

2016

# **Appendix B - Assessment of the potential for solar PV farms in Gwynedd and Ynys Môn**

Joint Local Development Plan  
Anglesey & Gwynedd





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# **Assessment of the potential for solar PV farms in Gwynedd and Ynys Môn**

**Final Report  
Prepared by LUC in association with Carbon Smart  
July 2016**

**Project Title:** Assessment of the potential for solar PV farms in Gwynedd and Ynys Môn

**Client:** Gwynedd and Anglesey Joint Planning Policy Unit

Version	Date	Version Details	Prepared by	Checked by	Approved by
0.1	08/06/2016	First draft for discussion	Maria Grant	Diana Manson	Sarah Young
0.2	30/06/2016	Draft Report	Maria Grant Diana Manson Helen Troup	Diana Manson	Sarah Young
0.3	05/07/2016	Final report	Maria Grant Diana Manson Helen Troup	Diana Manson	Sarah Young

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# 1 Introduction

## Introduction

- 1.1 LUC and Carbon Smart were commissioned to undertake an assessment of the potential suitability of land within Gwynedd planning area and Anglesey for large scale solar PV development.
- 1.2 The key objectives of the study were to:
  - Assess the potential and identify areas of search for Solar PV farms (above 0.5MW) within the Plan area (taking account of a series of land use, environmental, technical and financial constraints and opportunities).
  - Clearly set out the assumptions upon which the study is based, providing a robust, transparent and defensible evidence base that will withstand scrutiny.
- 1.3 Achievement of these objectives will enable the Joint Planning Policy Unit (JPPU) to allocate the most suitable and viable potential areas for solar PV farm development within the Local Development Plan, whilst protecting locations valued for their environmental, landscape or heritage importance.

## Context

### Solar Industry

- 1.4 The solar photovoltaic (PV) market in the UK has grown from virtually zero in 2010 to an estimated 9.2GW of installed capacity by 2016 (enough to power 2.2 million British homes)<sup>1</sup>.
- 1.5 In April 2016, a milestone was passed when it was revealed that, for the first time, the sun provided more UK electricity from photovoltaic panels than from coal-fired plants over a full 24-hour period. Just under 30 gigawatt hours – or 4% of national demand – was met by solar.
- 1.6 This rapid growth, occurring as it has against a backdrop of economic austerity, propelled the UK into the top ten global markets for solar PV. The published Part 2 of the UK Solar PV Strategy (April 2014) includes a non-binding target to install up to 20GW of solar capacity early in the next decade. Whilst the focus of the Strategy is arguably on roof-top solar projects rather than larger scale ground-mounted projects, the latter is likely to have a continued role to play. Appropriate siting and design and will continue to be key.
- 1.7 The success of solar to date has been driven by a combination of falling product prices – solar panels are 80% cheaper now than they were five years ago – but also by subsidies (the Feed in Tariff (FiT) and Renewables Obligation (RO)). Over the last year both the RO and FiT support mechanisms have been either removed or wound dramatically further down – with the government arguing the industry should largely be fending for itself while bill payers should be spared unnecessary cost. The RO has been replaced by Contracts for Difference (CfD's) but several schemes that secured strike prices under this new regime have not been progressed due to viability issues.
- 1.8 Despite these setbacks, a spokesperson for the Department of Energy and Climate Change (DECC) said:

*"Solar, nuclear, offshore wind and shale gas all have an important part to play in our future energy mix – this diversity is essential so we can deliver secure, affordable and clean energy for future generations."*

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<sup>1</sup> Source: DECC.

*"The costs of solar continue to fall and we are working to create a sustainable industry that delivers without subsidy."*

- 1.9 The economic and financial constraints to solar PV development are considered in the methodology section (Section 2) of this report.

### National policy context

- 1.10 Climate change and energy security are stated to be key priorities for the UK Government. On the 30<sup>th</sup> June 2016, Ministers laid regulations before Parliament for the 'fifth carbon budget' which governs reductions in emissions for the period 2028-2032. The Government has adopted targets that will require a 57% reduction in greenhouse gas emissions by 2030. The reductions are aimed at helping the UK reach the legally binding target of an 80% reduction in greenhouse gas emissions by 2050, (using the emissions in 1990 as a baseline).
- 1.11 In 2007, European Union (EU) leaders agreed to adopt a binding target requiring 20% of the EU's energy (electricity, heat and transport) to come from renewable energy sources by 2020. The UK signed up to the EU Renewable Energy Directive (formally agreed in April 2009) and agreed to legally binding targets to generate 15% of all our energy (electricity, transport and heat) from renewable sources by 2020. The UK Renewable Energy Strategy sets out the path for the UK to meet this target and states that 30% of electricity will need to come from renewable source by 2020.
- 1.12 The Welsh Government has set out an ambition to reduce CO<sub>2</sub> emissions in Wales and to produce more of their energy from renewable and low carbon energy sources, including solar. The energy policy, Energy Wales: A Low Carbon Transition (2012), sets out how Wales will move from fossil fuel based energy generation to utilise a wider mix of energy sources, which are mainly renewable or low in carbon. The Climate Change Strategy for Wales (2010) also sets a target to reduce its emissions of greenhouse gases by 3% per year from 2011 from areas of devolved competence.

- 1.13 The energy and environment sector is considered to be a key component underpinning the drive for 'Economic renewal: a new direction.' It identifies the two main opportunities for creating jobs for a sustainable economy as delivering resource efficiency; and driving forward the low carbon, low waste agenda. It hoped that with targeted intervention, Wales can gain competitive advantages and benefit from the markets within this sector. It is estimated that there could be £50 billion of investments in low carbon electricity production in Wales over the next 10 to 15 years.
- 1.14 Planning Policy Wales (PPW) (Edition 8, Jan 2016) and supporting Technical Advice Notes (TAN 12 and TAN 8) and practice guidance, set out a number of areas of evidence gathering and policy making for renewable and low carbon energy generation that local authorities are expected to consider when developing their Local Development Plan's. These requirements include planning for renewable and low carbon energy (chapter 12.8 in PPW).
- 1.15 Section 12.8.2 of PPW specifically mentions using a Planning for Renewable and Low Carbon Energy - A Toolkit for Planners Toolkit (2015), and states:
 

*Planning policy at all levels should facilitate delivery of both the ambition set out in Energy Wales: A Low Carbon Transition and UK and European targets on renewable energy. The Renewable Energy Directive contains specific obligations to provide guidance to facilitate effective consideration of renewable energy sources,.....The issues at the heart of these duties are an established focus of planning policy in Wales, and in this context both local planning authorities and developers should have regard in particular to the guidance contained in Technical Advice Note 8: Planning for Renewable Energy and Planning for Renewable Energy – A Toolkit for Planners.*
- 1.16 The Welsh Government's key requirements and expectations for local authority plan making for these aspects as set out in PPW are as follows:

1.17 Renewable and Low Carbon Energy (PPW Chapter 12.9.2 and 12.9.3) state:

*Local planning authorities should guide appropriate renewable and low carbon energy development by undertaking an assessment of the potential of all renewable energy resources and renewable and low carbon energy opportunities within their area and include appropriate policies in development plans. Local planning authorities are encouraged to work collaboratively in order to gather evidence on a sub-regional basis wherever possible.*

*In undertaking such assessments local planning authorities should establish an evidence base which:*

- takes into account the contribution that can be made by their local area towards carbon emission reduction and renewable and low carbon energy production;*
- recognises that approaches for the deployment of renewable and low carbon energy technologies will vary;*
- identifies the accessible deliverable renewable energy resource potential (including heat) for their area and considers the likely utilisation of this resource over the plan period;*
- takes into account the environmental, social and economic impacts and opportunities from renewable and low carbon energy development;*
- takes into account the cumulative effects of renewable and low carbon energy development;*
- takes into account the likely mechanisms for determining applications for sites based on their potential and actual output; and*
- takes into account issues associated with grid connection and the transportation network.*

1.18 In December 2015, The Minister for Natural Resources in Wales wrote to Planning Lead Members to inform them of the Changes to Section 12 of the PPW. The letter also urged authorities to formulate policies (including allocations for areas of search) for local authority scale renewable energy schemes. It stated that:

*"The designation of such areas would show leadership at the local level; give certainty to the renewable energy industry in making investment decisions; and, through the LDP consultation process, would give communities a say as to where renewable energy developments should be located. By designating these areas, developments can be guided to the most appropriate locations.*

1.19 It went on to state that:

*"The Welsh Government has recently published a revised version of the Renewable Energy Toolkit for Planners. This toolkit has been updated and includes a new section for local planning authorities (LPAs) to assess the potential for solar farm developments in their areas. This methodology, coupled with the extensive landscape assessments already produced as part of the LDP evidence base, can be used to identify in Development Plans policies for renewable energy developments. These areas can be informed by local priorities for renewable energy and the deliverability of schemes in consultation with landowners and the renewable energy industry whom I also expect to engage in the process to identify the most appropriate sites."*

*"It is imperative that the planning system identifies and protects areas with renewable energy generation potential for the long term, irrespective of any short term decisions on financial support and regulatory regimes which are being taken by the UK Government."*

1.20 The revised toolkit provides advice on how the translation between evidence and policies should be achieved and the Minister has stated that particular attention will be given to this issue when LDPs are passed to the Welsh Government for comment.

1.21 A further Ministerial letter was sent to Planning Lead Members in March 2016, reiterating the importance the Welsh Assembly Government place on the transition to a low carbon economy. The letter restated the need for local authorities to be more proactive in developing positive local planning policies towards renewable energy developments through strategies and spatial allocations.



## Local policy context

- 1.22 The Anglesey Energy Island Programme aims to make Anglesey a driving force behind energy research and development, generating and servicing, bringing economic and social benefits to the Island and the surrounding area. Gwynedd Werdd has studied the potential for producing renewable energy by making the most of the natural resources throughout the county. Gwynedd Werdd alongside Anglesey Energy Island is also working with local colleges to ensure that training needed to make the most of renewable energy is available
- 1.23 The Gwynedd and Anglesey Joint Local Development Plan (JLDP) details numerous policies that seek to promote renewable energy production, whilst also giving weight to the need to ensure that these developments are sensitively sited and designed.
- 1.24 Relevant objectives and policies in the JLDP include, but are not limited to:
- SO6: Minimise, adapt and mitigate the impacts of climate change (including promoting renewable and low carbon energy production within the area)
    - Policy PS6: Alleviating and adapting to the effects of climate change.
    - Policy PS7: Renewable energy technology.
    - Policy ADN2: Other renewable energy technologies.
  - SO16: Protect, enhance and manage the natural and heritage assets of the Plan area, including its natural resources, wildlife habitats, and its landscape character and historic environment.
    - Policy PS16: Conserving and enhancing the natural environment.
    - Policy AMG5: Protecting sites of regional or local significance.
    - Policy PS17: Preserving and enhancing heritage assets.

- 1.25 This study and its outputs will provide the JPPU with a robust evidence base to underpin the identification of potential solar PV development areas within the Local Development Plan.

## Report Structure

- 1.26 The remainder of this report is structured as follows:
- **Chapter 2:** sets out the methodology used to undertake the assessment.
  - **Chapter 3:** presents the study findings.
  - **Appendix 1:** provides information on the Distributed Network Operator (DNO) Infrastructure.
  - **Appendix 2:** Summarises the findings from the Landscape Sensitivity and Capacity Review.
  - **Appendix 3:** sets out the full assessment results.

## 2 Methodology

- 2.1 An assessment was undertaken of the land that could be suitable for solar PV development. This type of assessment is undertaken using Geographic Information Systems (GIS) and considers a range of opportunities and constraints that relate to solar PV development. This is a desk-based assessment and no verification has been undertaken in the field.
- 2.2 The study area consists of the Gwynedd planning area (i.e. excludes Snowdonia National Park) and Anglesey as shown in **Map 2.1**.
- 2.3 The methodology is based on Sheet K from the *Welsh Government Practice Guidance: Planning for Renewable and Low Carbon Energy – A Toolkit for Planners* (September 2015). This sets out guidance on how local authorities should assess the potential for solar PV within their area.

### Technical and planning constraints

- 2.4 **Table 2.1** lists the criteria used in this assessment, the justification for their inclusion, and the data sources used to undertake the assessment. **Table 2.2** lists the criteria that were considered for inclusion, but discounted. It also records the reason for excluding them from the assessment.
- 2.5 Each of the layers detailed in **Table 2.1** were collated in an ESRI geodatabase. These layers were added to a map and organised according to topics.
- 2.6 The layers were combined in GIS using a 'Union' in order to create a single layer of 'constrained' land that was unsuitable for solar PV Farm projects. Using GIS, these unsuitable areas were subtracted from the area of interest boundary in order to identify the land that remained once the constraints had been applied.
- 2.7 The steps followed for this first stage of the study are as follows:
- Map built-up areas and locations of other infrastructure.
  - High level assessment of opportunities within built-up areas (this step concluded that there were no areas of opportunity within built-up areas)
  - Map environmental and heritage constraints.
  - Map areas of unsuitable slope and aspect.
  - Map areas of unsuitable Agricultural Land Classification.
- 2.8 The above steps deviate slightly from the order set out in Sheet K as it was considered beneficial to remove as many unsuitable areas as possible before considering the potential installed capacity.
- 2.9 Following the application of the steps outlined in paragraph 2.7, there were still a considerable number of potential Opportunity Areas for solar PV. The toolkit is clear in terms of the assessment needing to result in a manageable number of Opportunity Areas for consideration. It was therefore considered appropriate to apply additional constraints to reduce the overall land area being considered.
- 2.10 In discussion with the client team, the additional constraints set out in **Table 2.3** were removed.

