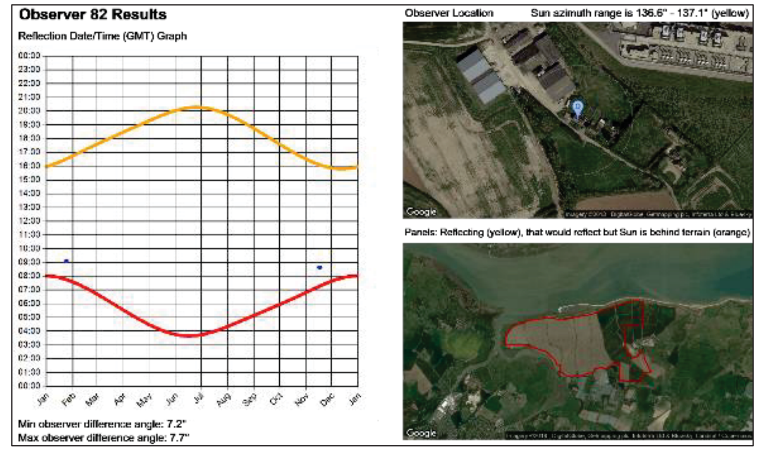

Observer 14 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 13.5°
Max observer difference angle: 16°
Observer Location
Sun azimuth range is 70.7° - 104.6° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


Observer 15 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 13.7°
Max observer difference angle: 15.9°
Observer Location
Sun azimuth range is 70.6° - 93.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

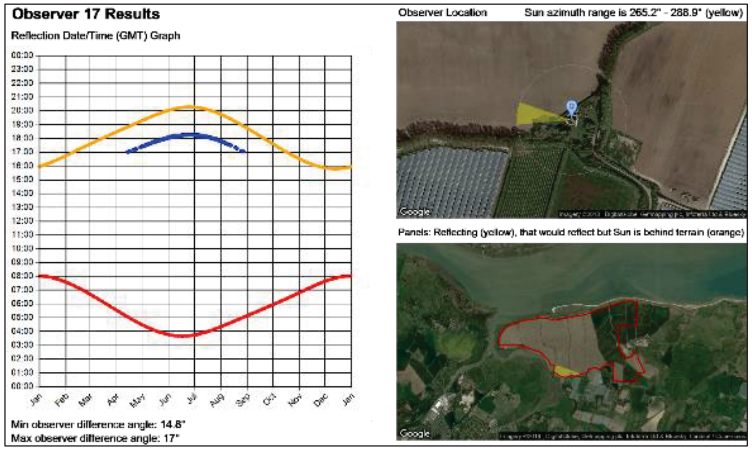

Observer 16 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 13.8°
Max observer difference angle: 15.9°
Observer Location
Sun azimuth range is 70.4° - 93.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

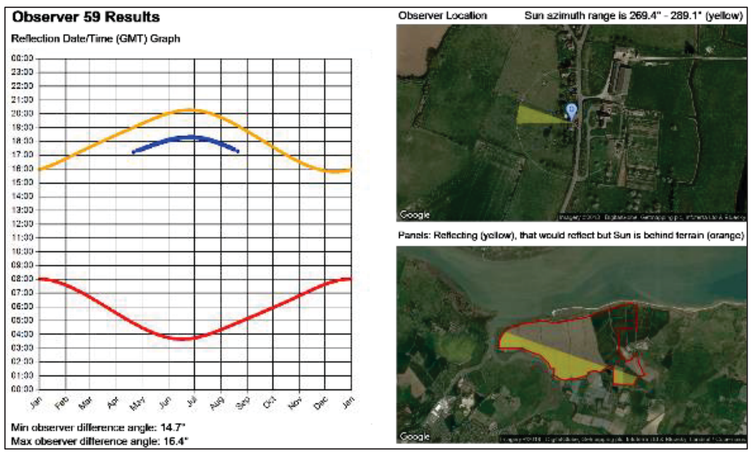

Observer 17 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.8° - 100.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 14.4°
Max observer difference angle: 16.1°

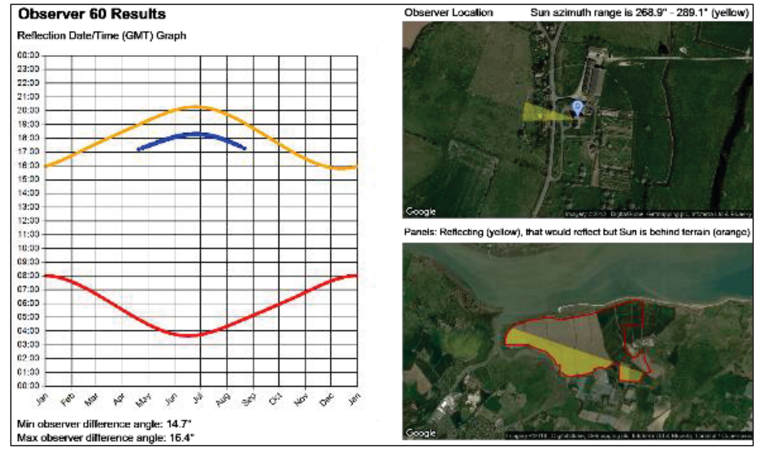

Observer 81 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 139.3° - 139.8° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.9°
Max observer difference angle: 7.4°

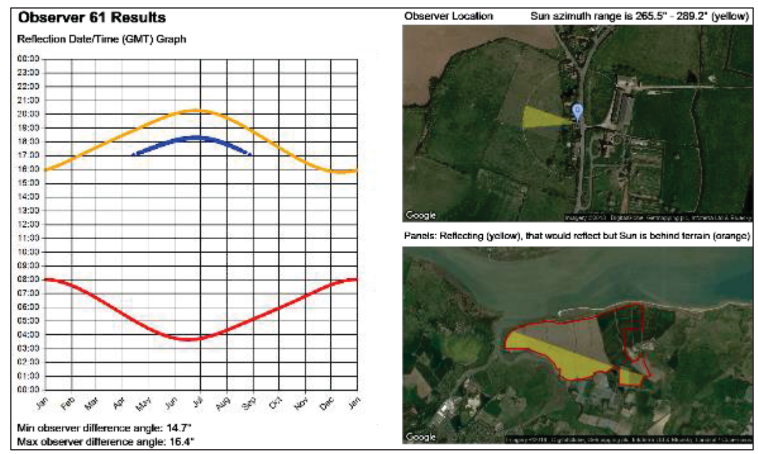

Observer 82 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 136.6° - 137.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.2°
Max observer difference angle: 7.7°

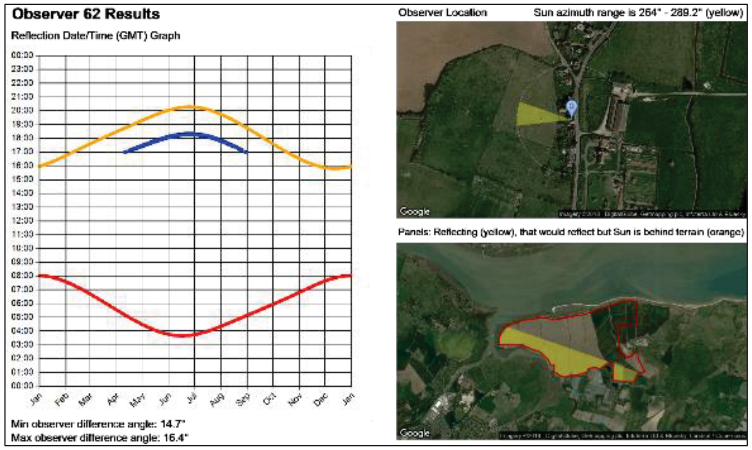
Dwelling Receptors – East Facing Panels

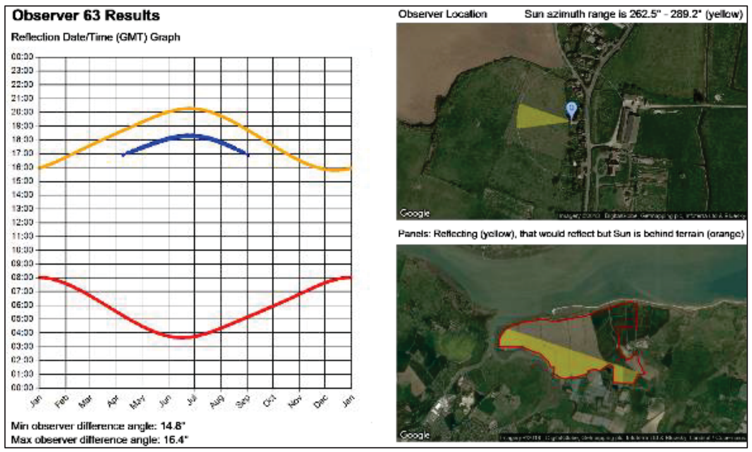


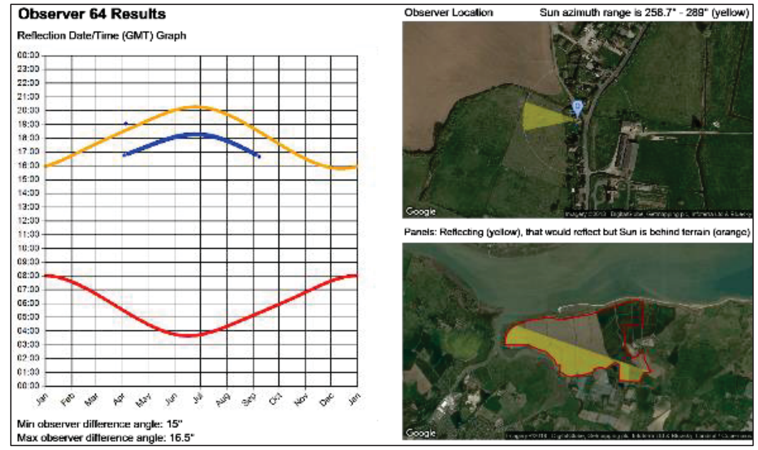


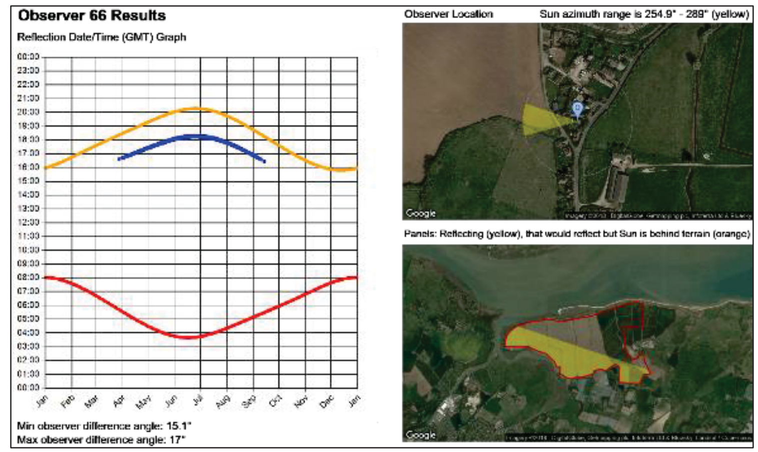


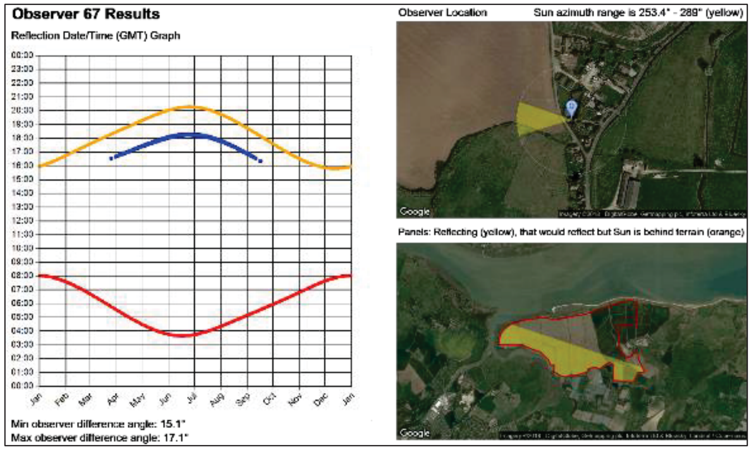


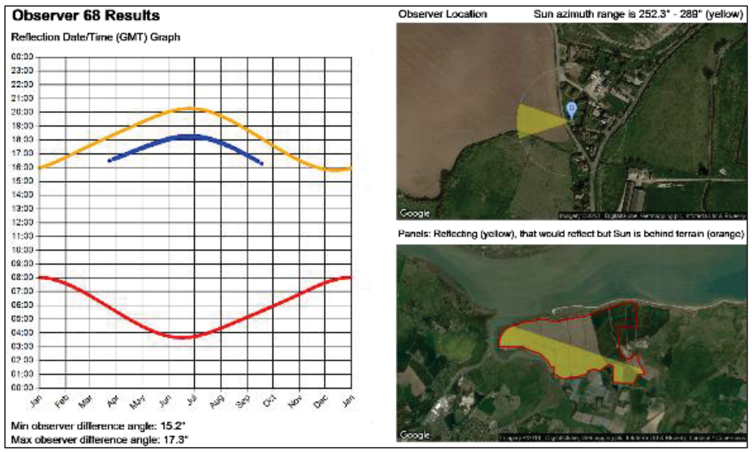

Observer 62 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.7°
Max observer difference angle: 16.4°
Observer Location
Sun azimuth range is 264° - 289.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

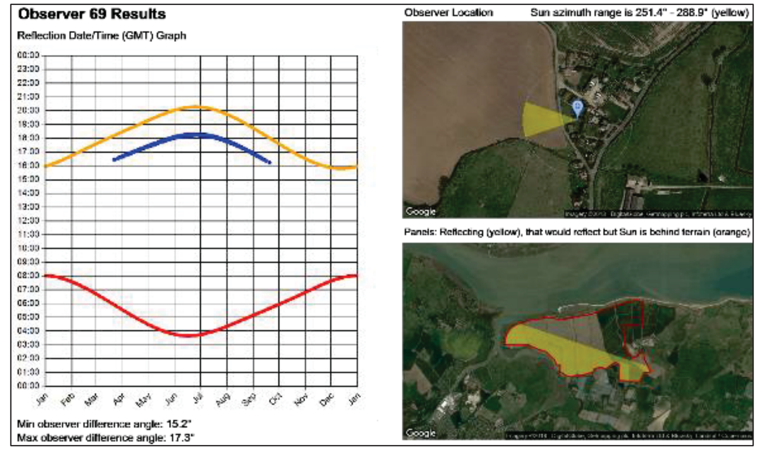

Observer 63 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 14.8°
Max observer difference angle: 16.4°
Observer Location
Sun azimuth range is 262.5° - 289.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

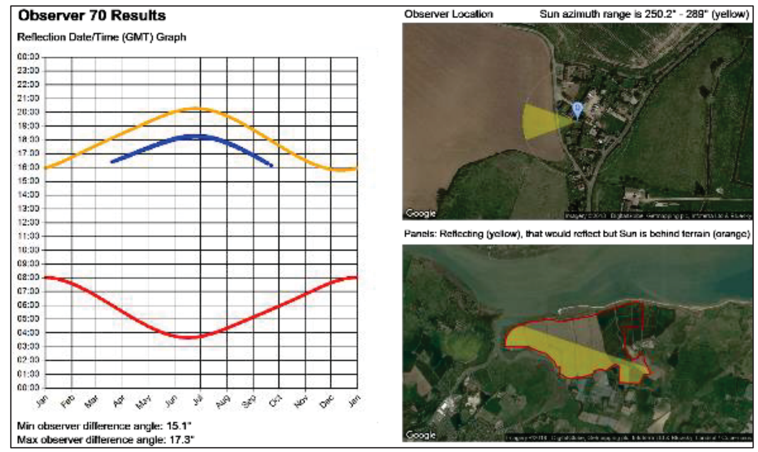

Observer 64 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 15°
Max observer difference angle: 16.5°
Observer Location
Sun azimuth range is 258.7° - 289° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

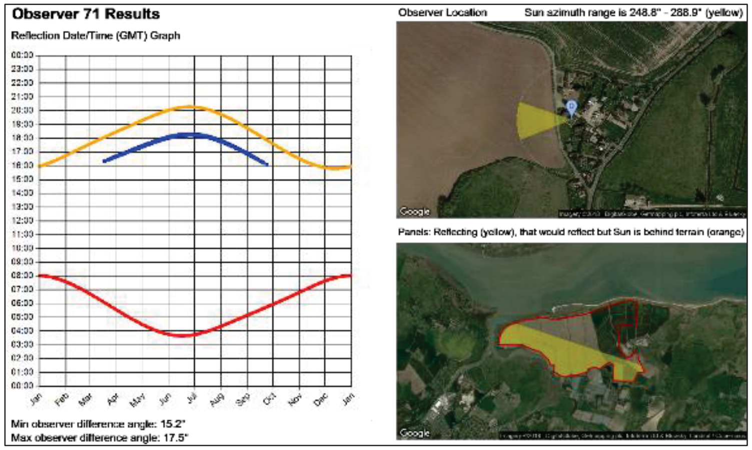

Observer 66 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 15.1°
Max observer difference angle: 17°
Observer Location
Sun azimuth range is 254.9° - 289° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

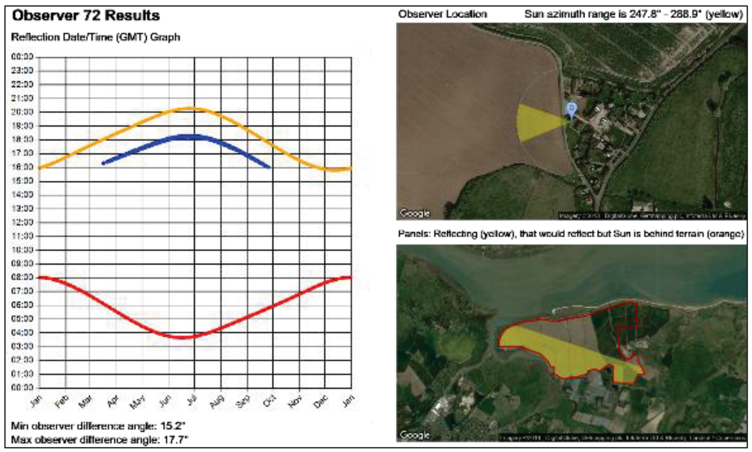

Observer 67 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 253.4° - 289° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15.1°
Max observer difference angle: 17.1°

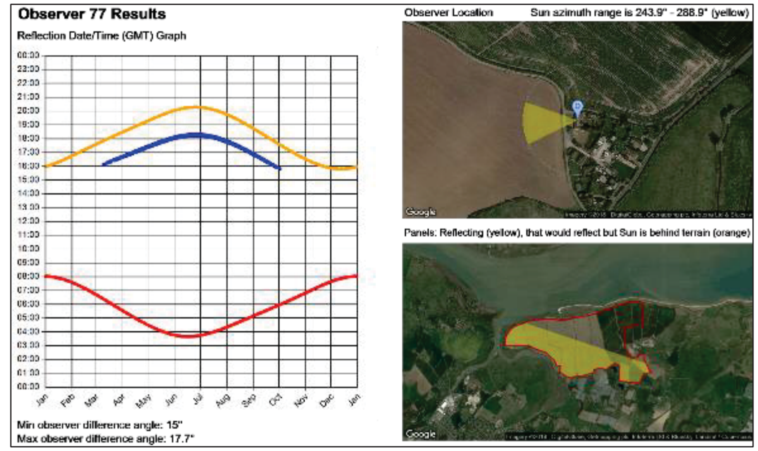

Observer 68 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 252.3° - 289° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15.2°
Max observer difference angle: 17.3°

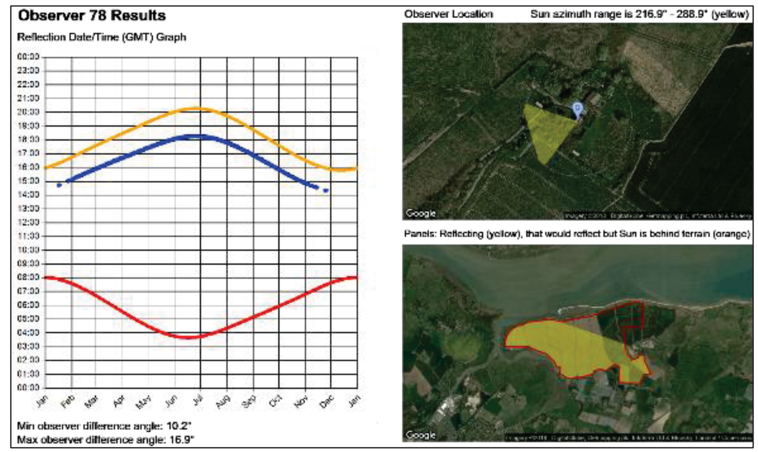

Observer 69 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 251.4° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15.2°
Max observer difference angle: 17.3°

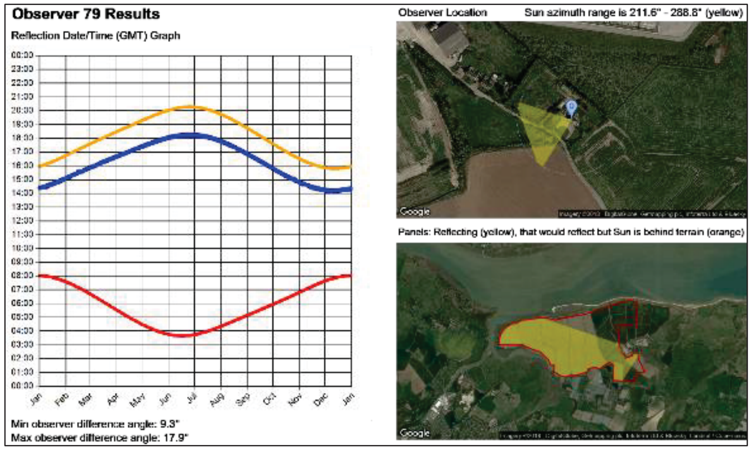

Observer 70 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 250.2° - 289° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15.1°
Max observer difference angle: 17.3°

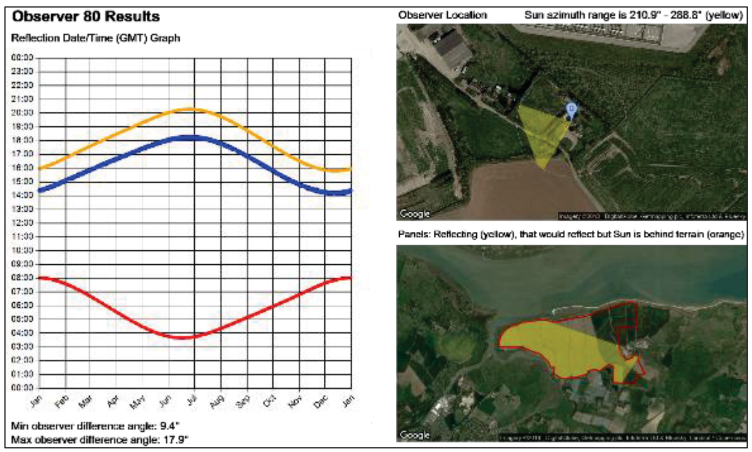

Observer 71 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 248.8° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15.2°
Max observer difference angle: 17.5°

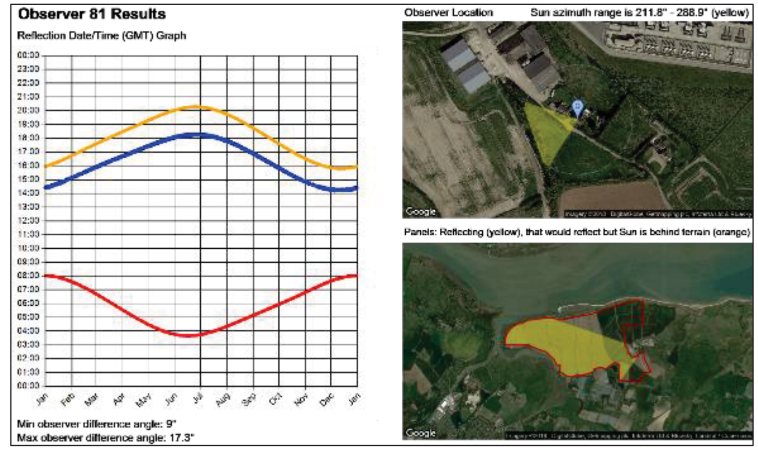

Observer 72 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 247.8° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15.2°
Max observer difference angle: 17.7°

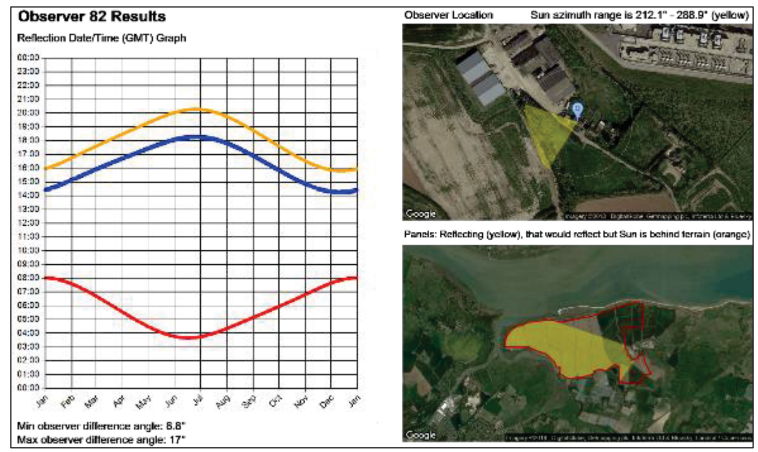

Observer 77 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 243.9° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 15°
Max observer difference angle: 17.7°


Observer 78 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 216.9° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 10.2°
Max observer difference angle: 16.9°

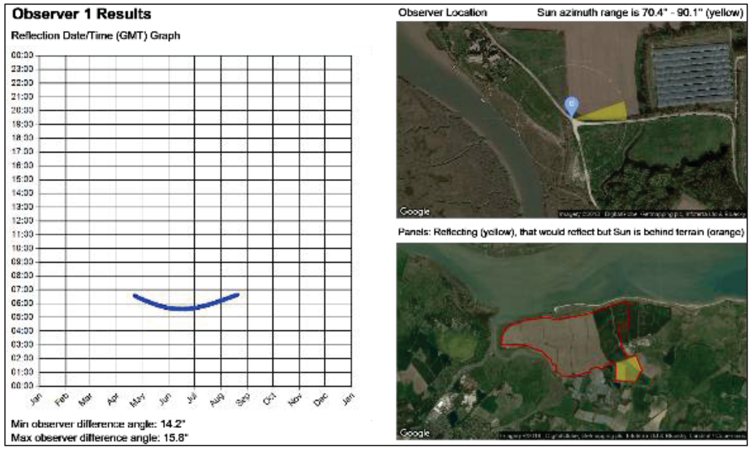

Observer 79 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 211.6° - 288.8° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 9.3°
Max observer difference angle: 17.9°

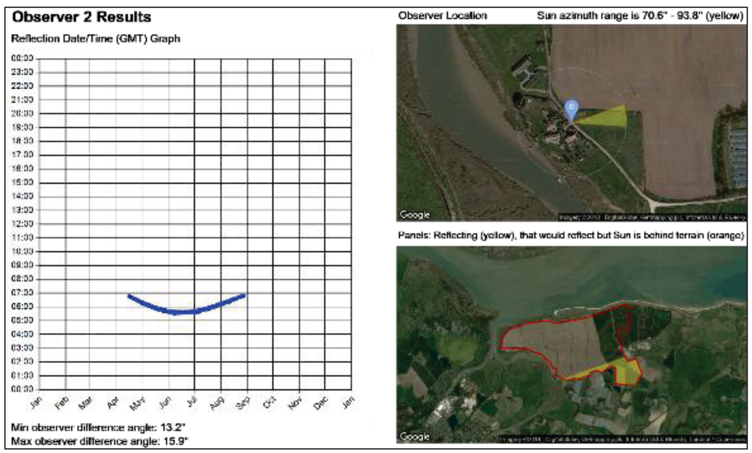

Observer 80 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 210.9° - 288.8° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 9.4°
Max observer difference angle: 17.9°

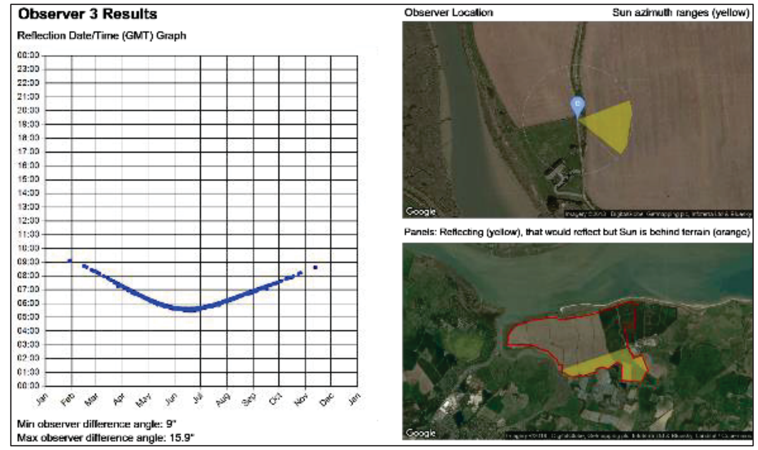

Observer 81 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 211.8° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 9°
Max observer difference angle: 17.3°