**Table 2.1: Criteria used in the assessment of suitability**

Parameter	Assumption	Data source	Justification and notes
Built up areas (See Map 2.2)	<ul style="list-style-type: none"> <li>The vast majority of locations within built up areas will have no potential.</li> <li>Areas allocated for housing or employment should be considered constrained.</li> </ul>	<ul style="list-style-type: none"> <li>Development boundaries</li> <li>Clusters</li> <li>Housing allocations with permission</li> <li>Housing allocation without permission</li> <li>Employment areas</li> </ul>	<ul style="list-style-type: none"> <li>The location of built up areas will significantly constrain any deployment of large-scale stand-alone PV farms.</li> <li>The Welsh Government (WG) method suggests the use of OS Strategici data to identify these areas. A thorough review of the Strategici dataset for this area showed that the dataset was not fit for purpose in this location (boundaries were too crude and not detailed enough).</li> <li>Other datasets were tested, but it was agreed that the Development Boundaries and Clusters that are used within the JLDP to identify towns and villages would be the best to use.</li> <li>The client team identified site allocations for housing and employment as constraints for this purpose.</li> </ul>
Infrastructure (See Map 2.2)	<ul style="list-style-type: none"> <li>Motorways, A Roads, B Roads (with a buffer to approximate the footprint)</li> <li>Railway lines (with a buffer to approximate the footprint)</li> </ul>	<ul style="list-style-type: none"> <li>Ordnance Survey VectorMap District</li> </ul>	<ul style="list-style-type: none"> <li>The WG method suggests the use of OS Strategici data for this constraint. This data is linear (and does not have a footprint) and is 1:250 000 scale. There are other Ordnance Survey products available that are higher resolution and considered better for this assessment.</li> <li>OS VectorMap District linear data has been used with the following widths in order to approximate a footprint (and allow an area to be subtracted): <ul style="list-style-type: none"> <li>Dual carriageways (20m)</li> <li>Single carriageways (10m)</li> <li>Railway tracks (15m)</li> </ul> </li> </ul>

Parameter	Assumption	Data source	Justification and notes
Natural features (See Map 2.3)	<ul style="list-style-type: none"> <li>Woodland Areas</li> <li>Lakes and Rivers</li> <li>Flood warning areas</li> </ul>	<ul style="list-style-type: none"> <li>Ordnance Survey VectorMap District</li> <li>WG Flood Warning Areas C1 and C2</li> </ul>	<ul style="list-style-type: none"> <li>The WG method suggests the use of OS Strategi data for this constraint. There are other Ordnance Survey products available that are higher resolution and considered better for this assessment – namely OS VectorMap District which has a higher resolution. Additionally, the use of this dataset for lakes and rivers removes the need to make an assumption about river width (as the OS Strategi dataset for rivers is linear and a footprint would need to be assumed).</li> <li>On the advice of the JPPU, Areas C1 and C2 are considered to be the equivalent of flood warning areas as these are assumed to be constrained on the basis that these are the areas used to indicate that flooding issues should be considered an integral part of decision making.</li> </ul>
Biodiversity/geodiversity (See Map 2.4)	<ul style="list-style-type: none"> <li>Special Protection Areas (SPA)</li> <li>Special Area of Conservation (SAC)</li> <li>Candidate Special Area of Conservation (cSAC)</li> <li>RAMSAR Sites</li> <li>National Nature Reserves (NNR)</li> <li>Local Nature Reserves (LNR)</li> <li>Site of Special Scientific Interest (SSSI)</li> <li><i>Marine Nature Reserves (MNR) (not relevant)</i></li> </ul>	<ul style="list-style-type: none"> <li>Natural Resources Wales</li> <li>Joint Nature Conservation Committee</li> </ul>	<ul style="list-style-type: none"> <li>The WG method assumes that there is no potential for large-scale solar PV farm developments within these designated areas.</li> </ul>
Heritage (See Map 2.5)	<ul style="list-style-type: none"> <li>Scheduled Monuments</li> <li>Conservation Areas</li> <li>World Heritage Sites</li> </ul>	<ul style="list-style-type: none"> <li>CADW</li> <li>JPPU</li> </ul>	<ul style="list-style-type: none"> <li>The WG method assumes that there is no potential for large-scale solar PV farm developments within Scheduled Monuments.</li> <li>In agreement with the JPPU, World Heritage Sites and Conservation Areas</li> </ul>



Parameter	Assumption	Data source	Justification and notes
			were additionally included as areas of constraint.
Landscape (See Map 2.5)	<ul style="list-style-type: none"> <li>Areas of Outstanding Natural Beauty</li> </ul>	<ul style="list-style-type: none"> <li>NRW</li> </ul>	<ul style="list-style-type: none"> <li>The WG method assumes that there is no potential for large-scale solar PV farm developments within AONBs.</li> </ul>
Slope and orientation (See Map 2.6)	<ul style="list-style-type: none"> <li>Inclinations 0-3 degrees: all orientations suitable for development</li> <li>Inclinations 3-15 degrees: only south-west to south east facing slopes suitable for development</li> <li>Inclinations 15 degrees+: constrained</li> </ul>	<ul style="list-style-type: none"> <li>OS Terrain 50</li> </ul>	<ul style="list-style-type: none"> <li>The assumptions are based on the WG method.</li> </ul>
Agricultural Land Classification (See Map 2.7)	<ul style="list-style-type: none"> <li>Agricultural Land Classification Grades 1, 2 and 3a are constrained</li> </ul>	<ul style="list-style-type: none"> <li>ALC Provisional data</li> <li>WG Best and Most Versatile (BMV) dataset</li> </ul>	<ul style="list-style-type: none"> <li>Large-scale ground mounted solar PV should be located on less productive agricultural land or previously developed land.</li> <li>The ALC Provisional data does not distinguish between grades 3a and 3b.</li> <li>Through consultation with WG, we have assumed that Grades 1, 2 and 3 from the provisional dataset are constrained except in locations where the WG has previously identified the area to be non-BMV.</li> </ul>

**Table 2.2 Additional criteria considered but not included as constraints**

Consideration	Reason for not including as a constraint
Overhead power lines (400kV) and preferred routeing corridor	<ul style="list-style-type: none"> <li>Overhead powerlines may cause shading. However, given the movement of the sun throughout the day, it would be difficult to approximate an area of influence for this.</li> <li>The relationship of areas of potential and the preferred routeing corridor for the new National Grid Overhead line will be considered at a later stage.</li> </ul>
RSPB Reserves	<ul style="list-style-type: none"> <li>It is assumed that the most sensitive bird areas will be protected by other biodiversity designations. These</li> </ul>

Consideration	Reason for not including as a constraint
	could be considered at a later stage if prioritising the available land.

**Table 2.3: Further constraints applied**

Parameter	Assumption	Data source	Justification and notes
Landscape (See Map 2.8)	<ul style="list-style-type: none"> <li>Special Landscape Areas</li> </ul>	<ul style="list-style-type: none"> <li>JPPU</li> </ul>	<ul style="list-style-type: none"> <li>Special Landscape Areas are a non-statutory designation which offers additional protection to the landscape. Policy AMG1 in the Deposit Plan (2015) states that 'any development proposal gives consideration to maintaining, enhancing or restoring the recognised character and quality of the areas'.</li> <li>All areas designated as Special Landscape Areas are considered constrained.</li> </ul>
Heritage (See Map 2.8)	<ul style="list-style-type: none"> <li>Landscapes of Outstanding Historic Interest</li> <li>Registered Parks, Essential Settings and Kitchen Gardens</li> <li>Candidate World Heritage Sites</li> </ul>	<ul style="list-style-type: none"> <li>CADW</li> <li>JPPU</li> </ul>	<ul style="list-style-type: none"> <li>The importance of Landscapes of Outstanding Historic Interest is identified in policy PS17, which also recognises the importance of protecting the setting of these assets. All of these areas are considered constrained.</li> <li>Draft boundaries for sites being considered as potential World Heritage Sites were sense checked against the remaining areas.</li> </ul>
Recreation and Access (See Map 2.8)	<ul style="list-style-type: none"> <li>CROW Dedicated Land</li> </ul>	<ul style="list-style-type: none"> <li>NRW</li> </ul>	<ul style="list-style-type: none"> <li>Development of solar PV on Open Access Land is likely to adversely affect the recreational amenity of the area, as fencing is required around these sites for security and safety reasons. All dedicated access land under the Countryside Rights of Way Act is considered constrained.</li> </ul>

## Technical and financial constraints

- 2.11 The land remaining as a result of the application of these further constraints was still too extensive when compared to the example of 20-30 Opportunity Areas noted in the Toolkit. It was considered appropriate to apply some high level financial and economic viability constraints to remove those areas that would not be economically viable.
- 2.12 Optimal siting of solar panels depends on a range of factors, including the capacity of, and costs associated with, connecting to the grid via the local Distribution Network Operator (DNO). Existing DNO level infrastructure in Anglesey and Gwynedd was mapped, along with its current condition, which is a measure of the likelihood and cost of connection – this data was taken from SP Energy Network’s Distributed Generation Heat Map<sup>2</sup>.
- 2.13 Using maps of the DNO infrastructure, the Red/Amber/Green (RAG) rating of up to four constraints was captured for each grid-, super- and sub-station within the area of interest. These constraints are:
- reverse flow;
  - generation capacity;
  - fault level (for the relevant voltage); and
  - wider constraints.
- 2.14 A list of stations considered is included in **Appendix 1**.
- 2.15 For more than three quarters of the stations in question, the “wider constraints” rating is red, however this does not necessarily exclude the location from hosting new generation technologies<sup>3</sup>.
- 2.16 **Table 2.4** sets out technical and financial constraints used to eliminate unviable land.

<sup>2</sup> [http://www.spenergynetworks.co.uk/pages/sp\\_manweb\\_heat\\_maps.asp](http://www.spenergynetworks.co.uk/pages/sp_manweb_heat_maps.asp)

<sup>3</sup> This rating was correct as of 28/6/16.

## Landscape Sensitivity and Capacity Review

- 2.17 Following the application of all of the above constraints, **92 individual Opportunity Areas remained** that were above the required size threshold of 1.2ha (or 3 acres) needed to support developments of 0.5MW or more.
- 2.18 Using the steps set out in the Toolkit, at this stage, there is provision within the method to apply further constraints based on a stricter application of the Agricultural Land Classification constraint or the introduction of LANDMAP information to constrain the areas further.
- 2.19 In consultation with the Welsh Government, it was agreed there was no justification for ruling out land in Agricultural Land Classification Grade 4 (as per the Toolkit example).
- 2.20 Given the availability of landscape sensitivity information directly related to solar PV development, it was considered appropriate to look at the Landscape Sensitivity of each Opportunity Area to rule out any Opportunity Areas that are located in areas with a high landscape sensitivity rating for solar PV developments.
- 2.21 Scores from the Landscape Sensitivity and Capacity Assessment<sup>4</sup> and its addendum<sup>5</sup> were used to generate a summary table of the landscape sensitivity of each Landscape Character Area (LCA) – focussing in on the areas that remained after all of the preceding constraints had been removed.
- 2.22 The landscape sensitivity of each LCA is shown in **Map 2.10**. The results of this review are shown in **Appendix 2**.

<sup>4</sup> Gillespies (March 2014) *Isle of Anglesey, Gwynedd and Snowdonia National Park: Landscape Sensitivity and Capacity Assessment*. Accessible here: [https://www.gwynedd.llyw.cymru/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Supporting-documents/Landscape-Sensitivity-and-Capacity-Assessment-\(DC.020\).pdf](https://www.gwynedd.llyw.cymru/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Supporting-documents/Landscape-Sensitivity-and-Capacity-Assessment-(DC.020).pdf)

<sup>5</sup> Gillespies (June 2016) *Field-Scale Solar PV Developments: Gwynedd Addendum to March 2014 Landscape Sensitivity and Capacity Assessment Draft Report*.

- 2.23 Opportunity Areas within Landscape Character Areas assessed as having no capacity for field-scale solar PV development were removed as well as Opportunity Areas within Landscape Character Areas assessed as only having potential for micro-scale solar PV development. Micro-scale is defined in the Landscape Sensitivity Study as developments less than 500kW – which is below the capacity threshold for the purposes of this study.
- 2.24 The results of applying this methodology are set out in the next section, along with the process used to rank/prioritise the remaining Opportunity Areas.



**Table 2.4 Technical and financial constraints**

Parameter	Assumption	Data source	Justification and notes
Distance to infrastructure (See Map 2.9)	<ul style="list-style-type: none"> <li>Consider only those areas within 1km of substations rated green for generation and 11kV faults as viable.</li> </ul>	<ul style="list-style-type: none"> <li>SP Energy Networks</li> <li>Solar developer research</li> </ul>	<ul style="list-style-type: none"> <li>Solar developers will only consider a site that is within 1km of a substation without any red ratings. Having mapped all the substations within the area of interest, this constraint was applied early in the process to reduce the amount of land identified. Given that infrastructure is being constantly upgraded, we have not ruled out all red-rated infrastructure, but in order to prioritise, we have only considered those substations rated green for generation and 11kV faults.</li> </ul>

## 3 Findings

- 3.1 The results of applying all of the constraints set out in **Table 2.1** and **Table 2.3** are shown in **Map 3.1**. This map shows that at this stage in the method, a significant amount of land was showing as having technical potential for solar PV farm development. The total amount when summed amounted to almost 26 000 hectares – or a little over 15% of the entire area of search.
- 3.2 The application of the technical and financial constraint listed in **Table 2.4** drastically reduced the land area. The resultant land area of 1,818 hectares (a little over 1% of the entire search area) was split into 92 discrete parcels of land or Opportunity Areas.
- 3.3 Taking the results of the Landscape Sensitivity and Capacity Study into consideration, 45 of these Opportunity Areas were ruled out on the basis that they either had no capacity (too sensitive) or only had capacity for micro-scale developments (less than 0.5MW). This left **47 Opportunity Areas** requiring further examination using the factors detailed below. **Map 3.2** shows the Opportunity Areas that were ruled out on the basis of their sensitivity and the remaining Opportunity Areas that underwent further analysis.

### Wider constraints and higher level infrastructure

- 3.4 In order to rank the list of Opportunity Areas, capacity in the higher level infrastructure (superstations) was reviewed. Grid and super stations in Anglesey are all critically constrained. The National Grid is delivering upgrades to these connections, with an expected capacity release date of 2019-2025. While this is within the timeframe for the Plan, new generation projects on that infrastructure are already contracted, with over 100MW in the

pipeline, which would take priority over any new applications on Opportunity Areas identified in this study. All Anglesey Opportunity Areas are therefore deprioritised, with a view to potential future connection at a later date. The higher level infrastructure in Powys and the south of Gwynedd is also critically constrained by the Swansea North interconnection; these substations are also therefore excluded.

### Cascade higher level infrastructure rating to “daughter” infrastructure

- 3.5 The two remaining Super Stations (Connahs Quay and Trawsfynydd) are ranked by their capacity for new generation connections; the connected “daughter” infrastructure inherits this rating. The next rating applied is the rating given by SP Manweb for the substation’s generation capacity, which is the dominant rating. However in the case where the super station’s rating is worse than the generation capacity, the lower rating was used, e.g. Abersoch is rated green for generation by SP Manweb, but feeds into the Trawsfynydd superstation, which has generation constraint at the grid substation level, and hence is rated amber overall.
- 3.6 This resultant RAG rating was used to restrict the number of locations under consideration, given the number of potential Opportunity Areas identified in earlier step; a RAG rating was assigned to each substation to assist in prioritisation.

### Connection costs as a proportion of overall project costs

- 3.7 The financial implications of each Opportunity Areas are assessed in terms of cost of connection and revenue generation potential. SP Energy Networks quote a “high-cost project threshold of £200/kW”, which has been taken as an upper limit to connection costs for the proposed Opportunity Areas. There is a detailed methodology<sup>6</sup> for costing the connection charge for generators (and consumers), however the exact cost of connection varies

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<sup>6</sup> [http://www.spenergynetworks.co.uk/userfiles/file/SPEN\\_connection\\_methodology.pdf](http://www.spenergynetworks.co.uk/userfiles/file/SPEN_connection_methodology.pdf)

from site to site depending on factors like the condition of the local grid at the time of the application, what portion of the cost is being borne by the developer and the DNO, the involvement of a third party independent connections provider, or charges due to competition in connection.

- 3.8 The project team sought contact with SP Energy Networks, but without success within the timeframe of this project. Thus detailed connection costs for the proposed Opportunity Areas have not been estimated. The next step will be to apply for a budget estimate from SP Energy Networks in advance of a feasibility study or formal application. Detailed costings would need to be undertaken as part of pre-application viability work by a developer.
- 3.9 It has been assumed that, for larger systems, the connection cost is a smaller proportion of the total project costs than for smaller systems. Hence larger areas of land with lower sensitivity are prioritised, as they have capacity for up to 5MW system, at a lower relative connection cost than a smaller area hosting a smaller system.

### Revenue sources

- 3.10 DECC offer a feed-in tariff for standalone PV installations up to 5MW; this is the effective upper size limit for new solar PV farms. The latest published figure for standalone PV is 0.15p/kWh (Jan – Mar 2019)<sup>7</sup>.
- 3.11 Power purchase agreements with developers or utility companies therefore represents the larger contribution to revenue, at around 5p/kWh.

## Opportunity Areas

- 3.12 Within the study area, and taking landscape sensitivity into consideration, **47 Opportunity Areas were identified with potential for development**. To manage the number of Opportunity Areas under consideration, **all sites under 2.4ha were excluded**, i.e. only those able to host 1MW or above were considered. This is because larger capacity solar farms are financially more attractive to developers, as connection costs and other fixed costs represent a smaller proportion of the total cost, and are offset by larger revenue streams. This reduced the list to **38 Opportunity Areas**.

### Local Sense Checks

- 3.13 The final step was to undertake a local 'sense check' of the potential areas to ascertain whether there are any further significant constraints in relation to the potential sites.
- 3.14 The table below summarises the residual issues identified within the potential opportunity areas:

Potential Opportunity Area Number	Key Issue
71 Parc Menai	The majority of the potential area includes the garden areas of the Tyn y Lôn Cluster. In light of this, it was removed as a potential area.
4 Mona	Part of the area that falls within the Mona Airfield was removed.
36 Bangor Hospital	The majority of the potential area is a

<sup>7</sup> [https://www.ofgem.gov.uk/system/files/docs/2016/04/01\\_april\\_2016\\_tariff\\_table.pdf](https://www.ofgem.gov.uk/system/files/docs/2016/04/01_april_2016_tariff_table.pdf)

	school playing field. In light of this it was removed as a potential area.
General Issue	A review was undertaken of all the potential sites to ensure that wherever possible individual properties were taken out of the potential area of search. However in certain circumstances due to the shape of the potential area this was not possible.

- 3.15 With the removal of 71 Parc Menai & 36 Bangor Hospital, the number of potential Opportunity Areas was reduced to 36.

### Prioritising the suitable areas

- 3.16 The full results of the assessment are shown in **Appendix 3**.

### Top rated Opportunity Areas

- 3.17 Of the Opportunity Areas identified as having capacity from the Landscape Sensitivity and Capacity Study, only four are in areas without critical grid constraint for generation connections. In order of priority, these are shown in **Table 3.2** and shown on **Map 3.3**.
- 3.18 It is noted that some of these top rated Opportunity Areas are large enough to hold multiple sites. The Areas' boundaries are only indicative and it does not mean all of the land identified within an Opportunity Area would have the benefit of planning consent. It is also important to note that this assessment has also not included a consideration of cumulative impacts which can only be properly assessed at the planning application stage.

**Table 3.1 Top rated Opportunity Areas**

Site ID	Substation, LA	Technical rating and comments	Development size considerations
35	Parc Menai, Gwynedd	GREEN Connaahs Quay – Pentir supergrid; capacity for generation	Landscape Sensitivity Assessment indicates that ≤2.5MW installations may be able to be accommodated; optimal size for solar developer

Site ID	Substation, LA	Technical rating and comments	Development size considerations
5	Rhoslan, Gwynedd	AMBER Trawsfynydd supergrid; less capacity for generation	Landscape Sensitivity Assessment indicates that ≤2.5MW installations may be able to be accommodated; optimal size for solar developer
7	Rhoslan, Gwynedd	AMBER Trawsfynydd supergrid; less capacity for generation	Landscape Sensitivity Assessment indicates that ≤2.5MW installations may be able to be accommodated; optimal size for solar developer
84	Rhoslan, Gwynedd	AMBER Trawsfynydd supergrid; less capacity for generation	Available land limits max installation to ~600kW. Higher proportion of cost of connection, compared to total project cost.

### Ranking the remaining Opportunity Areas

- 3.19 All of the remaining areas 32 are within grid infrastructure that is critically constrained, however in order to prioritise these for consideration within the JLDP, they were ranked as shown in **Table 3.2** and shown on **Map 3.3**. The ranking is based on the sensitivity of the landscape and the size of the potential area available.

**Table 3.2 Prioritisation of remaining Opportunity Areas**

Constraints on Opportunity Areas	System size	Site ID
Opportunity Area with area ≥ 12ha with lower landscape sensitivity	5 MW Medium	3, 4, 6, 10, 16, 19, 26, 27, 28
Opportunity Areas with area ≤12ha with lower landscape	2.5 – 5 MW	34, 37, 39 <sup>8</sup>

<sup>8</sup> Site 39 straddles two Landscape Character Areas, and half of the Opportunity Area can be considered more suitable than the other half.



Constraints on Opportunity Areas	System size	Site ID
sensitivity	Small to medium	
Opportunity Areas with either higher landscape sensitivity or ≤6ha	≤2.5MW Small	42, 45, 47, 53, 56, 57, 58, 59, 2, 9, 20, 22, 23, 32, 50, 51, 52, 60, 61, 62

3.20 Opportunity Areas able to host a 5MW system were prioritised, as the connection costs represent a smaller proportion of the overall costs, and hence have less impact on project viability for a developer.

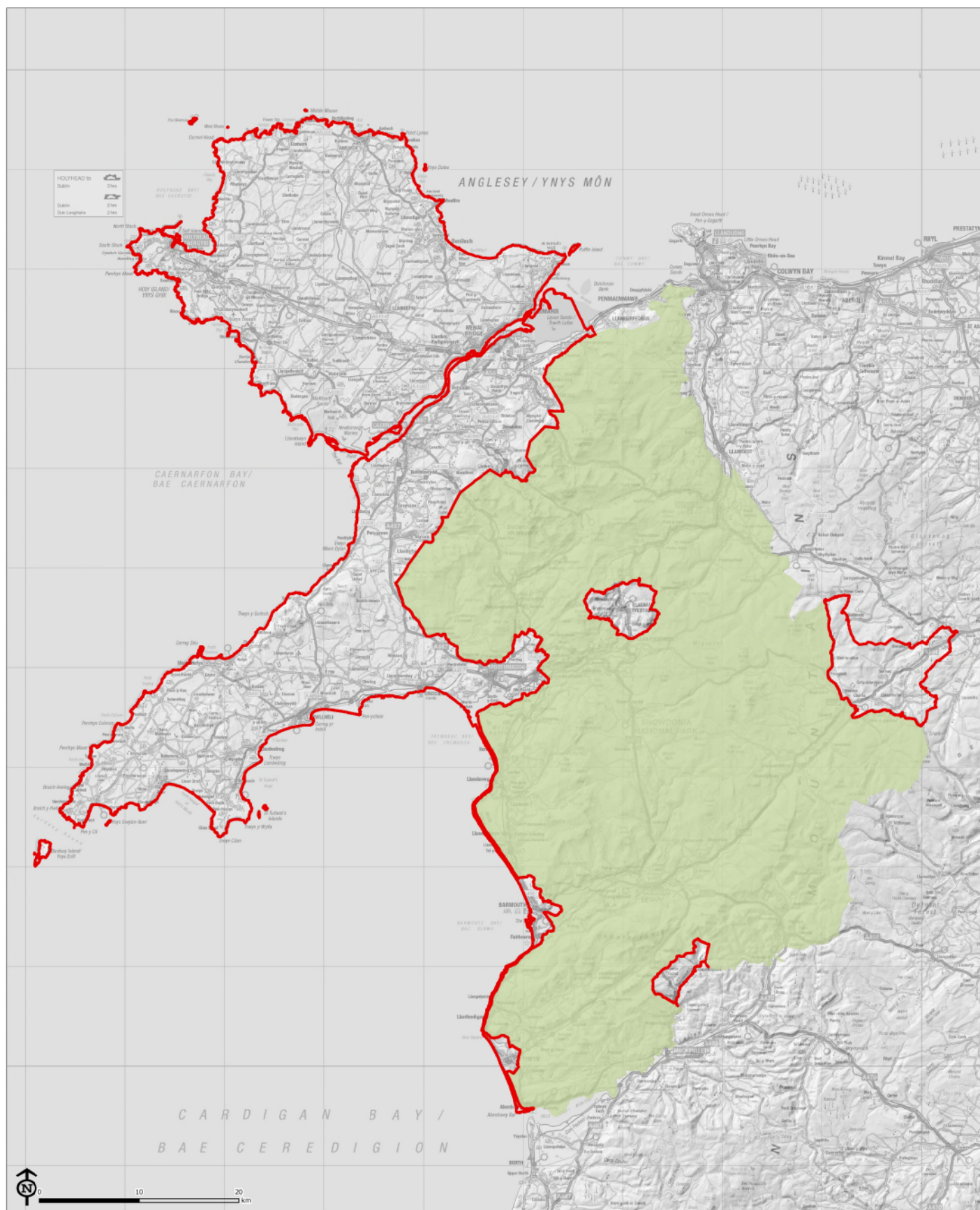
3.21 As referred to in paragraph 3.18, it is noted that the Opportunity Areas identified are often large enough to host multiple sites (up to the capacity dictated by the LSA). However since this assessment has not included a consideration of the cumulative impacts, we have ranked Opportunity Areas based on their ability to host one or more site of the given capacity.

### Conclusion

3.22 In conclusion, this assessment has identified that there are four top rated opportunity areas with the potential for the development of solar PV farms taking into account of constraints listed in Tables 2.1, 2.3 and 2.4, grid constraints and landscape sensitivity issues. A further 32 areas of opportunity have been identified but which are subject to grid constraints at the present time.

3.23 It is recommended that all of the 36 potential areas identified be allocated in the JLDP as areas of search for potential solar PV farm development. **Map 3.3** show the areas it is proposed should be allocated in the JLDP.

3.24 It is important to note that identifying areas of suitability for Solar PV farms does not provide a definitive statement of the suitability of particular location for solar PV. Site specific assessment and design would still be required and all applications would still need to be assessed on their individual merits. The setting of heritage assets, ecology and local landscape issues etc. would need to be carefully considered at a site level. These material planning considerations will be set out in policies in the Joint Local Development Plan.



- Study Area
- Snowdonia National Park

Potential for Solar PV Farms in  
Gwynedd and Ynys Môn

### Map 2.1: Study Area

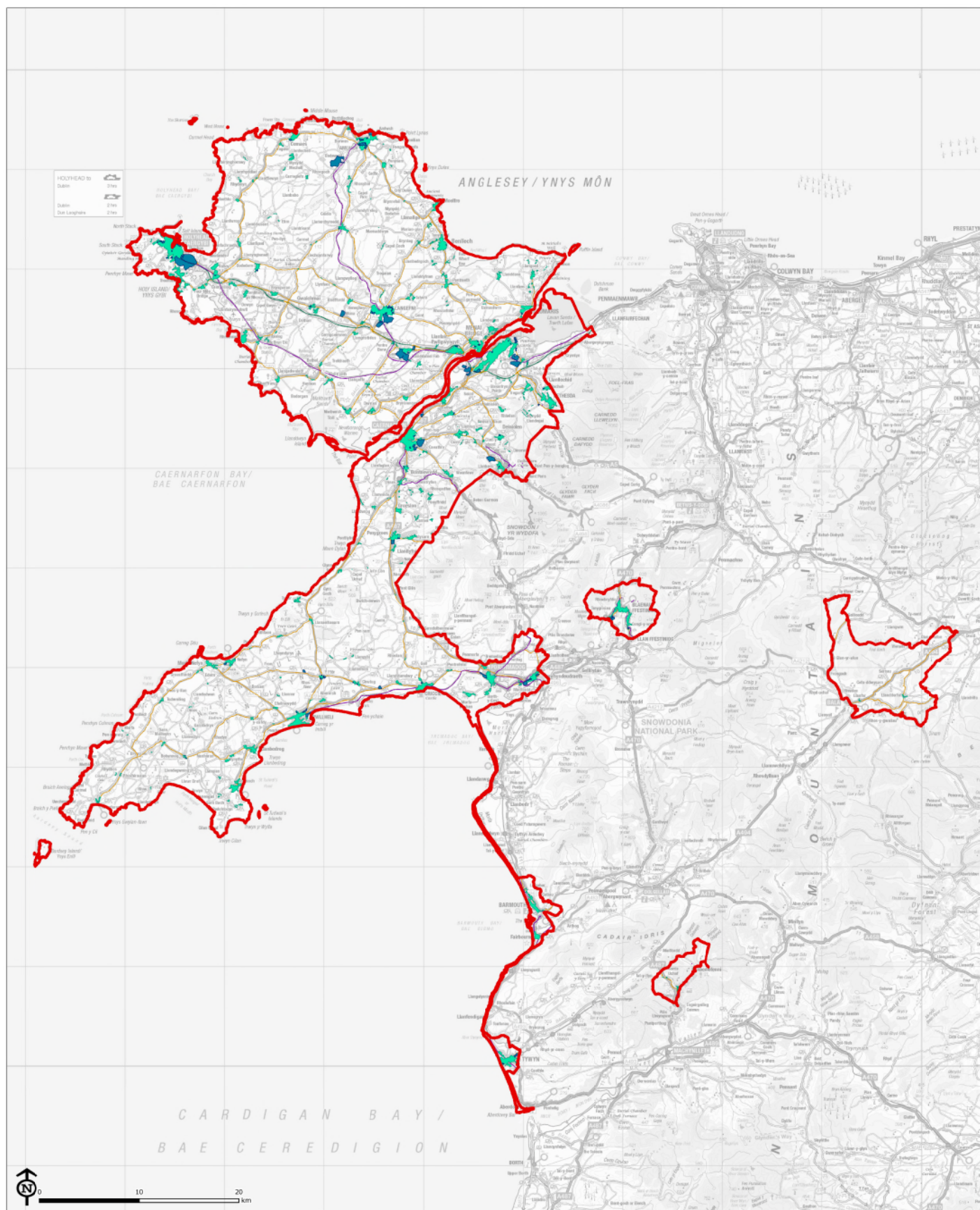
Source: Natural England



Gwynedd and Anglesey Joint  
Planning Policy Unit

Map Scale @ A3: 1:375,000





- Study Area
- A and B roads single carriage - 5m buffer
- A and B roads dual carriage - 10m buffer
- Housing allocations and employment areas
- Railway track - 7.5m buffer
- Urban areas and clusters