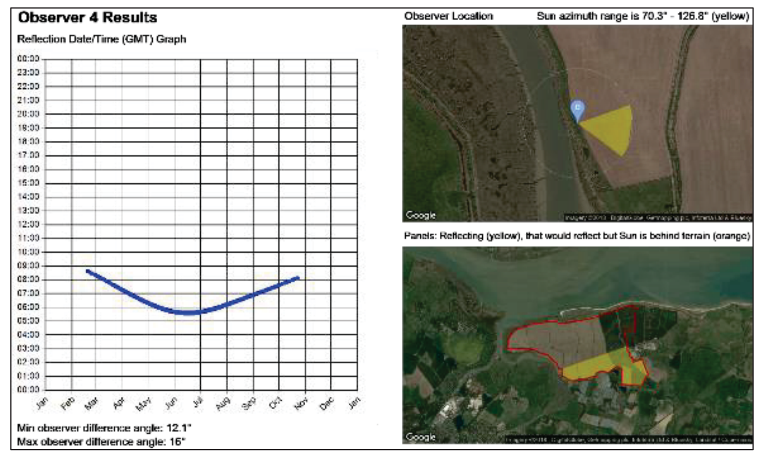

Observer 82 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.1° - 288.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.8°
Max observer difference angle: 17°

Footpath Receptors – West Facing Panels



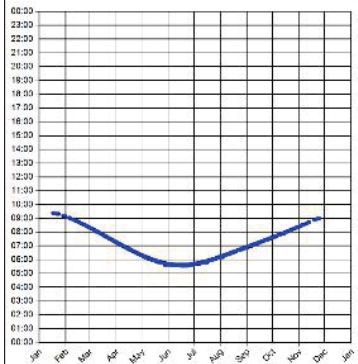






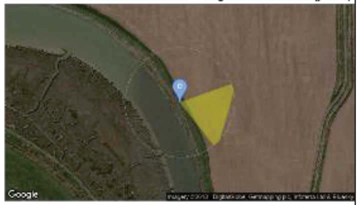
Observer 5 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 9.4°
Max observer difference angle: 16°

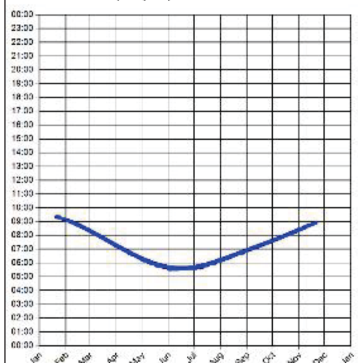
Observer Location — Sun azimuth range is 70.3° - 141.9° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 6 Results

Reflection Date/Time (GMT) Graph



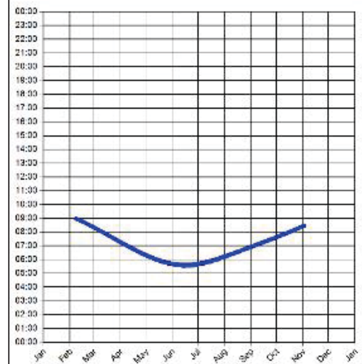
Min observer difference angle: 9.7°
Max observer difference angle: 16°

Observer Location — Sun azimuth range is 70.8° - 140.7° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 7 Results

Reflection Date/Time (GMT) Graph



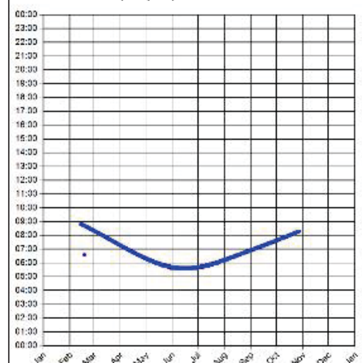
Min observer difference angle: 11.5°
Max observer difference angle: 16°

Observer Location — Sun azimuth range is 70.2° - 133.2° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 8 Results

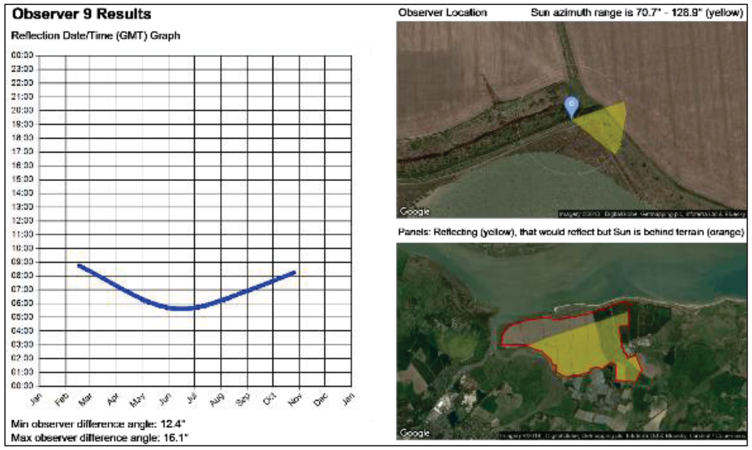
Reflection Date/Time (GMT) Graph

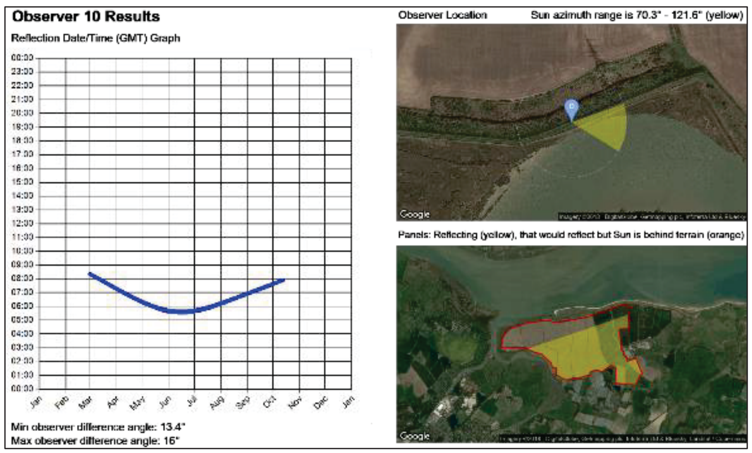


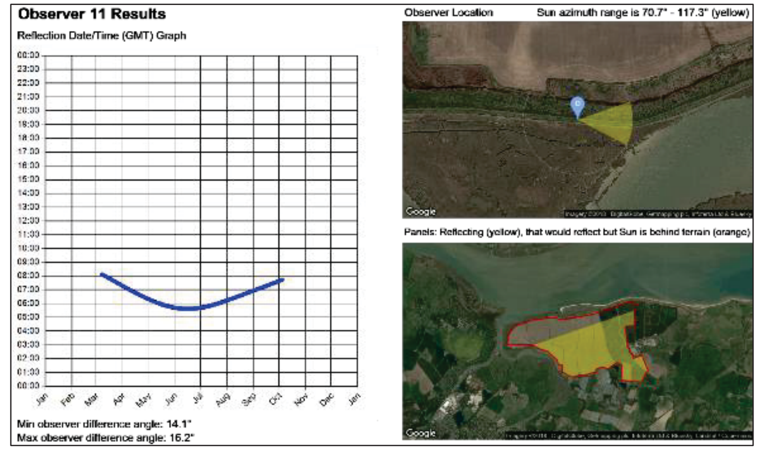
Min observer difference angle: 12.1°
Max observer difference angle: 16°

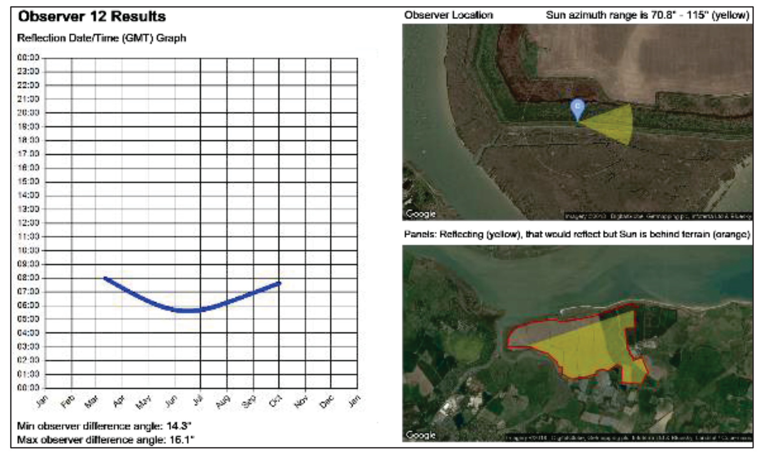
Observer Location — Sun azimuth range is 70.7° - 129.9° (yellow)

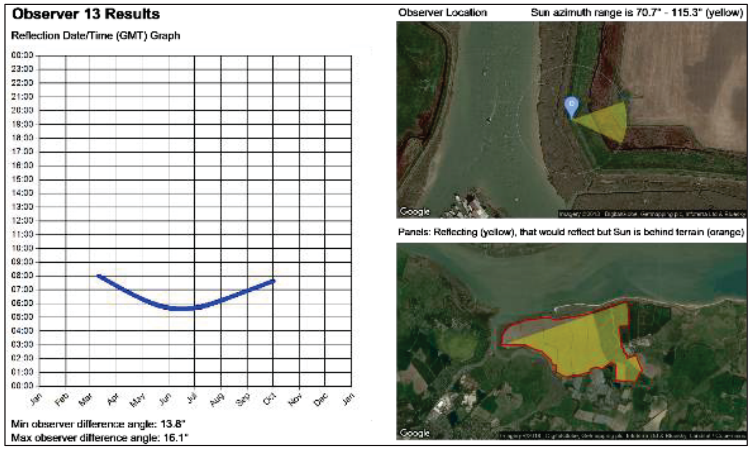
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

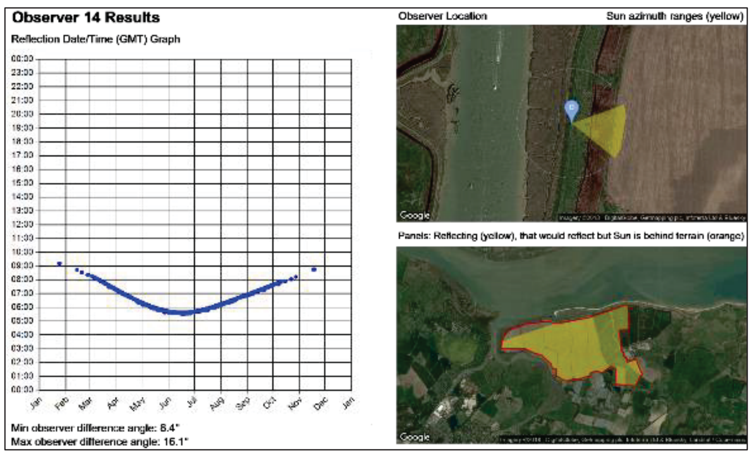

Observer 9 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.7° - 128.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 12.4°
Max observer difference angle: 16.1°

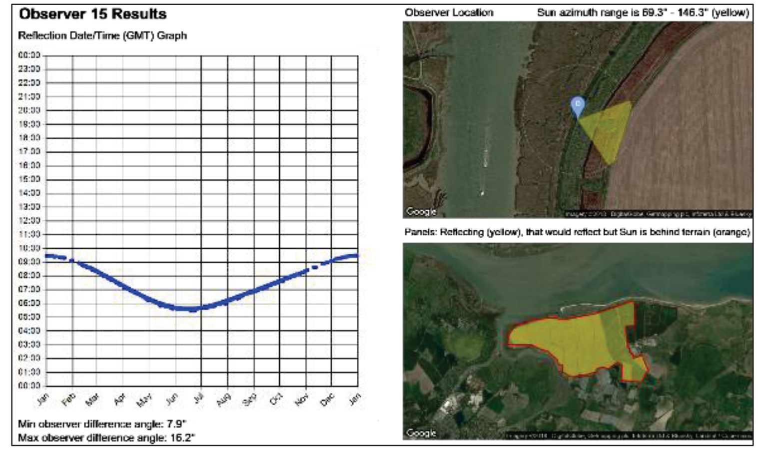

Observer 10 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.3° - 121.6° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 13.4°
Max observer difference angle: 16°

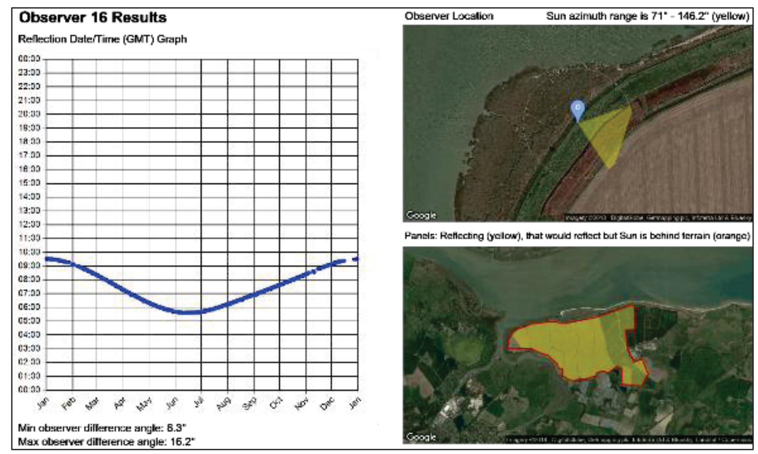

Observer 11 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.7° - 117.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 14.1°
Max observer difference angle: 16.2°

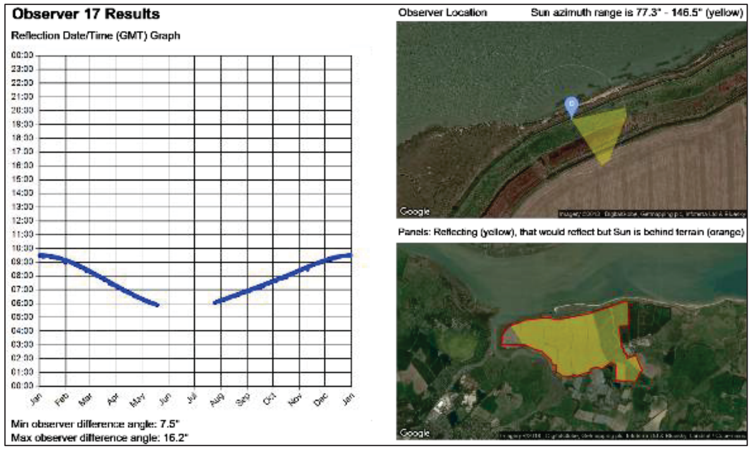

Observer 12 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.8° - 115° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 14.3°
Max observer difference angle: 16.1°

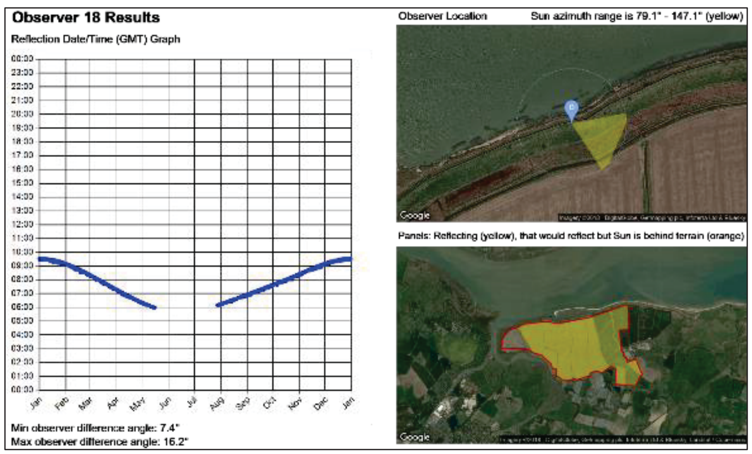

Observer 13 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.7° - 115.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 13.8°
Max observer difference angle: 16.1°