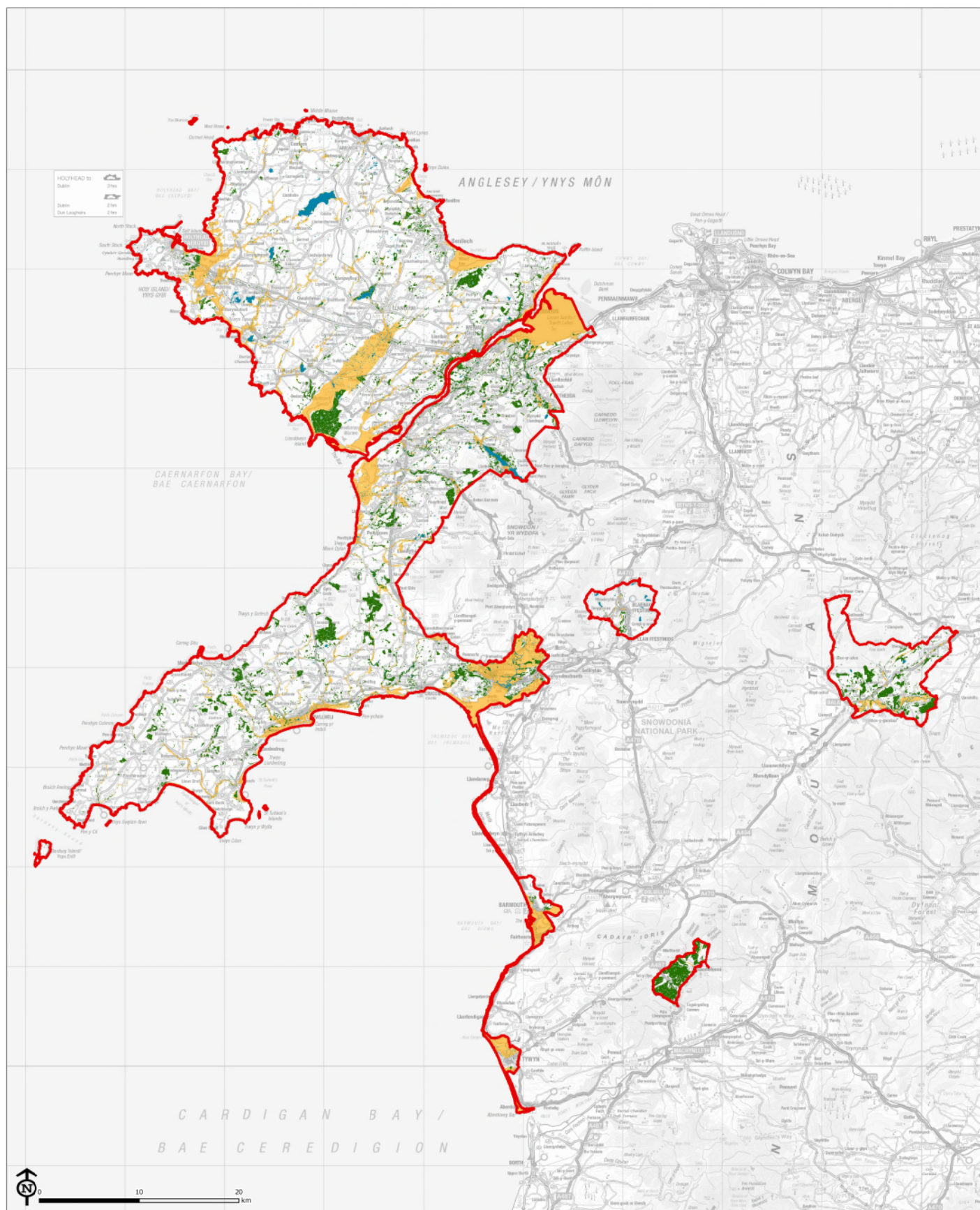
Potential for Solar PV Farms in  
Gwynedd and Ynys Môn

**Map 2.2: Built Up Areas and  
Infrastructure**

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Planning Policy Unit

Map Scale @ A3: 1:375,000



- Study Area
- Surface water
- Woodland
- Flood Warning Areas C1 and C2

Potential for Solar PV Farms in  
Gwynedd and Ynys Môn

### Map 2.3: Natural Features

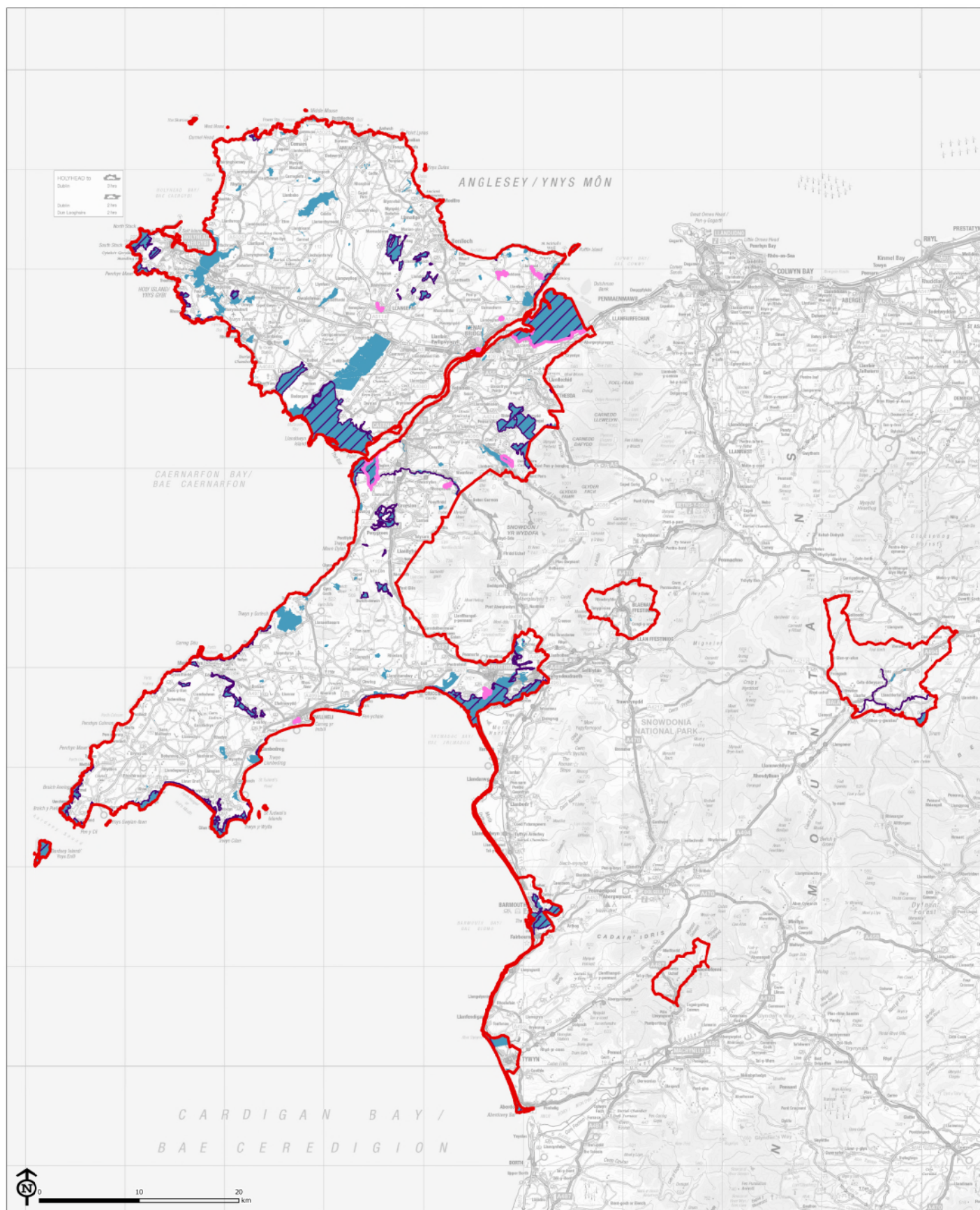
Source: Natural Resources Wales



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Map Scale @ A3: 1:375,000





- Study Area
- International Nature Conservation Sites\*
- National Nature Conservation Sites\*\*
- Local Nature Reserve

\*International Nature Conservation Sites include Ramsar, Special Areas of Conservation (SAC) and Special Protection Areas (SPA).

\*\*National Nature Conservation Sites include National Nature Reserve (NNR) and Sites of Special Scientific Interest (SSSI).

Potential for Solar PV Farms in Gwynedd and Ynys Môn

## Map 2.4: Biodiversity and Geodiversity

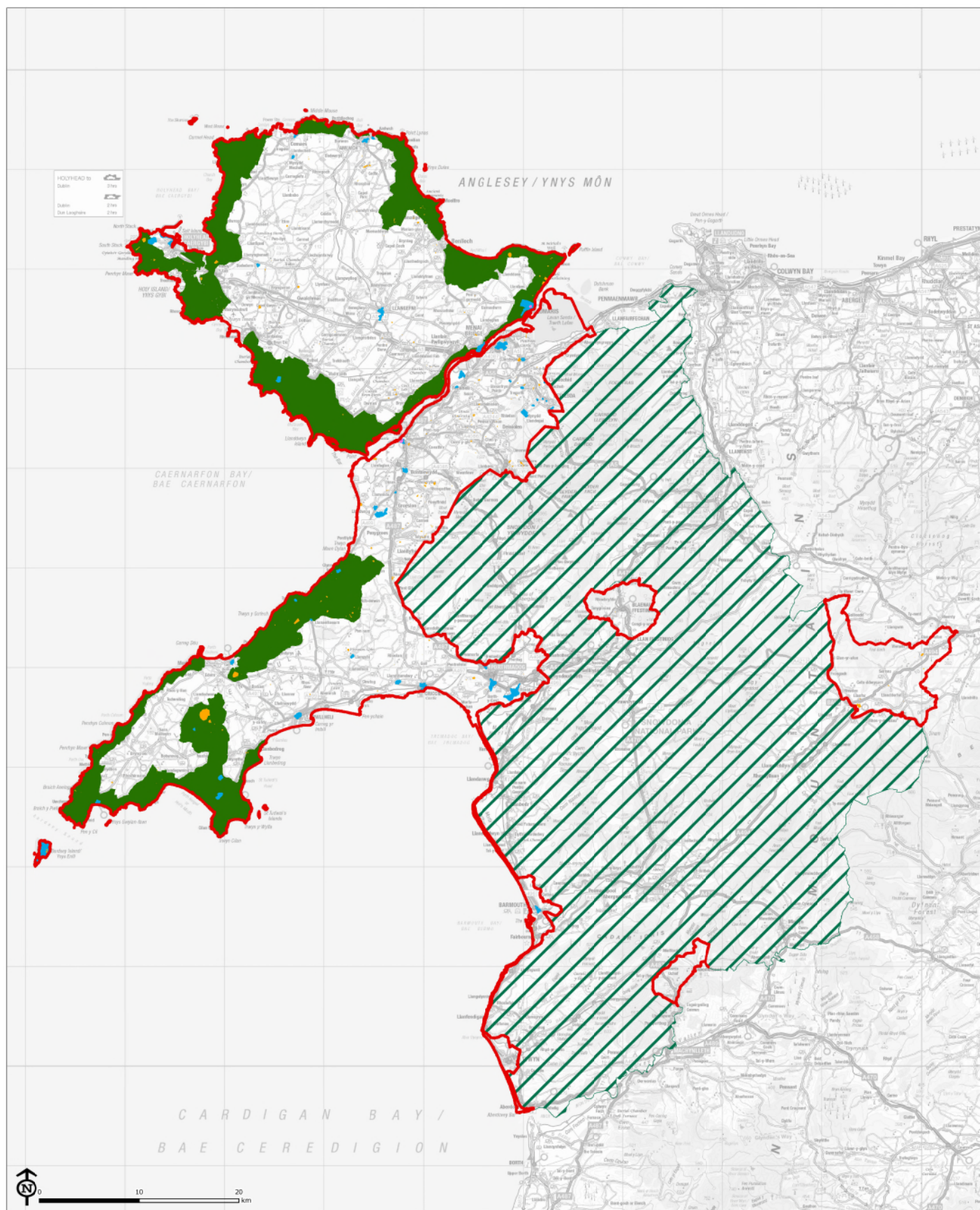
Source: Natural Resources Wales



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Map Scale @ A3: 1:375,000





- Study Area
- Area of Outstanding Natural Beauty
- Conservation Area
- Scheduled Ancient Monument
- World Heritage Site
- Snowdonia National Park

Potential for Solar PV Farms in  
Gwynedd and Ynys Môn

### Map 2.5: Heritage and Landscape

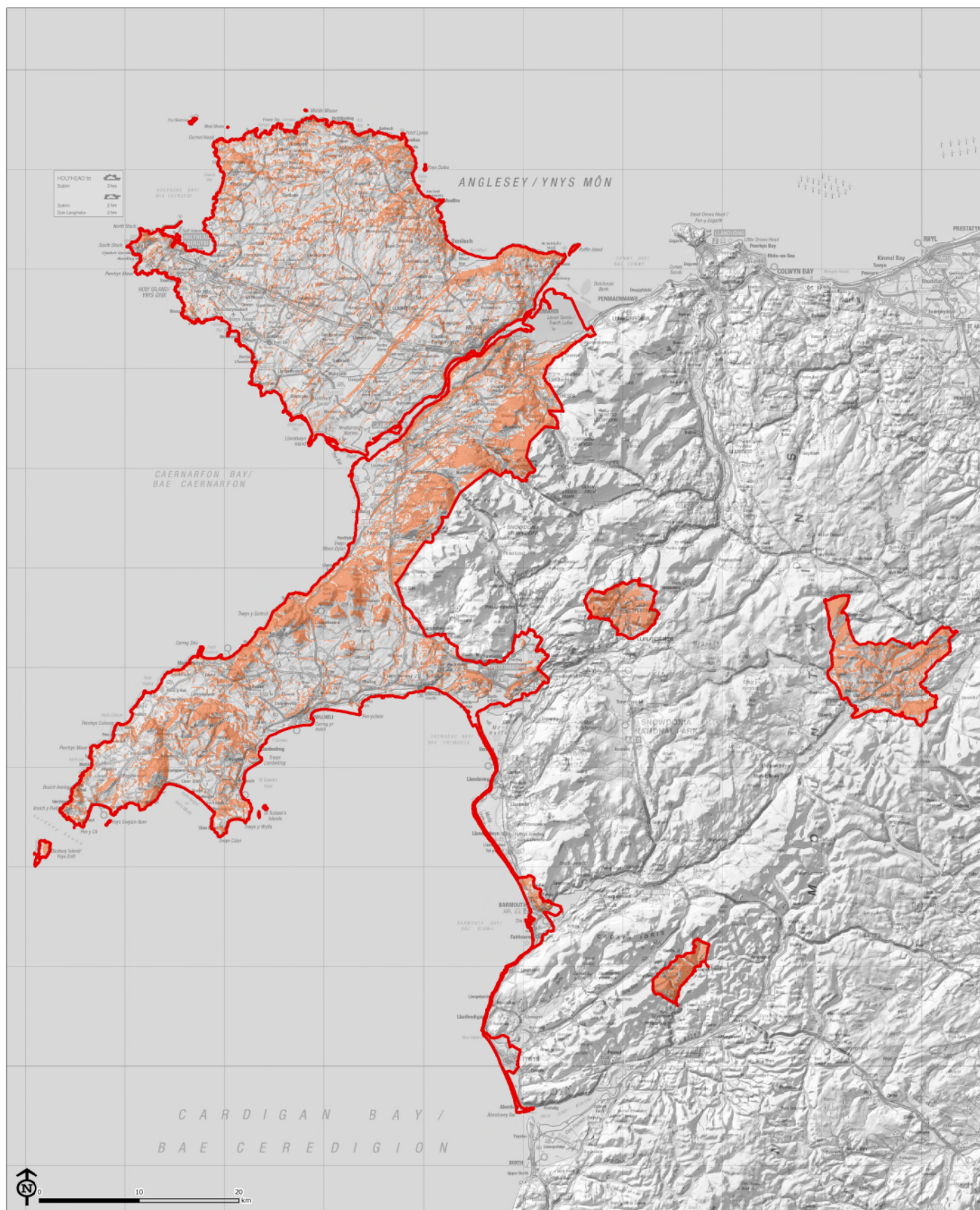
Source: Cadw, Natural Resources Wales

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- Study Area
- Unsuitable Slope and Aspect

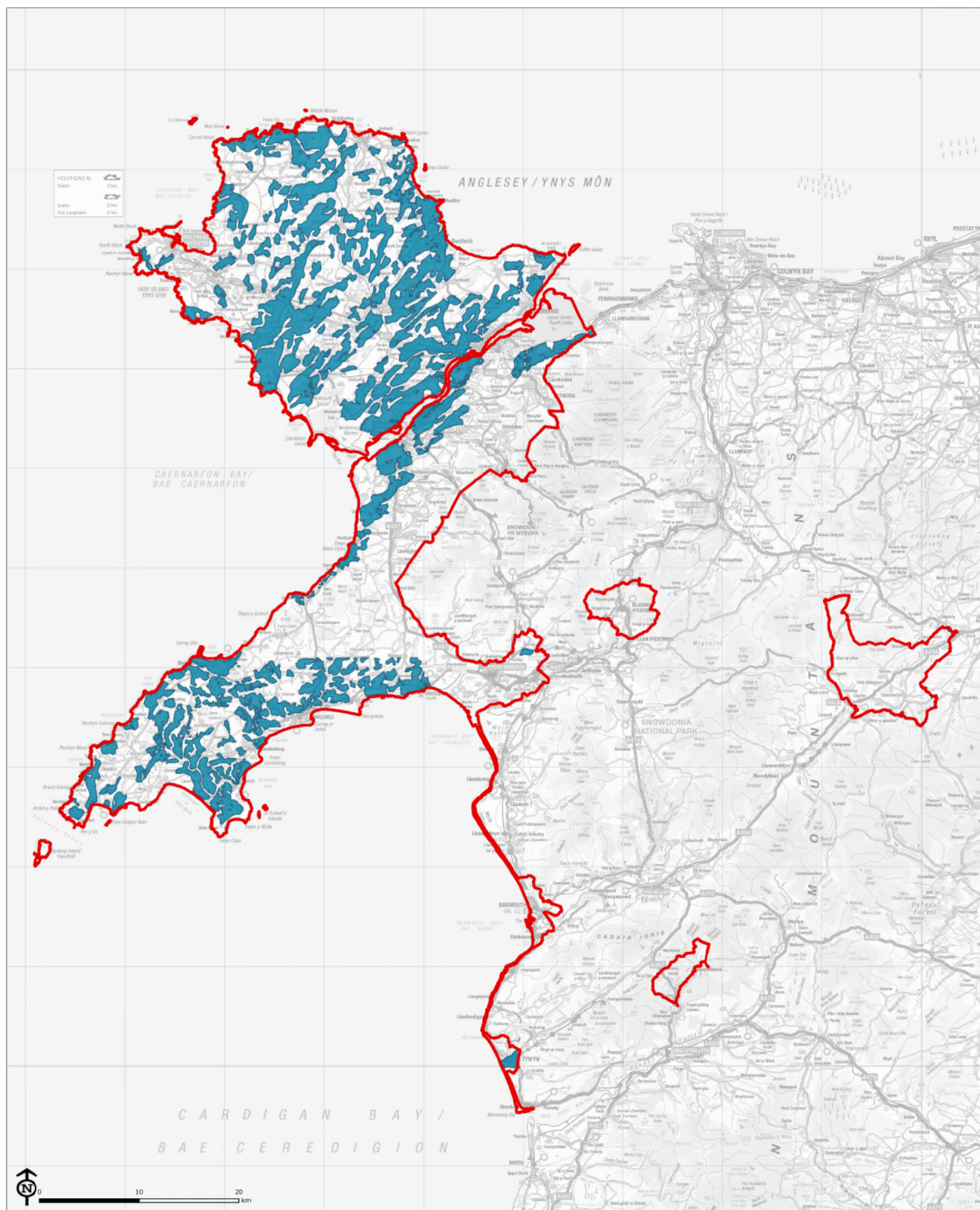
Potential for Solar PV Farms in  
Gwynedd and Ynys Môn

### Map 2.6: Slope and Orientation



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Study Area

Agricultural Land Classification Grade 1, 2 and 3 with areas identified as non-BMV removed\*

\*Welsh Government supplied data to identify those areas within the Provisional ALC Grades 1, 2 and 3 that are grade 3b.

Potential for Solar PV Farms in Gwynedd and Ynys Môn

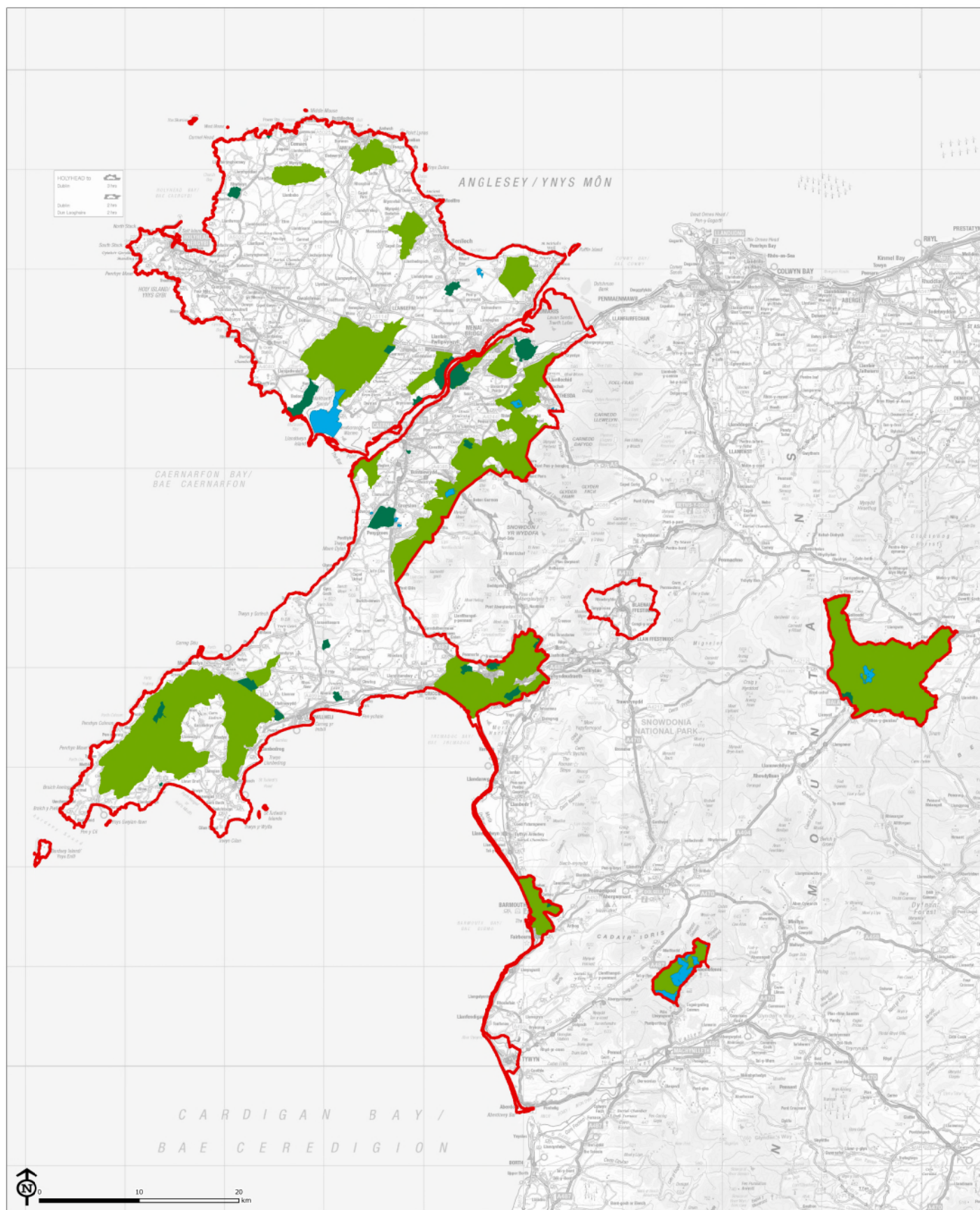
**Map 2.7: Agricultural Land Classification**

Source: Natural England and Welsh Government

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- Study Area
- CROW (Countryside and Rights of Way) dedicated land
- Registered parks, essential settings and kitchen gardens
- Special Landscape Areas