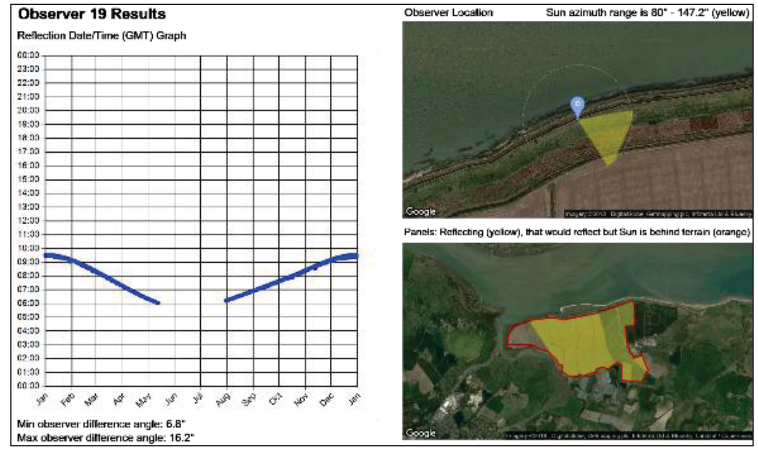

Observer 14 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth ranges (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.4°
Max observer difference angle: 16.1°

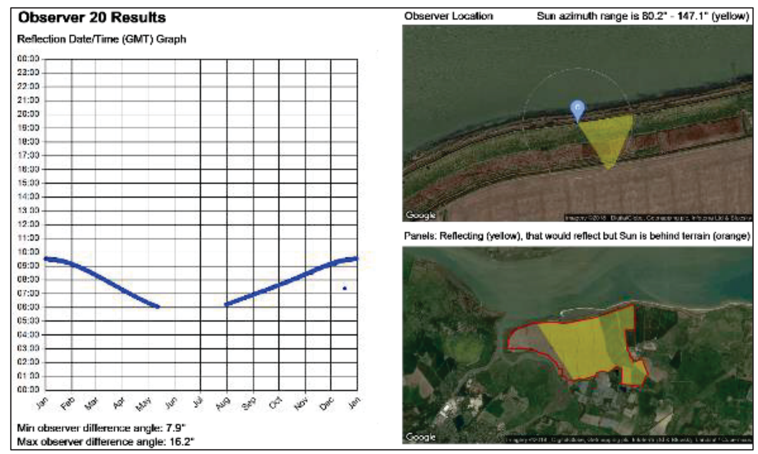

Observer 15 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 69.3° - 146.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.9°
Max observer difference angle: 16.2°

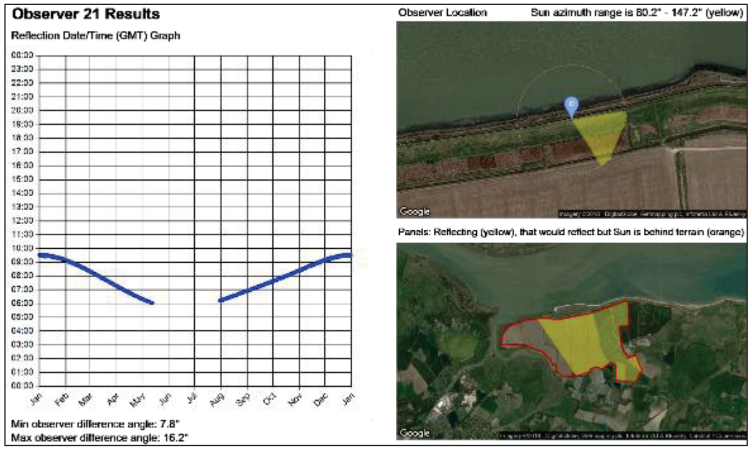

Observer 16 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 71° - 146.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.3°
Max observer difference angle: 16.2°

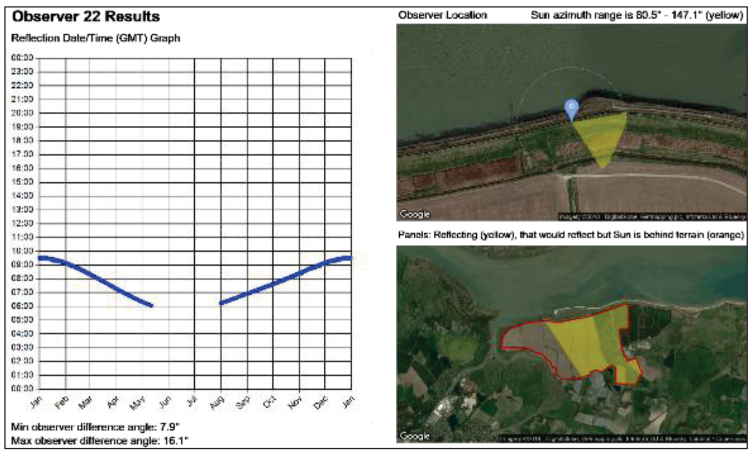

Observer 17 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.5°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 77.3° - 146.5° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

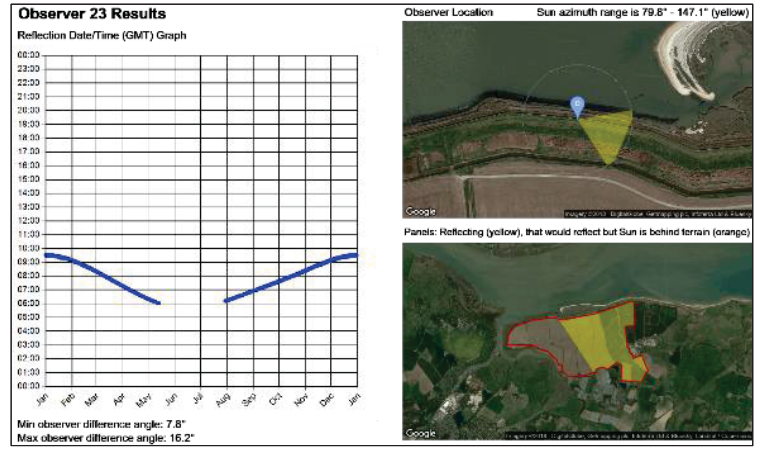

Observer 18 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.4°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 79.1° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

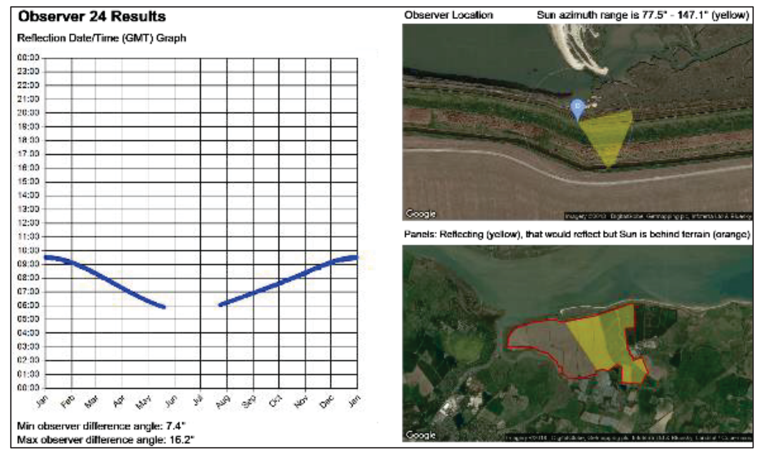

Observer 19 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 6.8°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 80° - 147.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

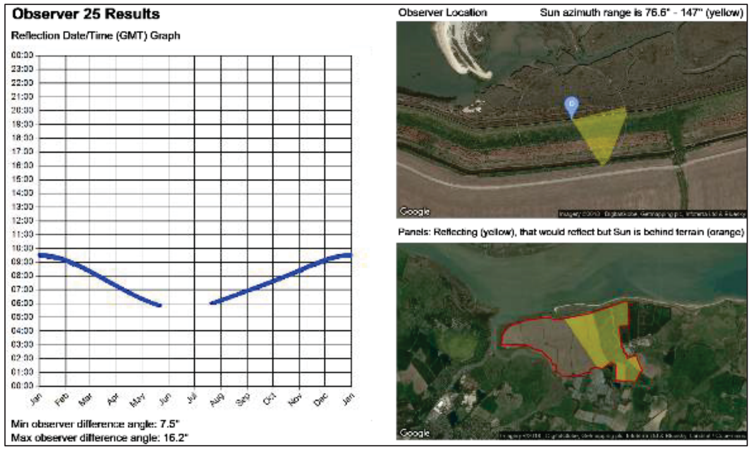

Observer 20 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.9°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 80.2° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

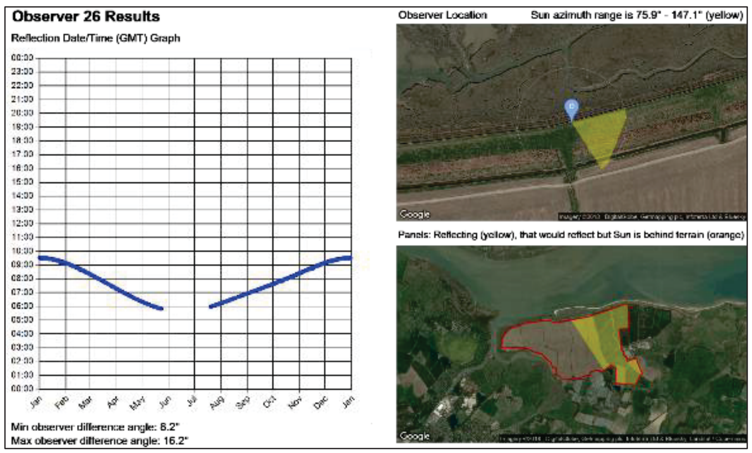

Observer 21 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.8°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 80.2° - 147.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

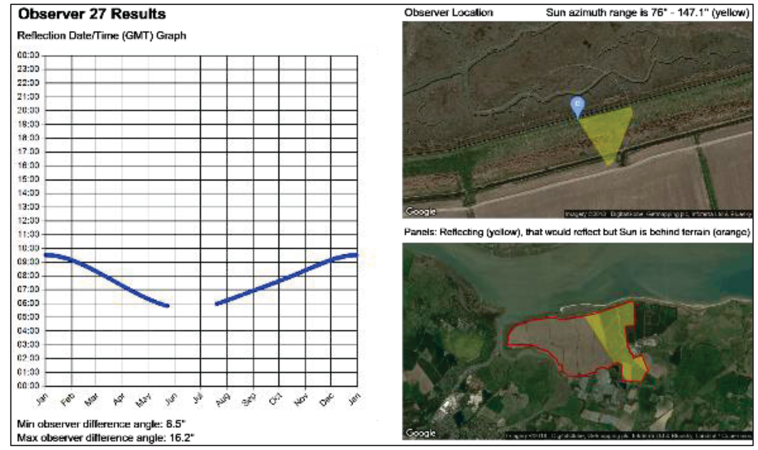

Observer 22 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.9°
Max observer difference angle: 16.1°
Observer Location
Sun azimuth range is 80.5° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

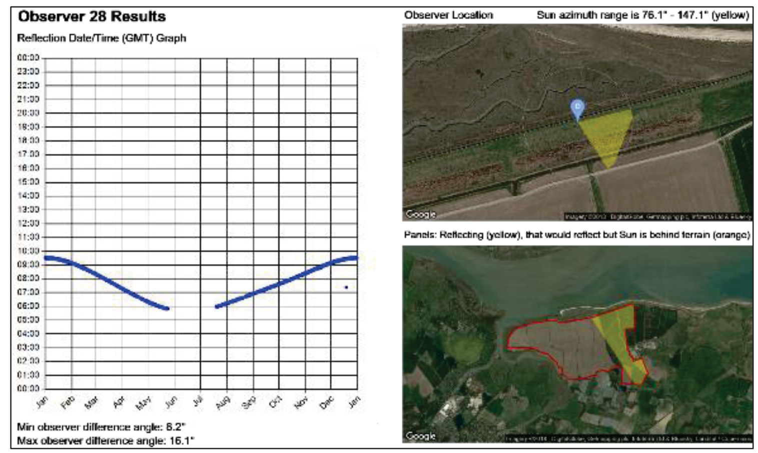

Observer 23 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.8°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 79.8° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

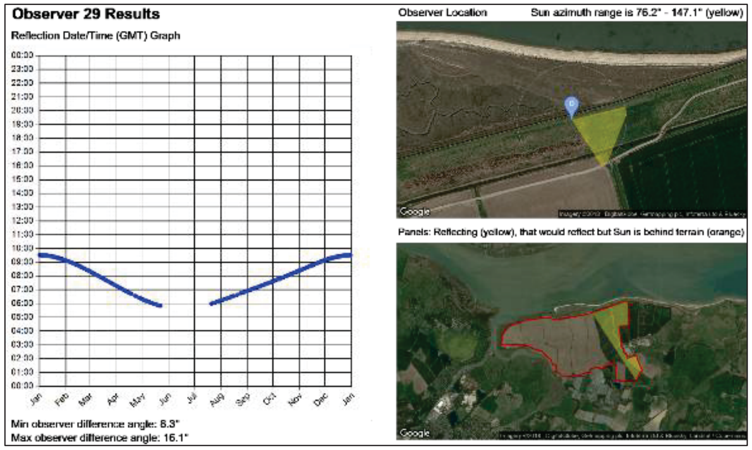

Observer 24 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.4°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 77.5° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

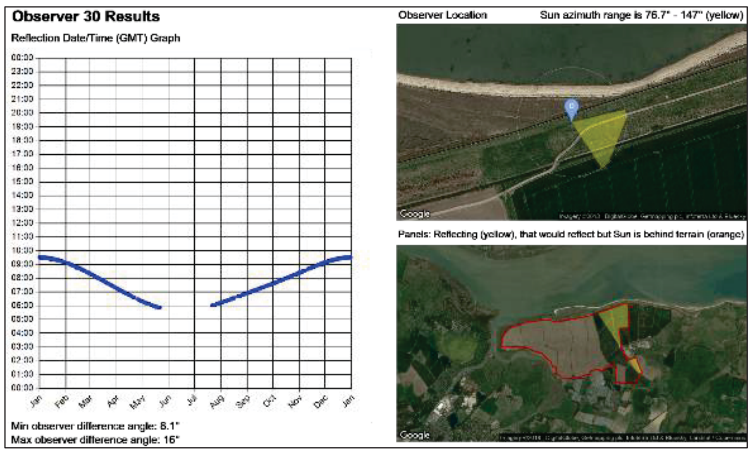

Observer 25 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 7.5°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 76.6° - 147° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