Potential for Solar PV Farms in Gwynedd and Ynys Môn

### Map 2.8: Further Considerations

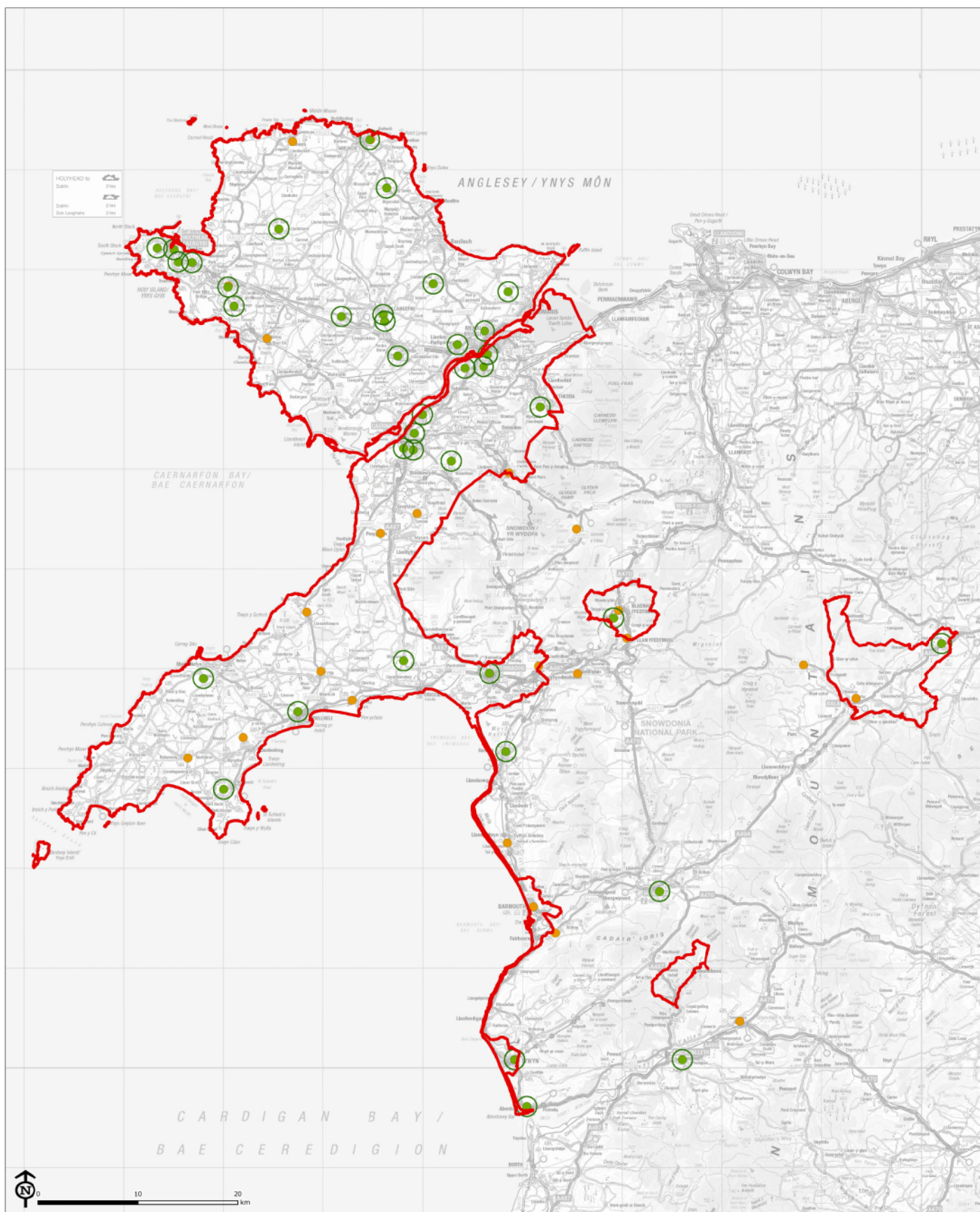
Source: Cadw, Natural Resources Wales



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Map Scale @ A3: 1:375,000





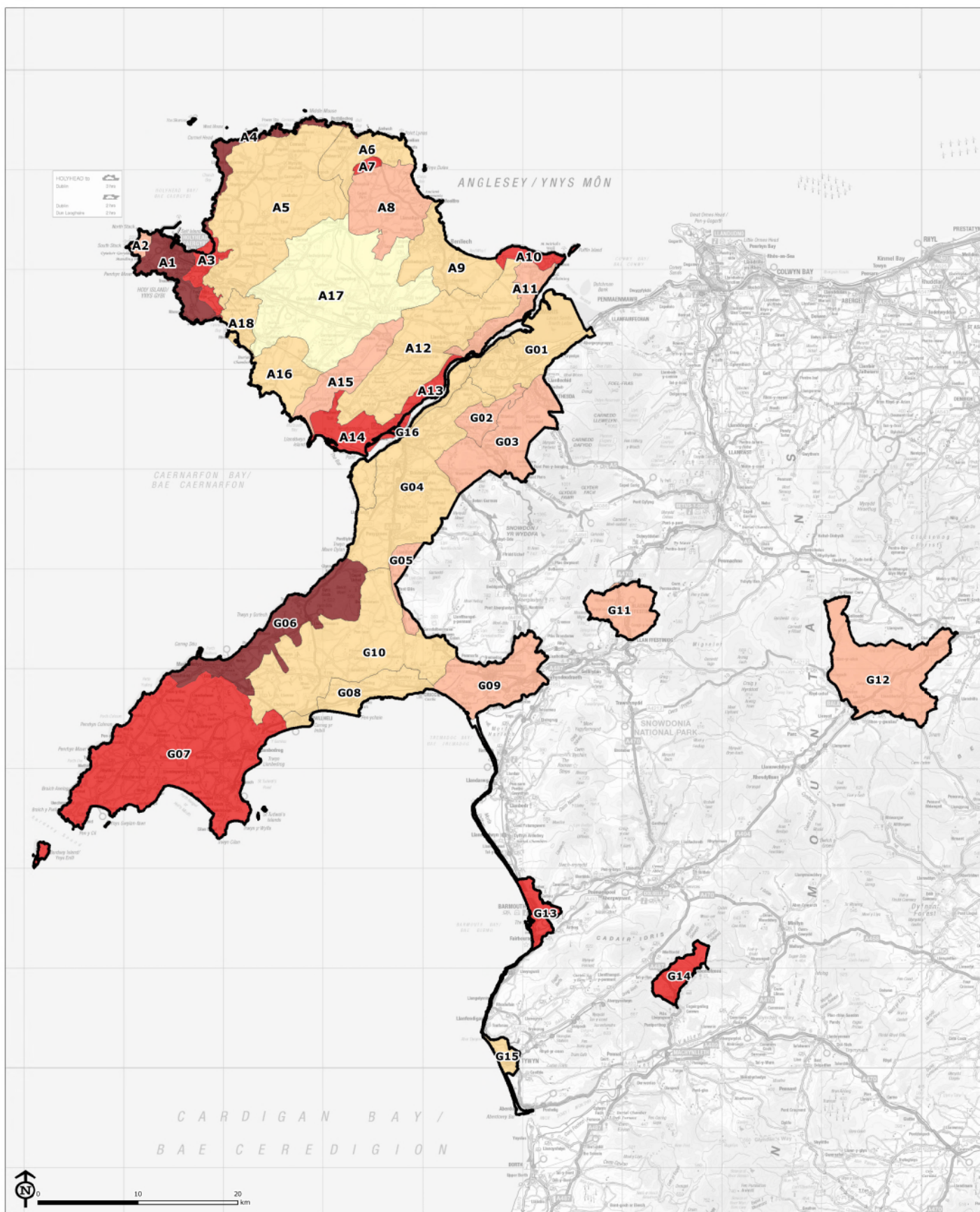
Potential for Solar PV Farms in Gwynedd and Ynys Môn

### Map 2.9: DNO Infrastructure

Source: [http://www.spenergynetworks.co.uk/pages/sp\\_manweb\\_heat\\_maps.asp](http://www.spenergynetworks.co.uk/pages/sp_manweb_heat_maps.asp)



Gwynedd and Anglesey Joint Planning Policy Unit



- Study Area**
- Solar sensitivity**
- Very high
  - High
  - Medium high
  - Medium
  - Low medium

Potential for Solar PV Farms in Gwynedd and Ynys Môn

### Map 2.10: Landscape Sensitivity

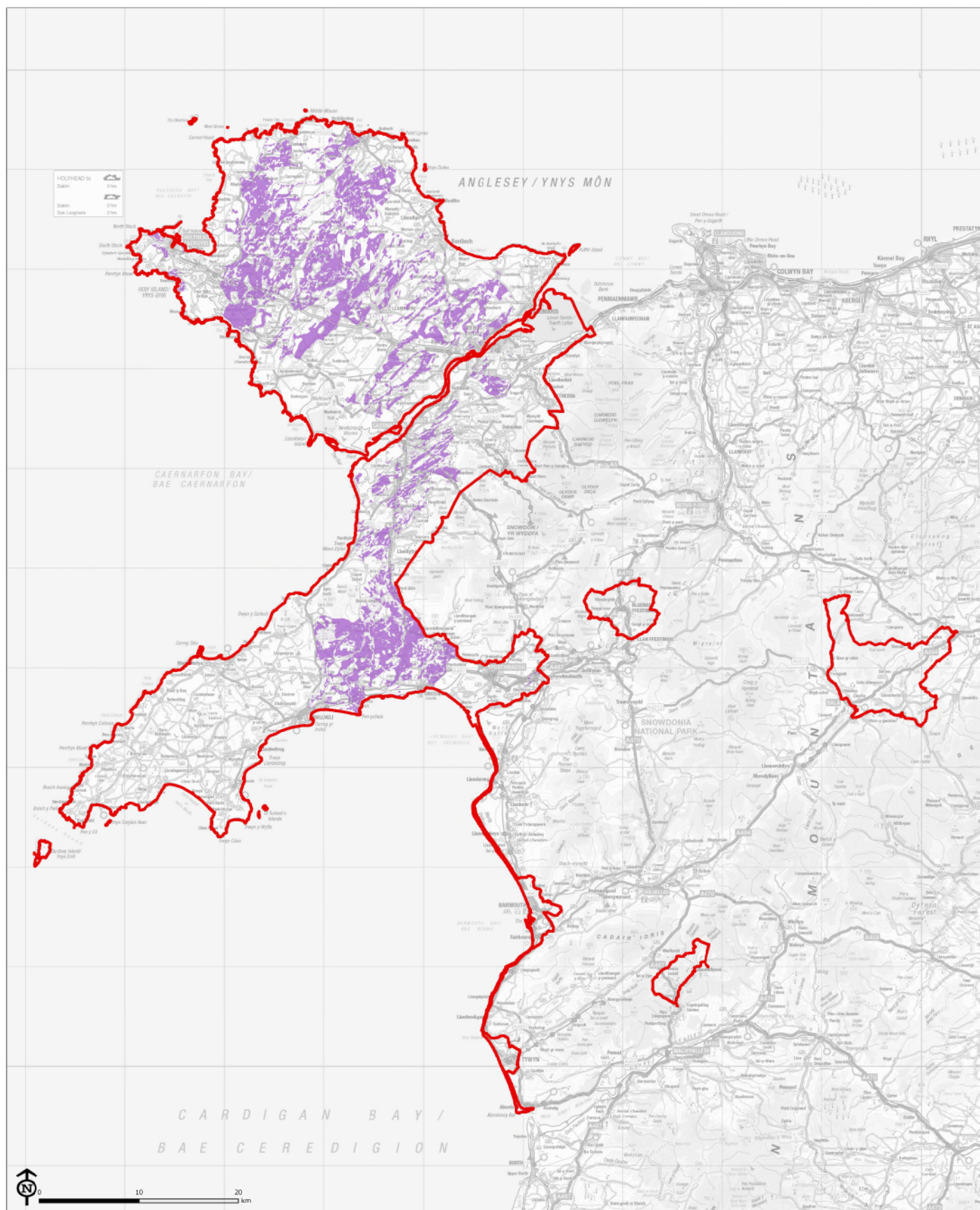
Source: Gwynedd Council, Anglesey Council



Gwynedd and Anglesey Joint Planning Policy Unit

Map Scale @ A3: 1:375,000





- Study Area
- Resultant Opportunity Areas

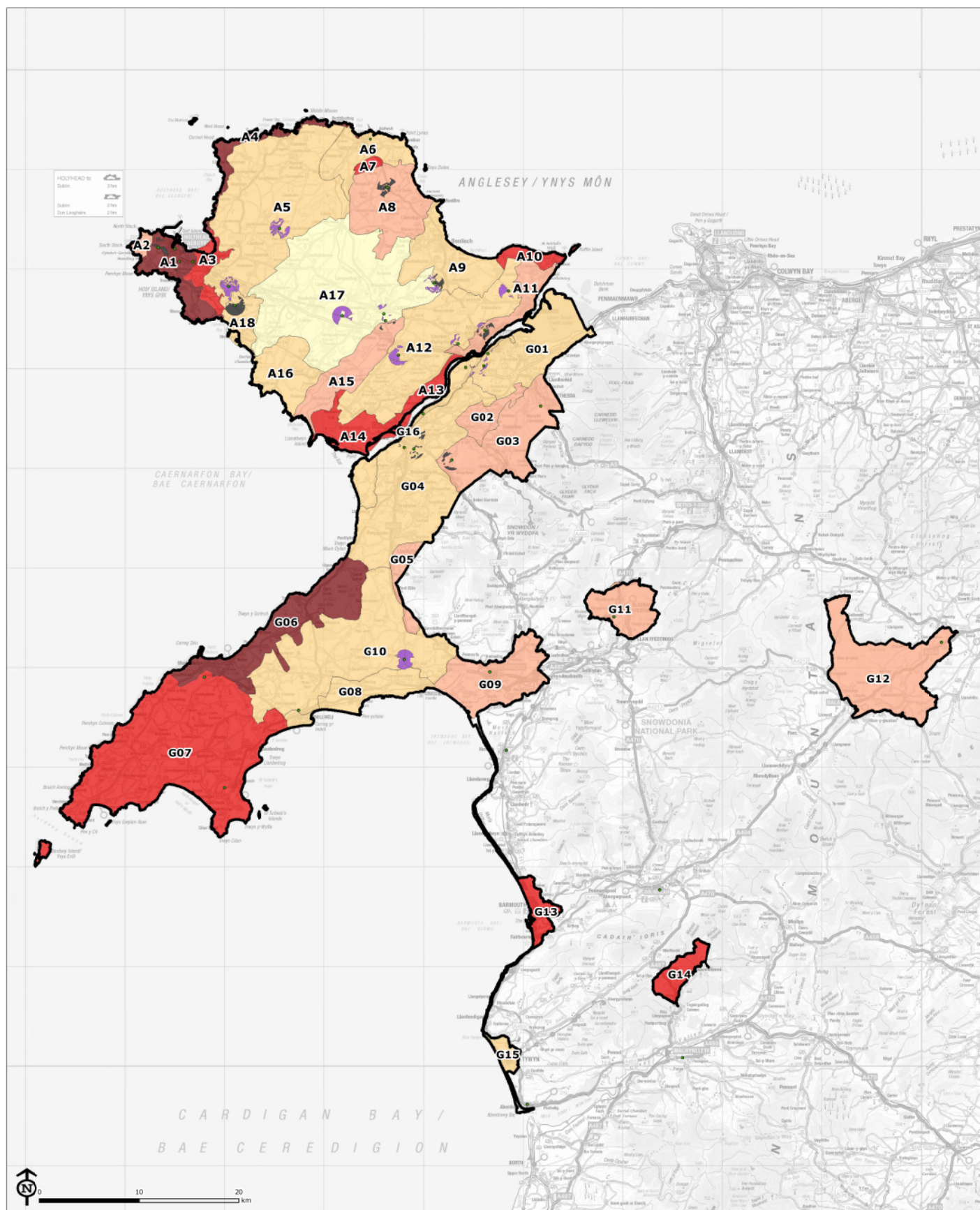
Potential for Solar PV Farms in Gwynedd and Ynys Môn

### Map 3.1: Resultant Opportunity Areas

Source: Natural England



Gwynedd and Anglesey Joint Planning Policy Unit



- Study Area**
- Study Area
  - Suitable substation
- Assessment**
- No capacity/capacity for micro-scale PV only
  - Opportunity Areas still being considered
- Solar sensitivity**
- Very high
  - High
  - Medium high
  - Medium
  - Low medium

Potential for Solar PV Farms in Gwynedd and Ynys Môn

**Map 3.2: Opportunity Areas Following Application of Technical, Financial and Landscape Sensitivity constraints**

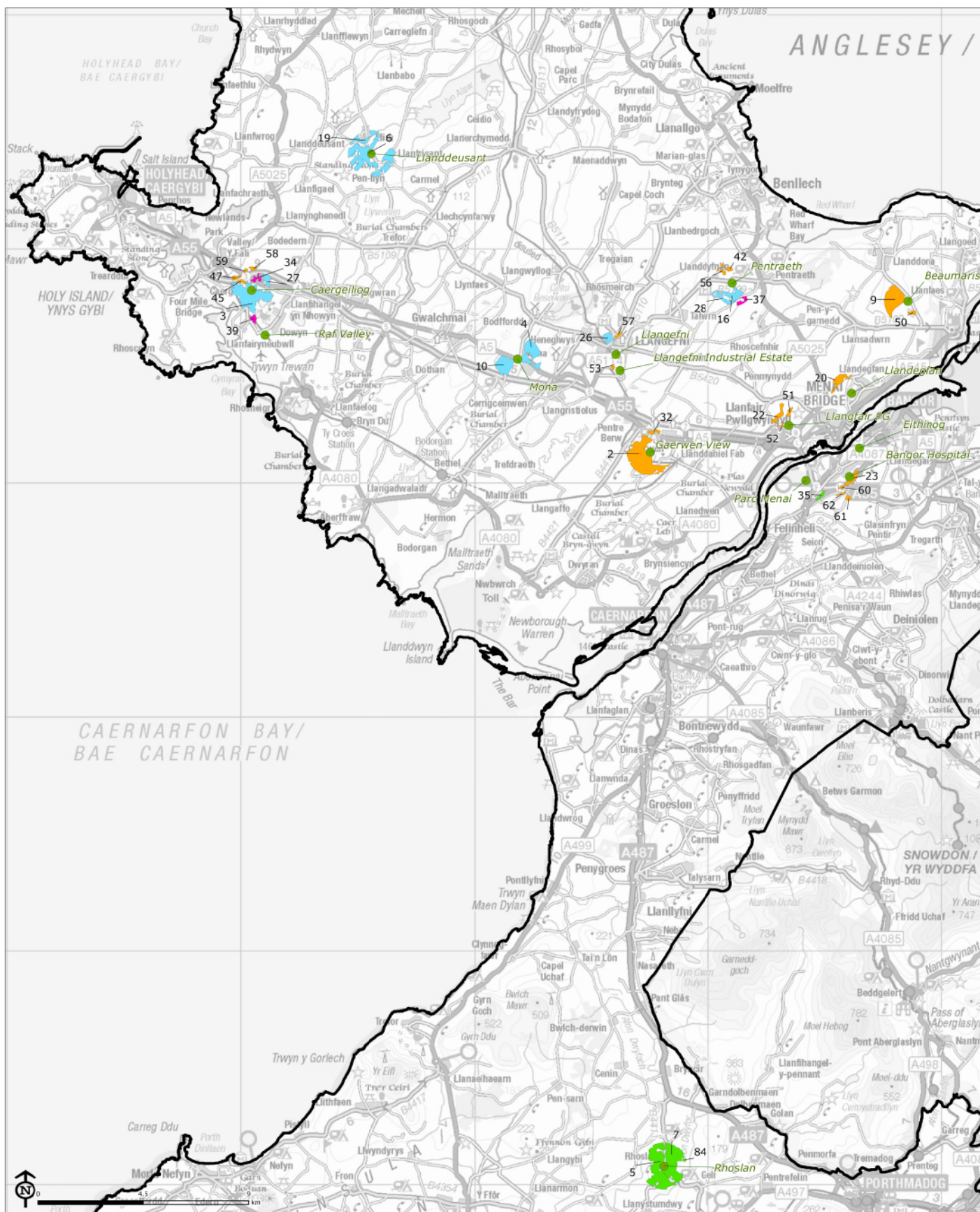
Source: Gwynedd Council, Anglesey Council