Observer 26 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 8.2°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 75.9° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


Observer 27 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 8.5°
Max observer difference angle: 16.2°
Observer Location
Sun azimuth range is 76° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


Observer 28 Results
Reflection Date/Time (GMT) Graph
Min observer difference angle: 8.2°
Max observer difference angle: 16.1°
Observer Location
Sun azimuth range is 76.1° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)


Observer 29 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 76.2° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.3°
Max observer difference angle: 16.1°


Observer 30 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 76.7° - 147° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.1°
Max observer difference angle: 16°

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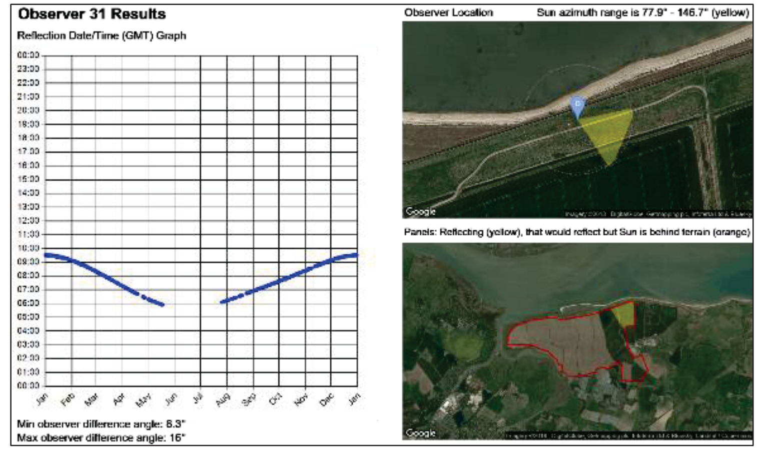
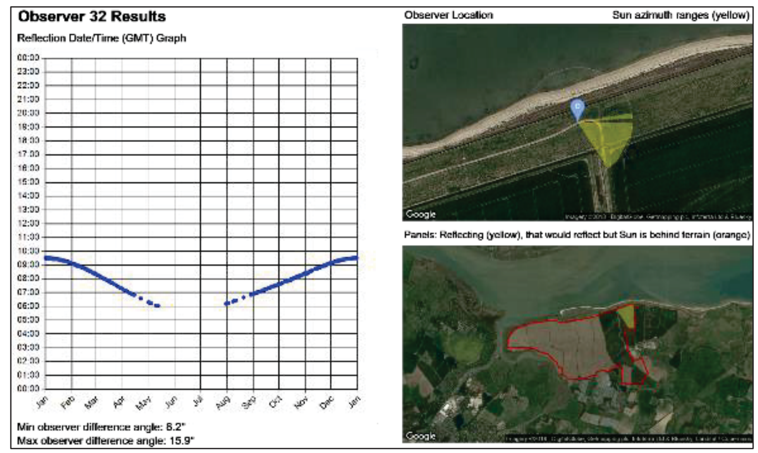
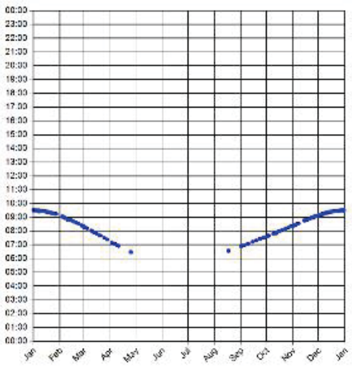

Observer 31 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 77.9° - 146.7° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.3°
Max observer difference angle: 16°


Observer 32 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth ranges (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.2°
Max observer difference angle: 15.9°

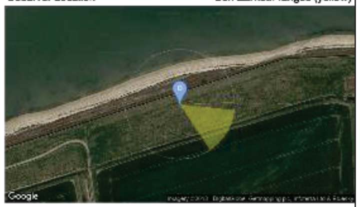
Observer 33 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 8°
Max observer difference angle: 15.6°

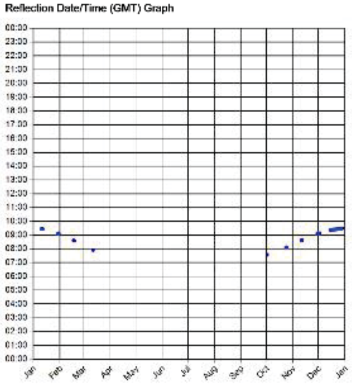
Observer Location — Sun azimuth ranges (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 34 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 7.7°
Max observer difference angle: 13.3°

Observer Location — Sun azimuth ranges (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

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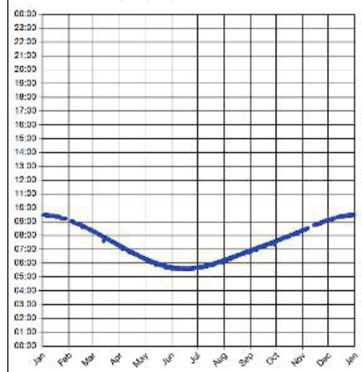
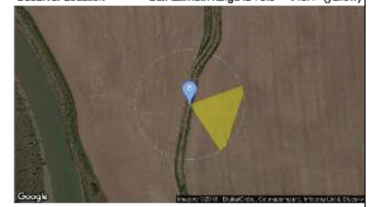
Observer 41 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 7.7°
Max observer difference angle: 15.9°

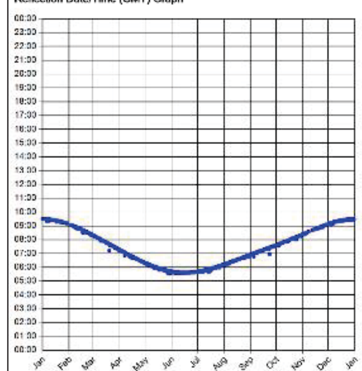
Observer Location — Sun azimuth range is 70.3° - 146.4° (yellow)



Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 42 Results

Reflection Date/Time (GMT) Graph



Min observer difference angle: 5.6°
Max observer difference angle: 15.9°

Observer Location — Sun azimuth range is 70.7° - 146.6° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

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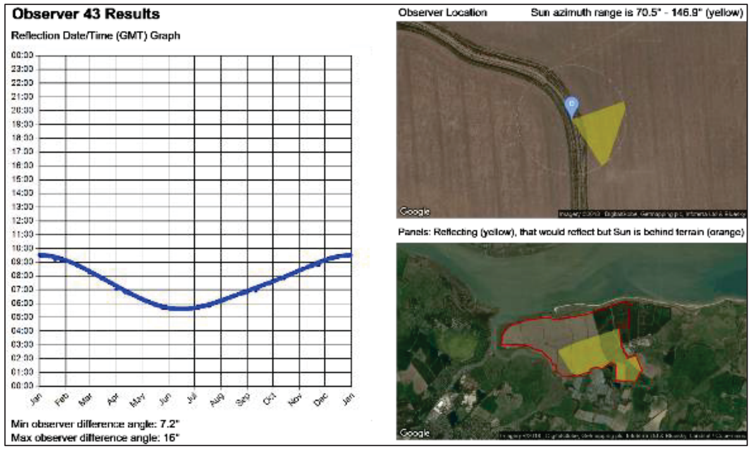

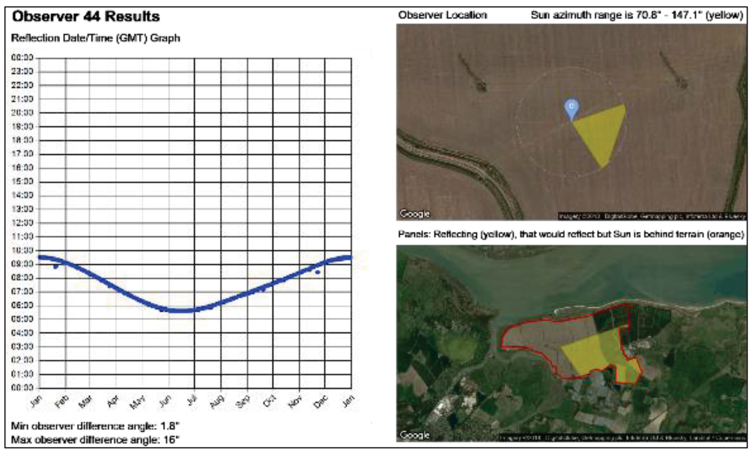

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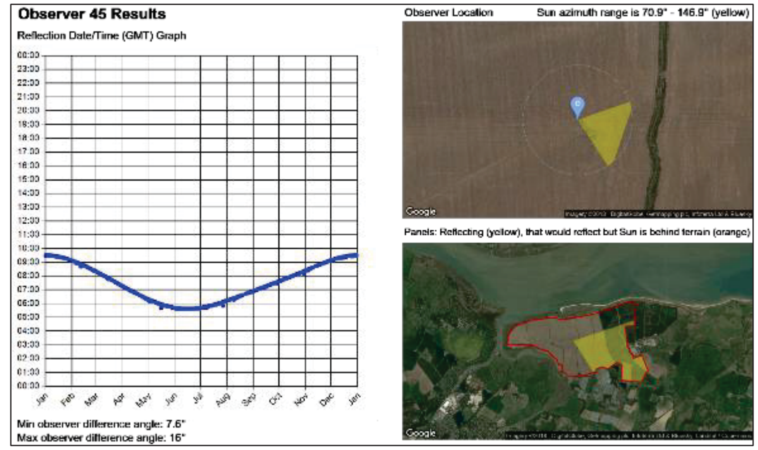
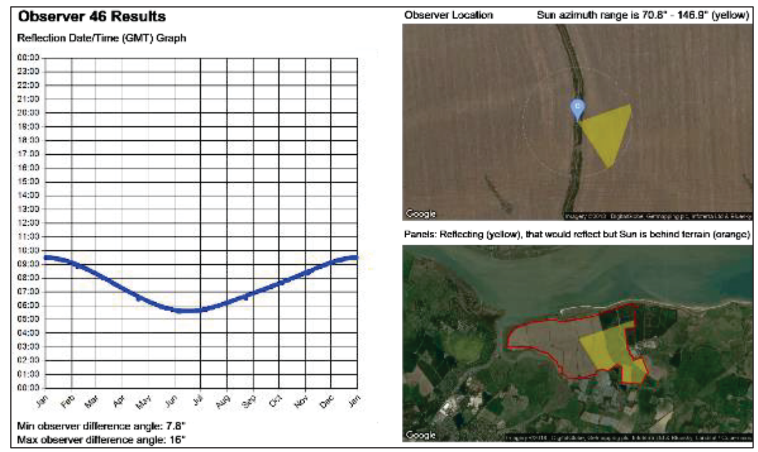
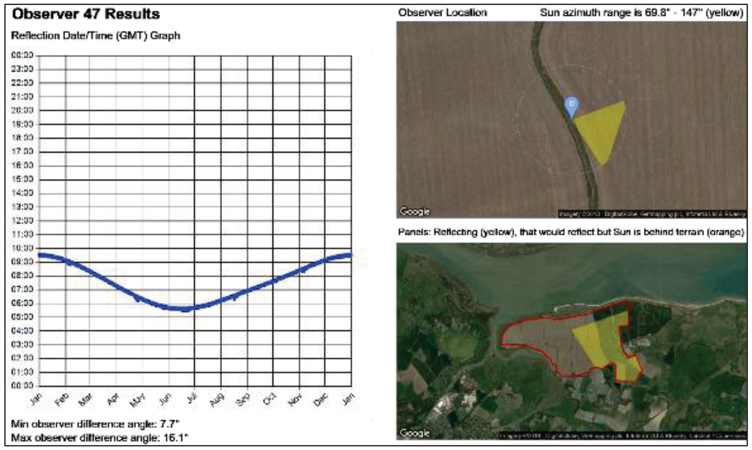
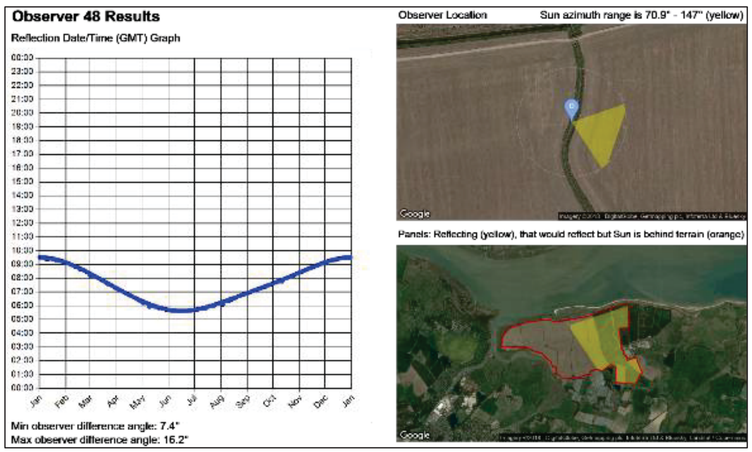
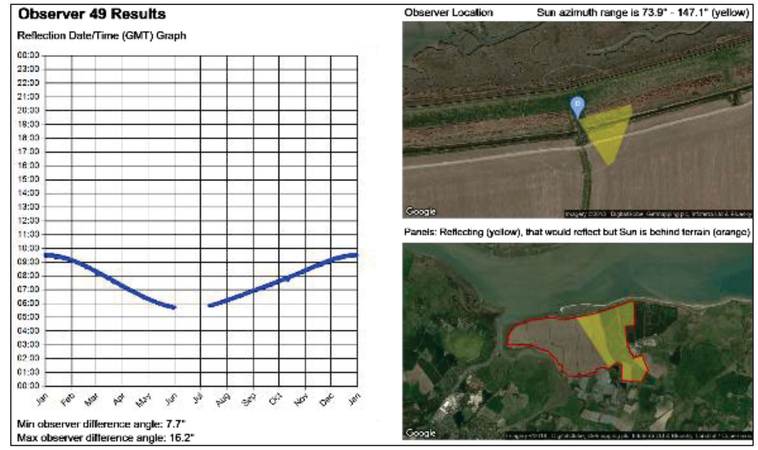





Observer 47 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 69.8° - 147° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.7°
Max observer difference angle: 16.1°


Observer 48 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 70.9° - 147° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.4°
Max observer difference angle: 16.2°


Observer 49 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 73.9° - 147.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.7°
Max observer difference angle: 16.2°

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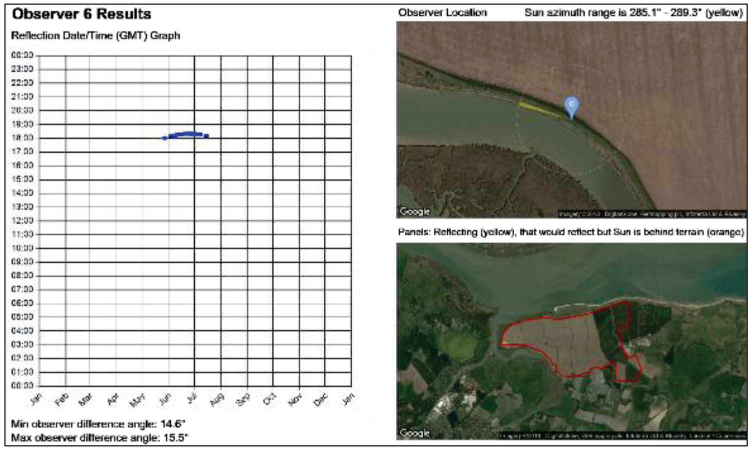
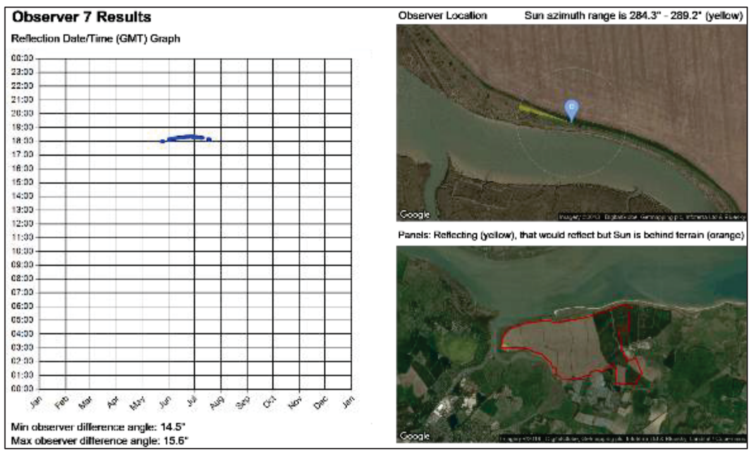
Footpath Receptors – East Facing Panels





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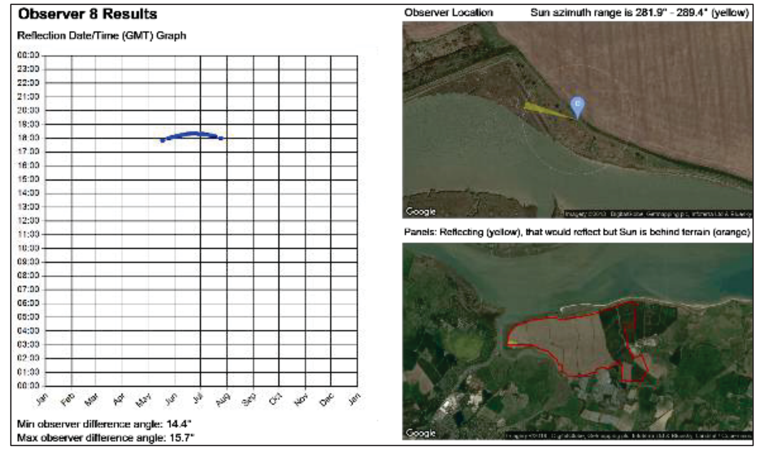
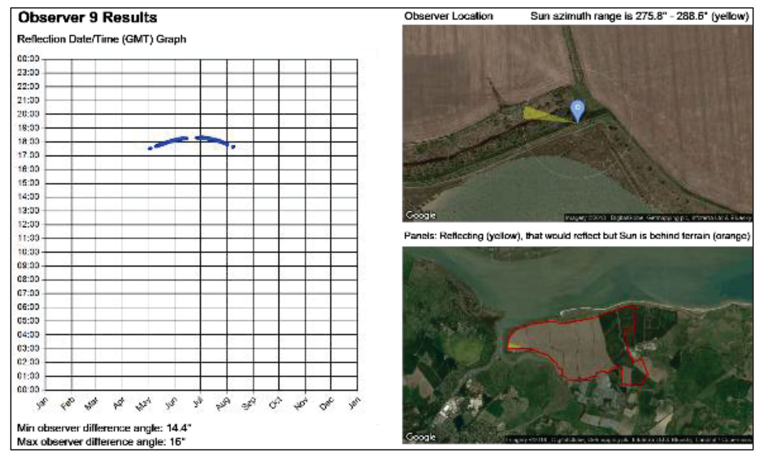
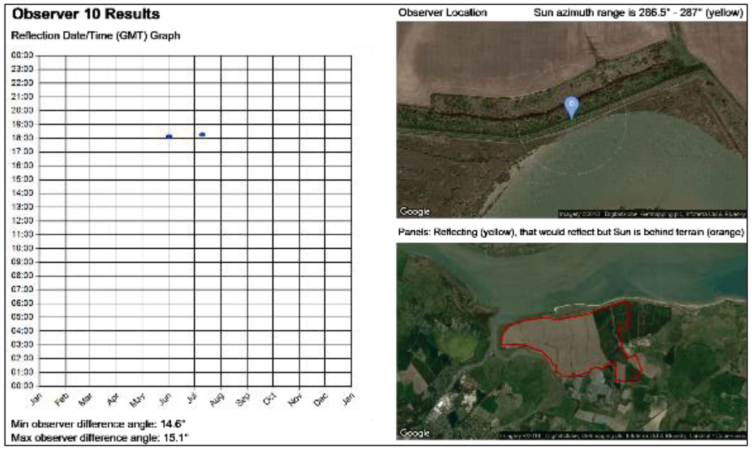
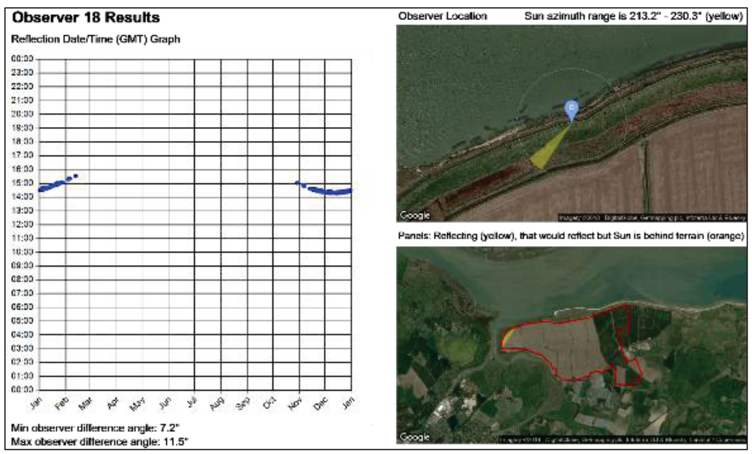
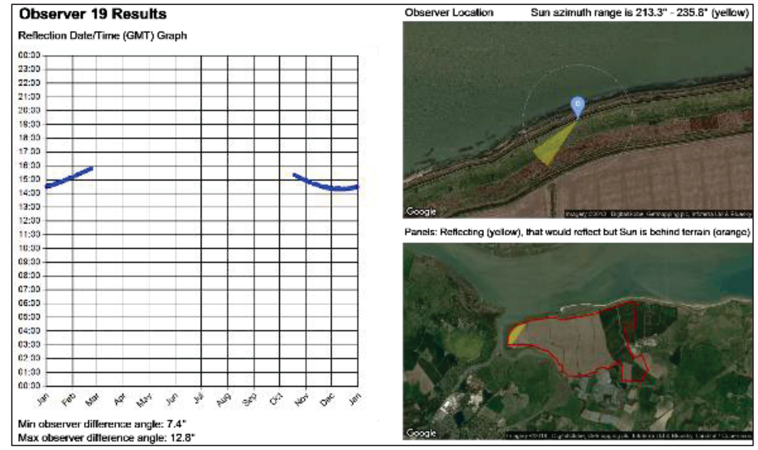
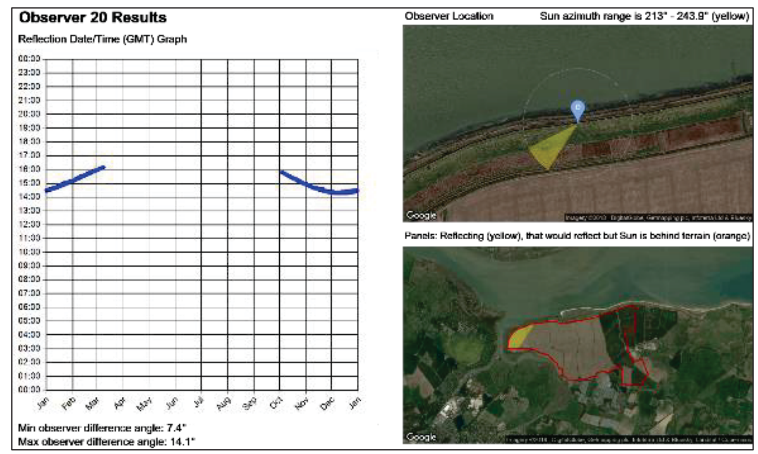


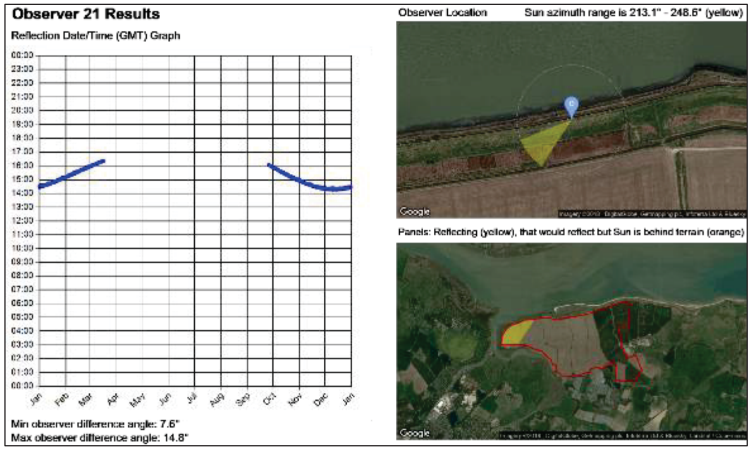


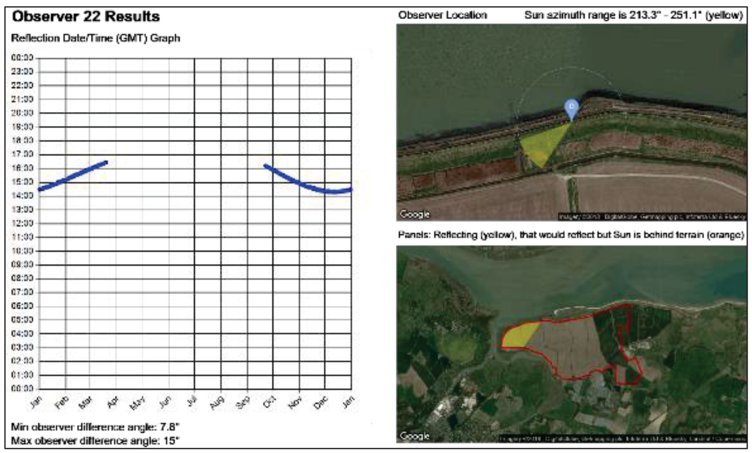

Observer 10 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 286.5° - 287° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 14.6°
Max observer difference angle: 15.1°

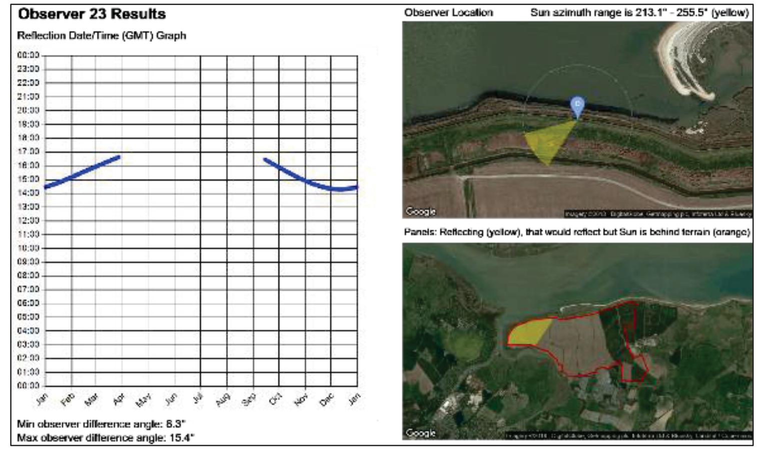

Observer 18 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213.2° - 230.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.2°
Max observer difference angle: 11.5°

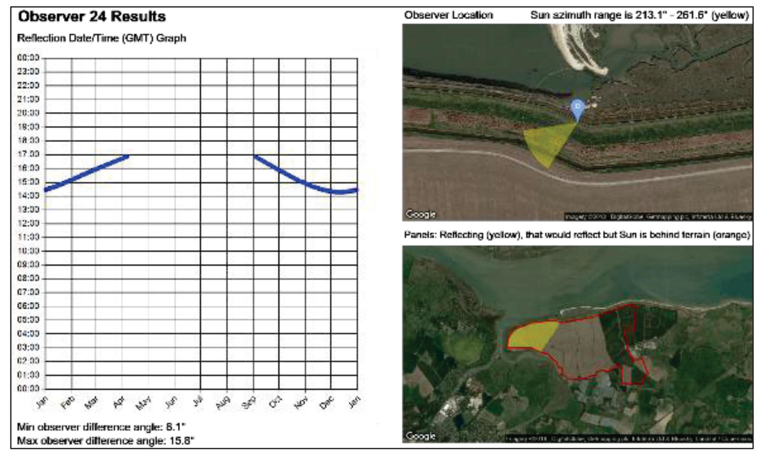

Observer 19 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213.3° - 235.8° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.4°
Max observer difference angle: 12.8°

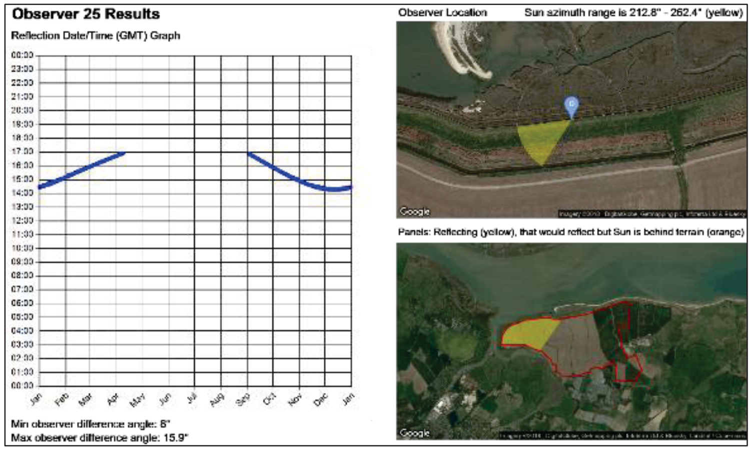

Observer 20 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213° - 243.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.4°
Max observer difference angle: 14.1°