**LUC**

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Map Scale @ A3: 1:375,000





Study Area

Substations with green generation capacity AND green 11kV faults near Opportunity Areas

Assessment (labels refer to Site IDs)

Top rated

Opportunity Area with area  $\geq 12$ ha with lower sensitivity

Opportunity Area with area  $\leq 12$ ha with lower sensitivity

Opportunity Areas with either higher sensitivity or  $\leq 6$ ha

Potential for Solar PV Farms in Gwynedd and Ynys Môn

Map 3.3: Areas to be Allocated as Search Areas in the JLDP

Source: Gwynedd Council, Anglesey Council

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Gwynedd and Anglesey Joint Planning Policy Unit

Map Scale @ A3: 1:160,000



**Appendix 1**  
DNO Infrastructure

Description of table headings				
Infra type	Category of DNO infrastructure (substation, grid substation, super station)	RAG rated columns All these ratings are taken from SP Energy Networks		
Parent	Next layer of infrastructure to which this element is connected	Reverse flow	How the local grid will respond to power generation away from substations	
Nominal voltage	Rated voltage on this element of the grid	Generation rating	Measure of how much decentralised generation the local grid can tolerate	
Group Generation Connected	Total existing capacity of local generation on this region of the network	Fault level	Whether there are faults on the grid around this element; faults often require repairs before local generation can be installed, which adds to the connection cost	
Group Generation Contracted	Planned and contracted capacity of local generation on this region of the network	Wider constraints	Measure of the level of grid constraint elsewhere on the network (notes follow)	

DNO infrastructure map - as of 14th June 2016												RAG rating from SPEN heatmap				Subsequent constraints applied		Notes	Local Authority
Location	Site IDs	Infra type	Parent grid station	Parent super station	Nominal voltage (kV)	Group Generation Connected (MW)	Group Generation Contracted (MW)	Group firm capacity (MW)	Group max load (MVA)	Group min load (MVA)	SP Networks overall rating	Reverse flow	Generation rating	11/33kV fault level	Wider constraints	Rating based on superstation	Final rating: based on generation rating (substation level)		
Aberdyfi		Primary substation	Aberystwyth	Swansea North	11			7.50	4.10	1.03	RED	GREEN	GREEN	GREEN	RED	RED	RED	Constraint comes from wider 132kV network - Swansea North interconnection	Gwynedd
Abersoch		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	4.08	1.02	RED	AMBER	GREEN	GREEN	RED	AMBER	AMBER		Gwynedd
Alpoco	18, 54	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	2.06	0.51	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Amlwch		Primary substation	Amlwch - Caergeiliog	Wylfa	11			10.00	4.62	1.16	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Amlwch		Grid substation		Wylfa	132/33	74.2	106.31	150.00	115.00	28.75	RED		RED	GREEN	RED	RED	RED		Anglesey
Bala		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	3.58	0.90	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd
Bangor		Grid substation		Connahs Quay - Pentir	132/33	16.07		120.00	115.00	28.75	AMBER		GREEN	AMBER	GREEN	GREEN	GREEN		Gwynedd
Bangor Hospital	23, 36, 60, 61, 62	Primary substation	Bootle 2A - Burlington St 1 - Lister Dv 2	Unknown	11			10.00	7.46	1.87	RED	RED	GREEN	GREEN	RED	RED	RED		Gwynedd
Bangor University		Primary substation	Bootle 2A - Burlington St 1 - Lister Dv 2	Unknown	11			20.00	13.83	3.46	RED	RED	GREEN	AMBER	RED	RED	RED		Gwynedd
Barmouth		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	3.67	0.92	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd
Beaumaris	9, 50, 82	Primary substation	Amlwch - Caergeiliog	Wylfa	11			4.00	4.85	1.21	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Bethesda		Primary substation	Bangor - Caernarfon	Connahs Quay - Pentir	11			7.50	5.08	1.27	AMBER	GREEN	GREEN	GREEN	AMBER	GREEN	GREEN		Gwynedd
Blaenau Ffestiniog		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	2.44	0.61	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd
Blanau Plastics		Primary substation	Four	Trawsfynydd	11						RED	GREEN	GREEN	GREEN	RED	AMBER	AMBER		Gwynedd

DNO infrastructure map - as of 14th June 2016											RAG rating from SPEN heatmap					Subsequent constraints applied		
																Final rating: based on generation rating (substation level)		
Location	Site IDs	Infra type	Parent grid station	Parent super station	Nominal voltage (kV)	Group Generation Connected (MW)	Group Generation Contracted (MW)	Group firm capacity (MW)	Group max load (MVA)	Group min load (MVA)	SP Networks overall rating	Reverse flow	Generation rating	11/33kV fault level	Wider constraints	Rating based on superstation	Notes	Local Authority
Botwynnog		Primary substation	Crosses - Maentwrog Four	Trawsfynydd	11		4.00	4.00	3.21	0.80	RED	AMBER	RED	GREEN	RED	AMBER	RED	Gwynedd
			Crosses - Maentwrog Four										RED					
Butlins		Primary substation	Crosses - Maentwrog	Trawsfynydd	11			7.50	4.53	1.13	RED	GREEN	AMBER	GREEN	RED	AMBER	AMBER	Gwynedd
Caergeiliog	3, 27, 34, 45, 47, 58, 59, 81, 85, 87	Primary substation	Caergeiliog	Wylfa	11			7.50	5.39	1.35	RED	GREEN	GREEN	GREEN	RED	RED	RED	Anglesey
													GREEN					
Caergeiliog		Grid substation		Wylfa	132/33	74.2	106.31	150.00	115.00	28.75	RED		RED	GREEN	RED	RED	RED	Anglesey
Caernarfon		Grid substation		Connahs Quay - Pentir	132/33	16.07		120.00	115.00	28.75	AMBER		GREEN	AMBER	GREEN	GREEN	GREEN	PV farm built in this region (Bontnewydd) - 2014 Preferred substation; but no capacity after LSA
Caernarfon	24, 33, 74	Primary substation	Bangor - Caernarfon Four	Connahs Quay - Pentir	11			7.50	6.72	1.68	AMBER	GREEN	GREEN	GREEN	AMBER	GREEN	GREEN	Gwynedd
Carmel		Primary substation	Crosses - Maentwrog	Trawsfynydd	11		2.00	4.00	2.31	0.58	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER	Gwynedd
Cemaes Bay		Primary substation	Amlwch - Caergeiliog	Wylfa	11			4.00	2.95	0.74	RED	AMBER	AMBER	GREEN	RED	RED	RED	Anglesey
Cemmaes Road		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11		2.70	4.00	3.00	0.75	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER	Substation located outside survey area, but within 8km of the Gwynedd border
			Four Crosses - Maentwrog										AMBER					
Cwm Dyli		Primary substation	Crosses - Maentwrog	Trawsfynydd	11			4.00	1.10	0.28	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER	Gwynedd
Dolgellau		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			7.50	4.41	1.10	RED	AMBER	GREEN	GREEN	RED	AMBER	AMBER	Gwynedd
Dyffryn Ardudwy		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	3.59	0.90	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER	Gwynedd
Edern		Primary substation	Crosses - Maentwrog	Trawsfynydd	11			4.00	4.37	1.09	RED	AMBER	GREEN	GREEN	RED	AMBER	AMBER	Gwynedd
			Bootle 2A - Burlington St 1 - Lister										GREEN					
Eithinog	89	Primary substation	Dv 2	Unknown	11			10.00	7.46	1.87	RED	RED	GREEN	GREEN	RED	RED	RED	Gwynedd

DNO infrastructure map - as of 14th June 2016											RAG rating from SPEN heatmap					Subsequent constraints applied			
																Final rating: based on generation rating (substation level)			
					Nominal voltage (kV)	Group Generation Connected (MW)	Group Generation Contracted (MW)	Group firm capacity (MW)	Group max load (MVA)	Group min load (MVA)	SP Networks overall rating	Reverse flow	Generation rating	11/33kV fault level	Wider constraints	Rating based on superstation	Final rating: based on generation rating (substation level)	Notes	Local Authority
Location	Site IDs	Infra type	Parent grid station	Parent super station	(kV)	(MW)	(MW)	(MW)	(MVA)	(MVA)	rating	flow	rating	level	constraints	superstation	level)		
Fairbourne		Primary substation	Aberystwyth	Swansea North	11			4.00	3.31	0.83	RED	AMBER	AMBER	GREEN	RED	RED	RED	Constraint comes from wider 132kV network - Swansea North interconnection	Gwynedd
Ferodo		Primary substation	Bangor - Caernarfon	Connahs Quay - Pentir	11			7.50	3.17	0.79	AMBER	GREEN	GREEN	GREEN	AMBER	GREEN	GREEN		Gwynedd
Four Crosses		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11		2.30	4.00	2.62	0.65	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER	PV farm built in this region (Buan) 2015	Gwynedd
Four Crosses		Grid substation		Trawsfynydd	132/33	82.6	59.20	75.00	115.00	28.75	RED		RED	AMBER	AMBER	AMBER	RED		Gwynedd
Gaerwen View	2, 32	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	2.61	0.65	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Glan-Yr-Afon		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			7.50	1.81	0.45	RED	GREEN	GREEN	GREEN	RED	AMBER	AMBER		Gwynedd
Harlech		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			7.50	3.73	0.93	RED	GREEN	GREEN	GREEN	RED	AMBER	AMBER		Gwynedd
Hirael		Primary substation	Bootle 2A - Burlington St 1 - Lister Dv 2	Unknown	11			20.00	13.83	3.46	RED	RED	GREEN	AMBER	RED	RED	RED		Gwynedd
Holyhead		Primary substation	Amlwch - Caergeiliog	Wylfa	11			10.00	9.23	2.31	RED	RED	GREEN	GREEN	RED	RED	RED		Anglesey
Llaingoch	11, 31, 46, 55, 63, 73, 88, 90	Primary substation	Amlwch - Caergeiliog	Wylfa	11			10.00	9.23	2.31	RED	RED	GREEN	GREEN	RED	RED	RED	LSA no capacity	Anglesey
Llanbedrog		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11		5.00	4.00	3.81	0.95	RED	AMBER	RED	GREEN	RED	AMBER	RED		Gwynedd
Llanberis		Primary substation	Bangor - Caernarfon	Connahs Quay - Pentir	11			4.00	3.76	0.94	AMBER	AMBER	AMBER	GREEN	AMBER	GREEN	AMBER		Gwynedd
Llanddeusant	6, 19	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	3.81	0.95	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Llandegfan	12, 20, 21, 48, 49, 79, 83	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	2.31	0.58	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Llanfaelog		Primary substation	Amlwch - Caergeiliog	Wylfa	11			4.00	3.79	0.95	RED	AMBER	AMBER	GREEN	RED	RED	RED		Anglesey
Llanfrothen		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	3.21	0.80	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd
Llangefni	26, 57, 76	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	4.91	1.23	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Llangefni Industrial Estate	40, 43, 66, 76	Primary substation	Amlwch - Caergeiliog	Wylfa	11			10.00	5.50	1.37	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Llangfair PG	22, 51, 52, 53	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	4.64	1.16	RED	GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Llanyfrydog	8, 14, 30	Primary substation	Amlwch - Caergeiliog	Wylfa	11			4.00	4.15	1.04	RED	AMBER	GREEN	GREEN	RED	RED	RED		Anglesey

DNO infrastructure map - as of 14th June 2016

DNO infrastructure map - as of 14th June 2016											RAG rating from SPEN heatmap				Subsequent constraints applied		Notes	Local Authority		
															Final rating: based on generation rating (substation level)					
Location	Site IDs	Infra type	Parent grid station	Parent super station	Nominal voltage (kV)	Group Generation Connected (MW)	Group Generation Contracted (MW)	Group firm capacity (MW)	Group max load (MVA)	Group min load (MVA)	SP Networks overall rating	Reverse flow	Generation rating	11/33kV fault level	Wider constraints	Rating based on superstation				
Machynlleth		Primary substation	Aberystwyth	Swansea North	11			5.30	4.93	1.23	RED	AMBER	GREEN	GREEN	RED	RED		Substation located outside survey area, but within 8km of the Gwynedd border; constraint comes from wider 132kV network - Swansea North interconnection	Powys	
Maentwrog		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	2.38	0.59	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd	
Maentwrog		Grid substation		Trawsfynydd	132/33	82.6	59.20	75	115.00	28.75	RED		RED	AMBER	AMBER	AMBER	RED		Gwynedd	
Manod		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	1.40	0.35	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd	
Minffordd		Primary substation	Bootle 2A - Burlington St 1 - Lister Dv 2	Unknown	11			20.00	13.83	3.46	RED	RED	GREEN	AMBER	RED	RED	RED		Gwynedd	
Mona	4, 10, 86	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	2.06	0.51	RED		GREEN	GREEN	GREEN	RED	RED	RED	Anglesey	
Parc Cybi		Primary substation	Amlwch - Caergeiliog	Wylfa	11			10.00	4.16	1.04	RED		GREEN	GREEN	GREEN	RED	RED	RED	Anglesey	
Parc Menai	35, 71	Primary substation	Bangor - Caernarfon	Connahs Quay - Pentir	11			7.50	2.07	0.52	AMBER		GREEN	GREEN	GREEN	AMBER	GREEN	GREEN	Gwynedd	
Peblic Mills	29, 38, 64, 65, 68, 72, 75	Primary substation	Bangor - Caernarfon	Connahs Quay - Pentir	11			7.50	1.50	0.38	AMBER		GREEN	GREEN	GREEN	AMBER	GREEN	GREEN	LSA allows for micro scale only	Gwynedd
Pentir		Supergrid substation		Connahs Quay - Pentir	132	271.56	276.74				AMBER						GREEN		Preferred supergrid station	Gwynedd
Pentraeth	13, 16, 25, 28, 37, 41, 42, 56, 69, 78	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	5.62	1.40	RED		GREEN	GREEN	GREEN	RED	RED	RED		Anglesey
Pen-y-Groes		Primary substation	Bangor - Caernarfon	Connahs Quay - Pentir	11			4.00	3.61	0.90	AMBER		AMBER	AMBER	GREEN	AMBER	GREEN	AMBER		Gwynedd
Porthmadog		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			10.00	5.43	1.36	RED		GREEN	GREEN	GREEN	RED	AMBER	AMBER	PV farm implemented in this region (Llanstumdwy) - 2015; second farm in development 2015	Gwynedd
Pwllheli		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			7.50	4.57	1.14	RED		AMBER	GREEN	GREEN	RED	AMBER	AMBER		Gwynedd