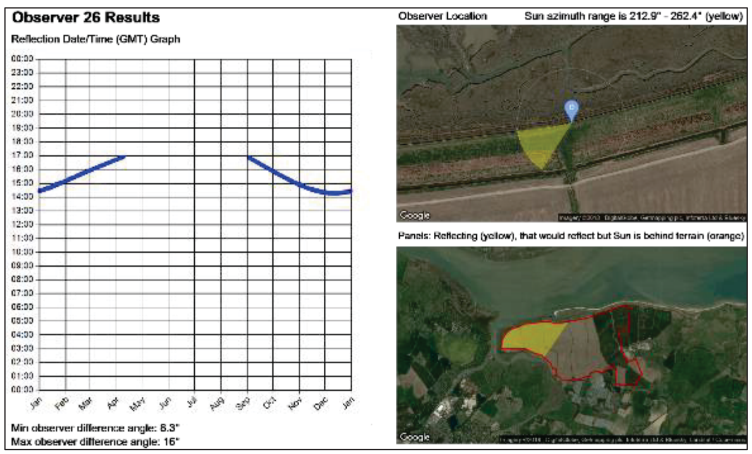

Observer 21 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213.1° - 248.6° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.6°
Max observer difference angle: 14.8°

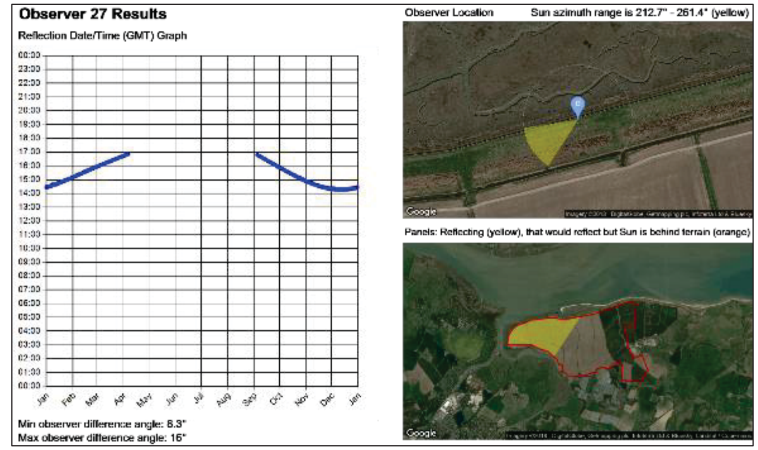

Observer 22 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213.3° - 251.1° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.8°
Max observer difference angle: 15°

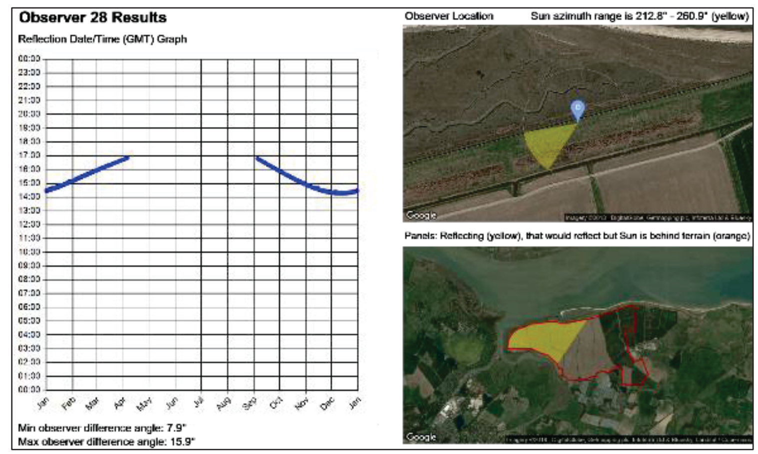

Observer 23 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213.1° - 255.5° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.3°
Max observer difference angle: 15.4°

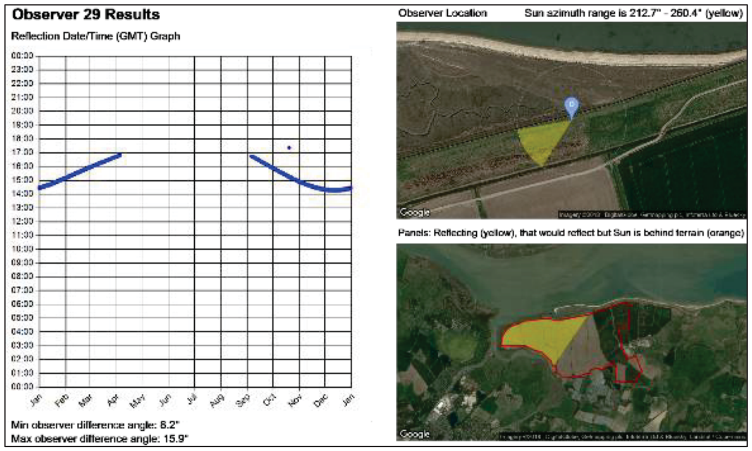

Observer 24 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213.1° - 261.6° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.1°
Max observer difference angle: 15.8°

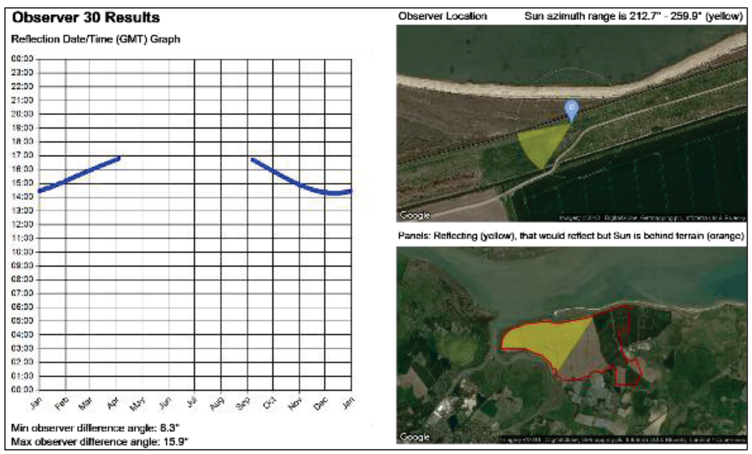

Observer 25 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.8° - 262.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8°
Max observer difference angle: 15.9°

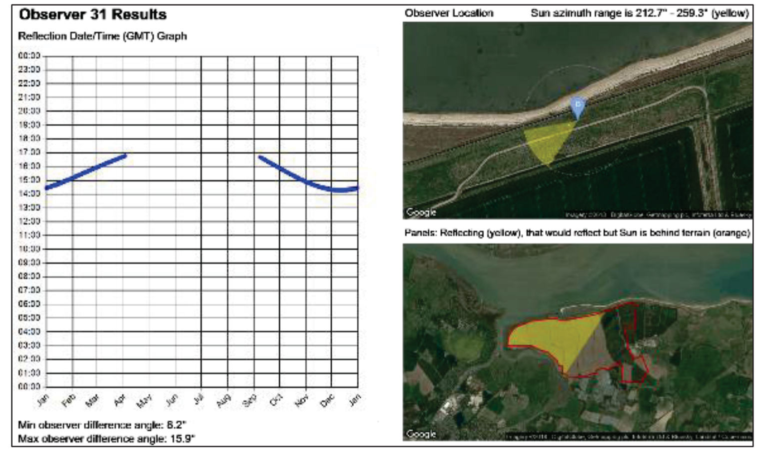

Observer 26 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.9° - 262.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.3°
Max observer difference angle: 16°

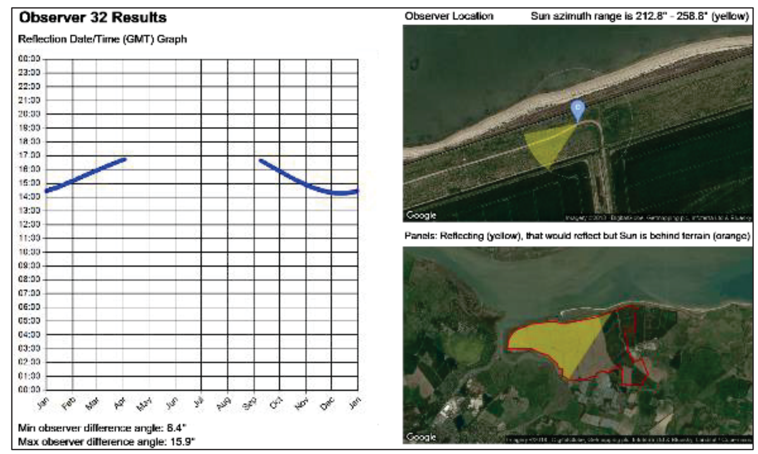

Observer 27 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.7° - 261.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.3°
Max observer difference angle: 16°

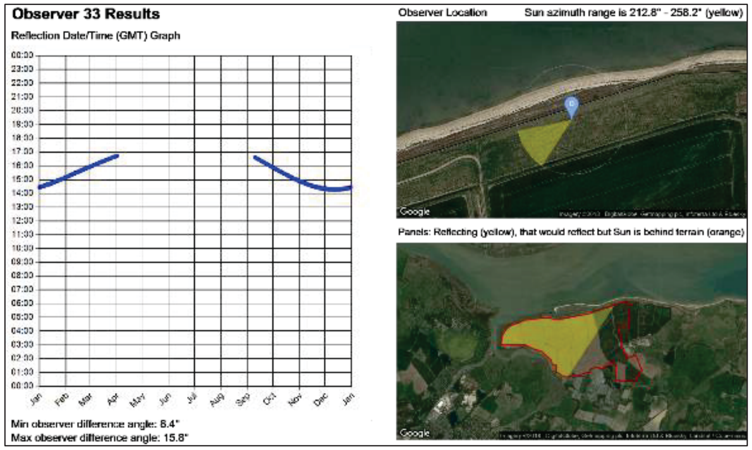

Observer 28 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.8° - 260.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 7.9°
Max observer difference angle: 15.9°

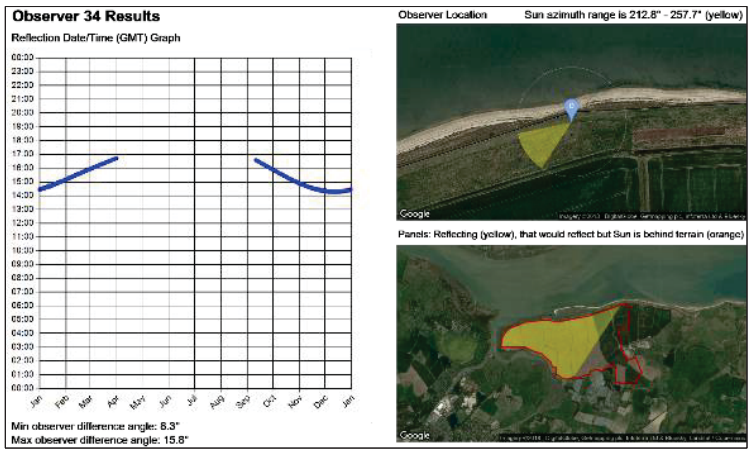

Observer 29 Results
Reflection Date/Time (GMT) Graph
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
Min observer difference angle: 6.2°
Max observer difference angle: 15.9°
Observer Location
Sun azimuth range is 212.7° - 260.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

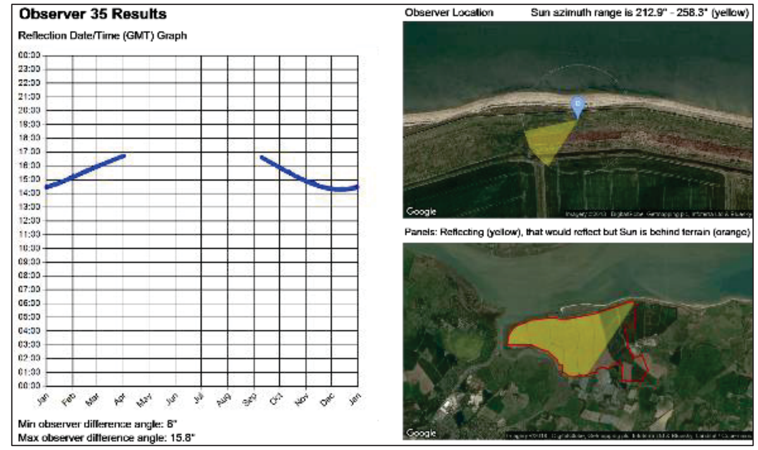

Observer 30 Results
Reflection Date/Time (GMT) Graph
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
Min observer difference angle: 6.3°
Max observer difference angle: 15.9°
Observer Location
Sun azimuth range is 212.7° - 259.9° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

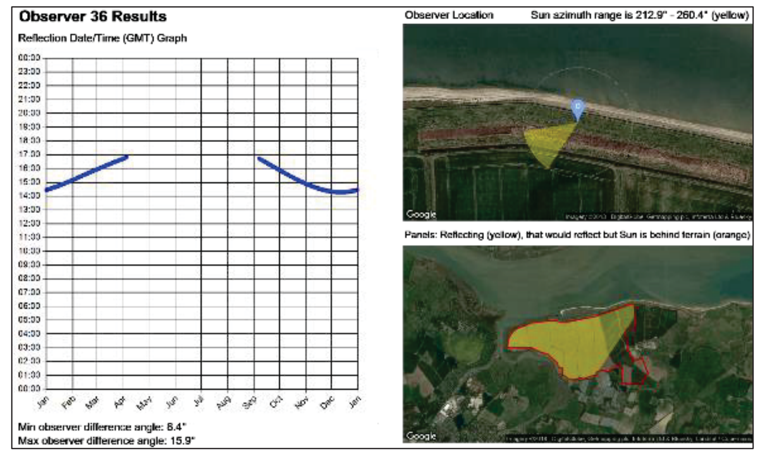

Observer 31 Results
Reflection Date/Time (GMT) Graph
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
Min observer difference angle: 6.2°
Max observer difference angle: 15.9°
Observer Location
Sun azimuth range is 212.7° - 259.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

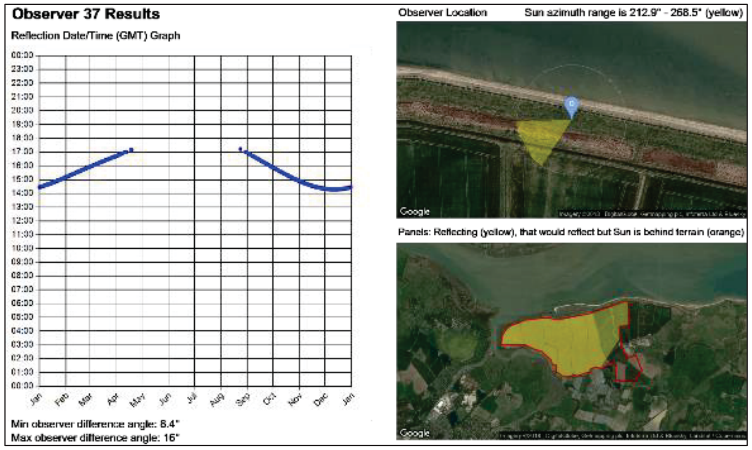

Observer 32 Results
Reflection Date/Time (GMT) Graph
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan
Min observer difference angle: 6.4°
Max observer difference angle: 15.9°
Observer Location
Sun azimuth range is 212.8° - 258.8° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

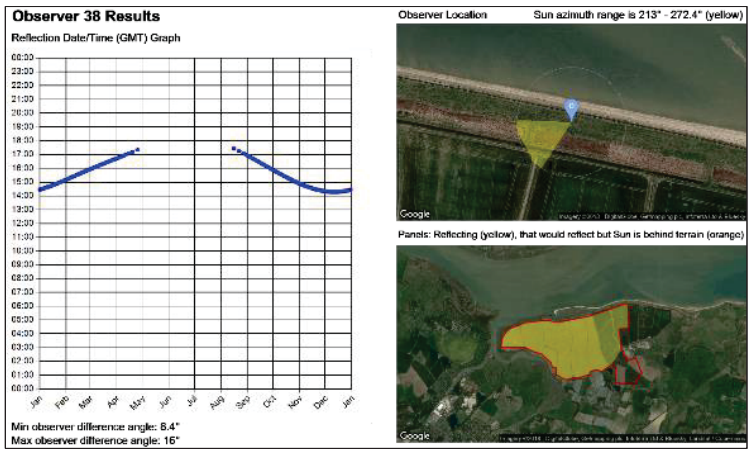

Observer 33 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.8° - 258.2° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.4°
Max observer difference angle: 15.8°

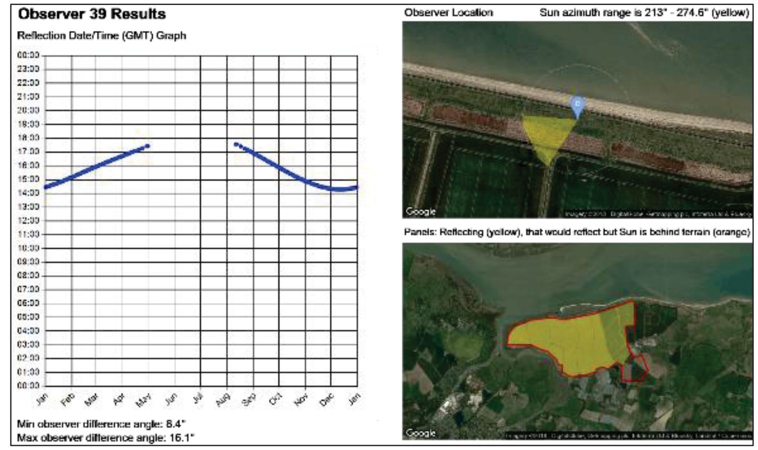

Observer 34 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.8° - 257.7° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.3°
Max observer difference angle: 15.8°

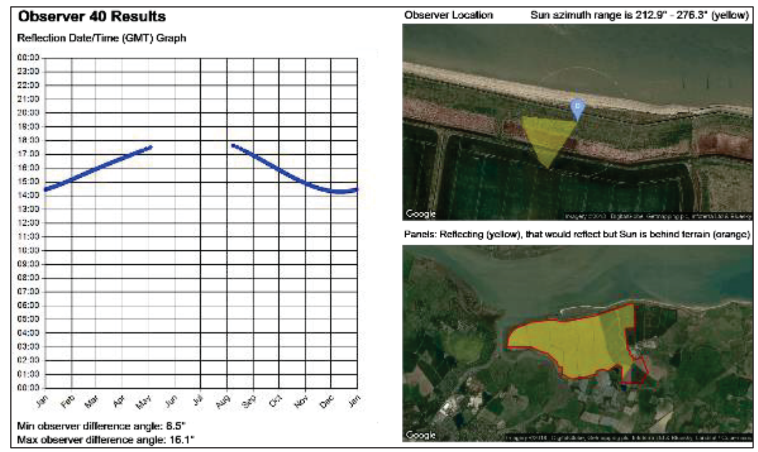

Observer 35 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.9° - 258.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8°
Max observer difference angle: 15.8°

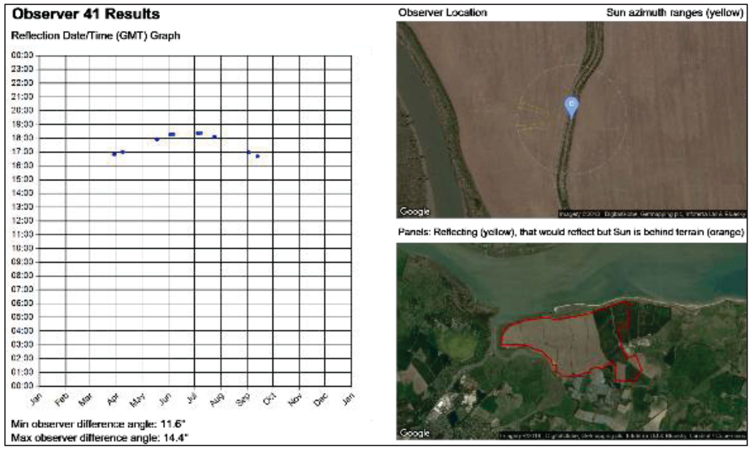

Observer 36 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.9° - 260.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.4°
Max observer difference angle: 15.9°

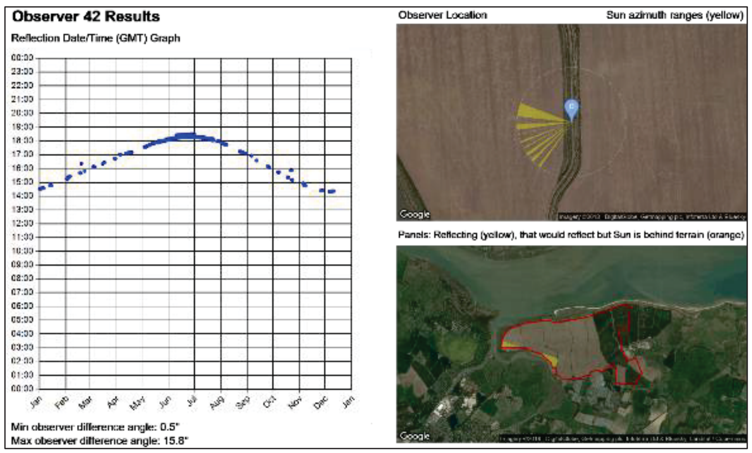

Observer 37 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.9° - 268.5° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.4°
Max observer difference angle: 16°

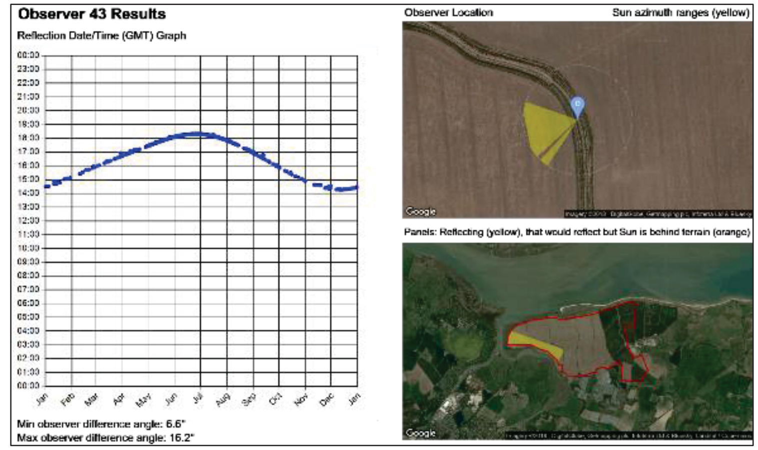

Observer 38 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213° - 272.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.4°
Max observer difference angle: 16°

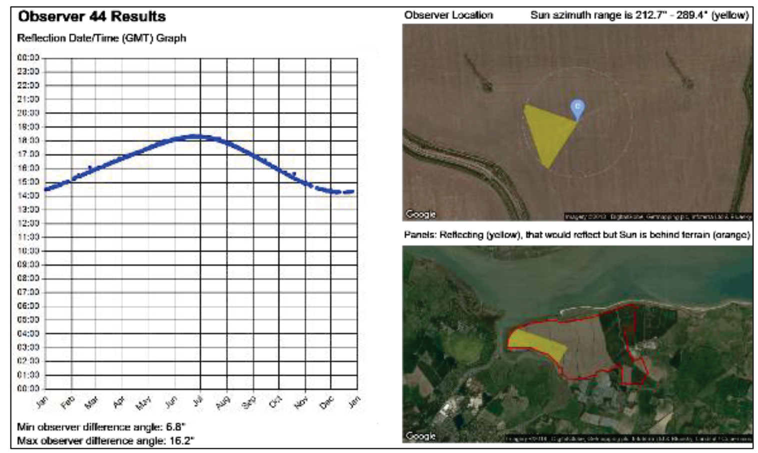

Observer 39 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 213° - 274.6° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.4°
Max observer difference angle: 16.1°


Observer 40 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.9° - 276.3° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 8.5°
Max observer difference angle: 16.1°


Observer 41 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth ranges (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 11.6°
Max observer difference angle: 14.4°

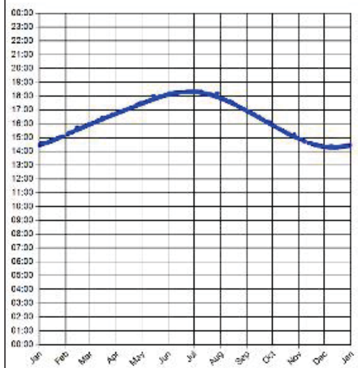

Observer 42 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth ranges (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 0.5°
Max observer difference angle: 15.8°


Observer 43 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth ranges (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.6°
Max observer difference angle: 16.2°


Observer 44 Results
Reflection Date/Time (GMT) Graph
Observer Location
Sun azimuth range is 212.7° - 289.4° (yellow)
Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)
Min observer difference angle: 6.8°
Max observer difference angle: 16.2°

Observer 45 Results

Reflection Date/Time (GMT) Graph



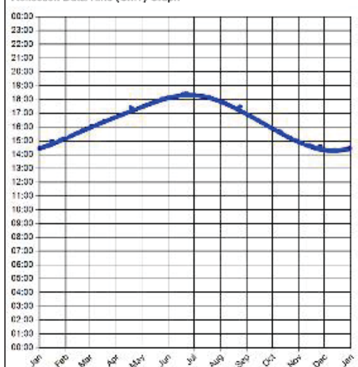
Min observer difference angle: 7.8°
Max observer difference angle: 16.2°

Observer Location — Sun azimuth range is 213° - 289.1° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 46 Results

Reflection Date/Time (GMT) Graph



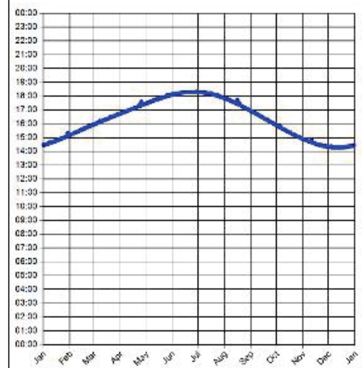
Min observer difference angle: 6.4°
Max observer difference angle: 16.2°

Observer Location — Sun azimuth range is 212.9° - 290.3° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 47 Results

Reflection Date/Time (GMT) Graph



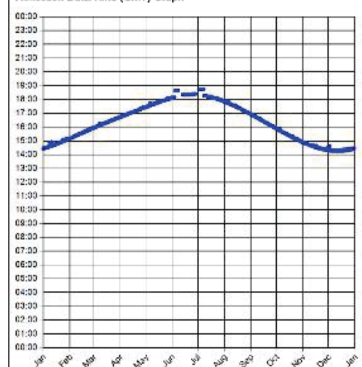
Min observer difference angle: 7.5°
Max observer difference angle: 16.2°

Observer Location — Sun azimuth range is 212.7° - 288.8° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

Observer 48 Results

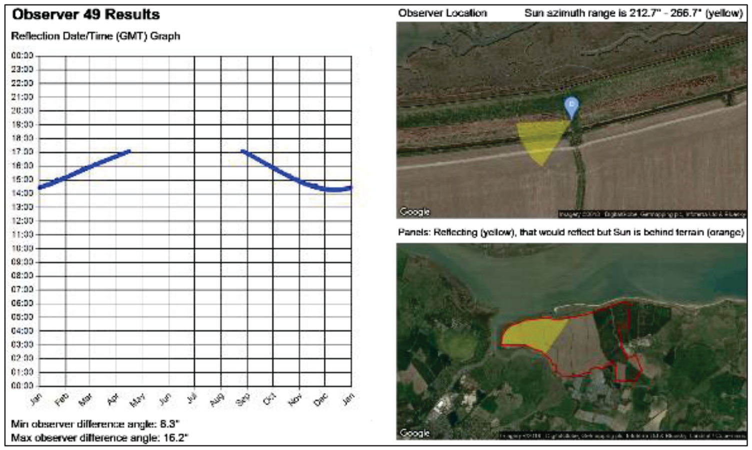
Reflection Date/Time (GMT) Graph



Min observer difference angle: 4.9°
Max observer difference angle: 16.2°

Observer Location — Sun azimuth range is 212.8° - 292.9° (yellow)

Panels: Reflecting (yellow), that would reflect but Sun is behind terrain (orange)

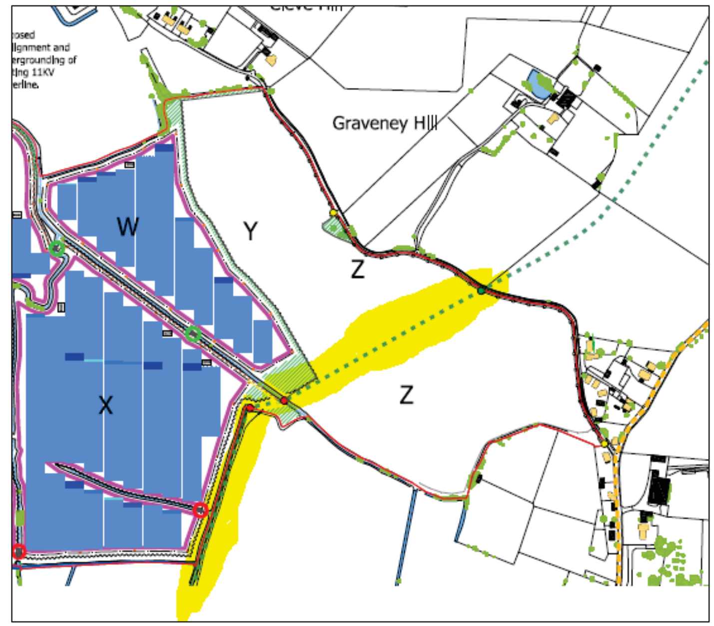


APPENDIX I – PUBLIC RIGHTS OF WAY (FURTHER DISCUSSION)

Overview

Detailed modelling has been undertaken for two footpaths in accordance with the request from Kent County Council.

There are other public rights of way in the wider area, including ZR488 to the southeast of the development. This is shown in the figure below, provided to Pager Power by Arcus Consulting:



Footpath ZR 488

Discussion of Potential Impacts

Effects for observers on this footpath are likely to be similar to those for observers on the assessed footpaths within this report. Reflections would be most likely at the end of the afternoon when the Sun is low in the sky to the west of the development. Effects would likely coincide with direct sunlight and be comparable in terms of intensity to other commonly encountered sources of glare. There is no safety hazard associated with glare from solar panels towards observers on a footpath.

Significant impacts on observers using surrounding public rights of way are therefore not predicted.

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