DNO infrastructure map - as of 14th June 2016

DNO infrastructure map - as of 14th June 2016											RAG rating from SPEN heatmap					Subsequent constraints applied			
																Final rating: based on generation rating (substation level)			
Location	Site IDs	Infra type	Parent grid station	Parent super station	Nominal voltage (kV)	Group Generation Connected (MW)	Group Generation Contracted (MW)	Group firm capacity (MW)	Group max load (MVA)	Group min load (MVA)	SP Networks overall rating	Reverse flow	Generation rating	11/33kV fault level	Wider constraints	Rating based on superstation	Notes	Local Authority	
Raf Valley	1, 39	Primary substation	Amlwch - Caergeiliog	Wylfa	11			7.50	2.51	0.63	RED	GREEN	GREEN	GREEN	RED	RED	RED	Substation with most opportunity areas identified, LSA: "limited capacity for small - medium"	Anglesey
Rhoslan	5, 7, 84	Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			7.50	4.73	1.18	RED	GREEN	GREEN	GREEN	RED	AMBER	AMBER		Gwynedd
Rivals		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	2.00	0.50	RED	AMBER	AMBER	GREEN	RED	AMBER	AMBER		Gwynedd
St Helen's Road	70, 91	Primary substation	Bangor - Caernarfon	Quay - Pentir	11			7.50	4.99	1.25	AMBER	GREEN	GREEN	GREEN	AMBER	GREEN	GREEN		Gwynedd
Trawsfynydd		Supergrid substation		Trawsfynydd	132	82.19	64.20				AMBER					AMBER	AMBER	Mid-preference supergrid station	Gwynedd
Tryweryn		Primary substation	Four Crosses - Maentwrog	Trawsfynydd	11			4.00	0.85	0.21	RED	AMBER	RED	GREEN	RED	AMBER	RED		Gwynedd
Tywyn		Primary substation	Aberystwyth	Swansea North	11			7.50	4.71	1.18	RED	AMBER	GREEN	GREEN	RED	RED	RED	Constraint comes from wider 132kV network - Swansea North interconnection; PV farm built here (Tywyn) 2015	Gwynedd
Waenfawr	15, 17, 44, 67, 77	Primary substation	Bangor - Caernarfon	Quay - Pentir	11			7.50	3.87	0.97	AMBER	AMBER	GREEN	GREEN	AMBER	GREEN	GREEN		Gwynedd
Wylfa		Supergrid substation		Wylfa	132	71.39	106.31				RED					RED	RED	Least preferred supergrid station	Anglesey

## **Appendix 2**

### Landscape Sensitivity and Capacity Review



## Summary of Isle of Anglesey, Gwynedd and Snowdonia National Park: Landscape Sensitivity and Capacity Assessment (March 2014)

### Anglesey

LCA Code	Solar PV Sensitivity	Notes from Landscape Sensitivity and Capacity Study
A1	VH	Typically no capacity for field-scale solar PV energy developments within this LCA.
A2	MH	N/A
A3	H	N/A
A4	VH	N/A
A5	M	Outside the AONB and SLA it is considered there may be some capacity for micro to small scale developments, in particular where these would relate well to the existing built environment/urban landcover.  There may also be limited capacity for very infrequent sensitively sited small to medium scale development towards the south of the LCA.
A6	M	Within the AONB and SLAs (and all areas that contribute to their setting), there is typically no capacity for field-scale solar PV energy developments.  Outside the AONB and SLAs it is considered there may be some capacity for well sited micro to small scale developments, in particular where these may relate to the existing built environment/urban landcover.
A7	H	N/A
A8	MH	Sensitivity increases within the parts of this LCA that fall within the Anglesey AONB and the distinctive Parciau Estatelands SLA as these areas are more tranquil, remote and scenic. The AONB is focussed towards the east along the coast and the prominent landform of Mynydd Bodafon and is largely free from energy and other modern developments (with the exception of some static caravan/chalet parks).  Outside the AONB and SLAs it is considered there may be some capacity for micro scale developments, in particular where these may relate to the existing built environment/urban landcover.
A9	M	The villages, together with the established road network, high number of static caravans and existing wind turbines and telecommunication masts have an influence on the character of the landscape and diminish the sense of remoteness and tranquillity in places, therefore reducing the sensitivity field scale solar PV development.  Outside the AONB there may be limited capacity for micro scale developments, in particular where these relate well to the existing built environment/urban landcover.
A10	H	N/A

LCA Code	Solar PV Sensitivity	Notes from Landscape Sensitivity and Capacity Study
A11	MH	<p>Sensitivity is enhanced by many sensitive visual receptors and intervisibility and associations with important landscape and cultural heritage features including the National Park, Beaumaris Castle - Castles and Town Walls of King Edward in Gwynedd World Heritage Site and Anglesey AONB.</p> <p>Typically no capacity for field-scale solar PV energy developments within this LCA.</p>
A12	M	<p>Outside the AONB and SLAs it is considered there may be some capacity for well sited micro to small scale developments, in particular where these may relate to the existing built environment/urban landcover.</p> <p>Sensitivity is further increased by the value of this landscape as a setting to the Anglesey AONB together with a high cultural heritage value as recognised through a number of historic designations (such as Penmon Registered Historic Landscape and Registered Parks and Gardens) increases the overall sensitivity.</p>
A13	H	N/A
A14	H	N/A
A15	MH	<p>Transport infrastructure influences the north of the LCA thus locally reducing the sensitivity. However this is outweighed by the remoteness and tranquillity experienced in other areas of the landscape as reflected by the designation of the regional Malltraeth Marsh &amp; Surrounds SLA and parts of this landscape designated within the Anglesey AONB which together with the cultural heritage value of the landscape further enhances sensitivity.</p> <p>Typically no capacity for field-scale solar PV energy developments within this LCA.</p>
A16	M	N/A
A17	LM	<p>Within the AONB and SLAs (and all areas that contribute to their setting), there is typically no capacity for field-scale solar PV energy (with the exception of very infrequent micro scale, development)</p> <p>The Mona airfield and A5/A55 corridor detract from the tranquillity of the landscape, further reducing sensitivity.</p> <p>There may also be limited capacity for larger scale developments, in particular towards the south west where the landscape is already influenced by modern infrastructure.</p>
A18	M	<p>The RAF Valley Airfield brings a level of visual intrusion to the area. The flat landform away from the coast comprises medium to large scale field systems enclosed by a mixture of boundaries including hedgerows which introduce the possibility of increasing vegetation height to provide further localised screening and therefore lessen sensitivity to field-scale solar PV energy development.</p> <p>Outside the AONB and SLAs it is considered there may be some capacity for well sited micro scale developments, in particular where these may relate to the existing built environment/urban landcover.</p>

## Gwynedd

LCA	Solar PV Sensitivity	Notes from Landscape Sensitivity and Capacity Study
G01	M	<p>Field systems are typically medium in scale and regular in pattern with a mix of field boundaries lessening the sensitivity of the landscape to field-scale solar PV energy development.</p> <p>This is counterbalanced by the presence of a high number of sensitive visual receptors in some places, nationally designated cycle routes and nationally important Registered Historic Landscapes together with a high degree of intervisibility from important landscape and cultural heritage features (including the National Park, Anglesey AONB and Beaumaris Castle - Castles and Town Walls of King Edward in Gwynedd World Heritage Site).</p> <p>Within all areas that contribute to the setting of the National Park, there is typically no capacity for field-scale solar PV energy developments. However, outside these areas there may be some limited capacity for field-scale solar PV energy developments. This could typically comprise occasional, well sited micro to small scale developments.</p> <p>Lavan Sands is particularly tranquil and devoid of man-made influence, therefore sensitivity in this locality is considered higher.</p>
G02	MH	N/A
G03	MH	<p>The sensitivity of the landscape is reflected in the fact that much of the LCA is regionally designated as a Special Landscape Area and almost the entire area lies within nationally important Registered Historic Landscapes.</p> <p>Within the SLA (and all areas that contribute to its setting and the setting of the National Park), there is typically no capacity for field-scale solar PV energy developments. Outside these areas there may be limited capacity for well sited micro scale developments.</p>
G04	M	<p>Field systems vary in scale and pattern throughout the area as do field boundaries; the least sensitive areas in terms of field scale and pattern are located towards the coast in the west where intervening blocks of woodland and tree belts are more frequent and may provide opportunities for screening.</p> <p>Within the AONB and SLAs (and all areas that contribute to their setting and the setting of the National Park and WHS), there is typically no capacity for field-scale solar PV energy developments.</p> <p>Outside these areas there may be limited capacity for well sited micro scale developments.</p>
G05	MH	N/A
G06	VH	N/A
G07	H	N/A
G08	M	<p>This medium scale, low lying coastal plain landscape comprises a mosaic of rural landcover interspersed with modern coastal resort developments. These resorts, together with major road and rail infrastructure strongly influence the character of the landscape and diminish the sense of remoteness and tranquillity, thus reducing sensitivity to field-scale solar PV energy development.</p> <p>Within all areas that contribute to the setting of the SLAs and the National Park, there is typically no capacity for field-scale solar PV energy developments. However, outside these areas there may be some limited capacity for very infrequent well-sited and micro scale field-scale solar PV energy developments.</p>

LCA	Solar PV Sensitivity	Notes from Landscape Sensitivity and Capacity Study
G09	MH	N/A
		<p>There are some large coniferous plantation to the north of the LCA and existing 400 kV overhead lines punctuate the skyline to the far east which further reduces sensitivity. Nevertheless, this is a relatively tranquil landscape with man-made influence otherwise limited to scattered rural properties and villages, connected by a network of local roads.</p> <p>Sensitivity is enhanced in places by the value placed on parts of the landscape which lie within the Llŷn AONB and Llyn and Bardsey Island Registered Historic Landscape, together with the presence of some sensitive receptors.</p>
G10	M	Outside the SLAs/AONBs/setting of the National Park there may be limited capacity for well sited micro to small scale developments.
G11	MH	N/A
G12	MH	N/A
G13	H	N/A
G14	H	N/A
G15	M	N/A

**Appendix 3**  
Full Assessment Results

Description of table headers											
Site ID	Unique site identifier from GIS assessment										
Substation	Nearest grid infrastructure (see appendix 1)										
Area	Total area within the opportunity area										
LSA comments	Comments taken directly from the review of the Landscape Sensitivity Assessment										
LCA	Landscape Character Area										
Max system size allowable from LSA	If comments reference a system size (micro, small, medium), this determines size of the system permissible within the opportunity area										
Total potential capacity from area	Total power capacity possible if whole area were covered with solar PV; often much larger than allowable by LSA										for reference
Total annual energy output	Energy generated per year from this size of system										for reference
No. household equivalent energy consumption	Metric used by DECC when evaluating energy systems; number of households this amount of energy would supply										for reference
Worst case scenario connection cost	Maximum cost of connection of the maximum system size within this opportunity area										for reference
Annual FiT	Revenue earned per year from government subsidies, if this system connected before March 2018										for reference
Potential annual Power Purchase Agreement or Export earnings	Revenue earned per year from sale of power to the grid or a utility company										for reference

Site_ID	Substation (RAG rating = final rating from tech assessment)	Area (ha)	Landscape Sensitivity Assessment comments	LCA	Max system size allowable from LSA (MW)	Total potential capacity from area (MW)	Total annual energy output (MWh)	No. household equivalent energy consumption	Worst case scenario connection cost (within LSA threshold)	Annual FiT	Potential annual Power Purchase Agreement/Export earnings
1	RAF Valley	200.68	Limited capacity for micro scale	A18	0.50	83.62	73,298	22,212	£ 100,000	£ 657	£ 21,915
2	Gaerwen View	137.60	Some capacity for micro to small-scale	A12	2.50	57.33	50,258	15,230	£ 500,000	£ 3,287	£ 109,575
3	Caergeiliog	115.00	Limited capacity for small to medium scale development	A5/A18	5.00	47.92	42,004	12,728	£ 1,000,000	£ 6,575	£ 219,150
4	Mona	54.90	Some capacity	A17	5.00	22.88	20,052	6,076	£ 1,000,000	£ 6,575	£ 219,150
5	Rhoslan	117.30	Some capacity for micro to small-scale	G8/G10	2.50	48.88	42,844	12,983	£ 500,000	£ 3,287	£ 109,575
6	Llanddeusant	126.70	Limited capacity for small to medium scale development	A5	5.00	52.79	46,277	14,023	£ 1,000,000	£ 6,575	£ 219,150
7	Rhoslan	90.90	Some capacity for micro to small-scale	G10	2.50	37.88	33,201	10,061	£ 500,000	£ 3,287	£ 109,575
8	Llanyfrydog	79.85	Some potential for micro scale development	A8	0.50	33.27	29,165				
9	Beaumaris	72.00	Some capacity for micro to small-scale	A12	2.50	30.00	26,298	7,969	£ 500,000	£ 3,287	£ 109,575
10	Mona	44.10	Some capacity	A17	5.00	18.38	16,108	4,881	£ 1,000,000	£ 6,575	£ 219,150
11	Llaingoch	40.52	No capacity	A1		16.88	14,800				
12	Llandegfan	35.72	No capacity	A11		14.88	13,047				
13	Pentraeth	29.90	Limited capacity for micro scale	A9		12.46	10,921				

Site_ID	Substation (RAG rating = final rating from tech assessment)	Area (ha)	Landscape Sensitivity Assessment comments	LCA	Max system size allowable from LSA (MW)	Total potential capacity from area (MW)	Total annual energy output (MWh)	No. household equivalent energy consumption	Worst case scenario connection cost (within LSA threshold)	Annual FiT	Potential annual Power Purchase Agreement/Export earnings
					0.50						
14	Llanyfrydog	26.90	Some potential for micro scale development	A8	0.50	11.21	9,825				
15	Waenfawr	26.51	Some capacity for development <1ha	A3	0.50	11.05	9,683				
16	Pentraeth	27.00	Some capacity	A17	5.00	11.25	9,862	2,988 £	1,000,000 £	6,575 £	219,150
17	Waenfawr	24.05	Some capacity for development <1ha	G3	0.50	10.02	8,784				
19	Llanddeusant	19.30	Limited capacity for small to medium scale development	A5	5.00	8.04	7,049	2,136 £	1,000,000 £	6,575 £	219,150
20	Llandegfan	22.30	Some capacity for micro to small-scale	A12	2.50	9.29	8,145	2,468 £	500,000 £	3,287 £	109,575
21	Llandegfan	19.87	No capacity	A11		-	8.28	7,258			
22	Llangfair PG	14.70	Some capacity for micro to small-scale	A12	2.50	6.13	5,369	1,627 £	500,000 £	3,287 £	109,575
23	Bangor Hospital	16.30	Some capacity for micro to small-scale	G1	2.50	6.79	5,954	1,804 £	500,000 £	3,287 £	109,575
24	Caernarfon	15.59	Some capacity for micro-scale	G4	0.50	6.50	5,694				
25	Pentraeth	15.26	Limited capacity for micro scale	A9	0.50	6.36	5,574				
26	Llangefni	14.40	Some capacity	A17	5.00	6.00	5,260	1,594 £	1,000,000 £	6,575 £	219,150
27	Caergeiliog	12.30	Limited capacity for small to medium scale development	A5	5.00	5.13	4,493	1,361 £	1,000,000 £	6,575 £	219,150
28	Pentraeth	13.20	Some capacity	A17	5.00	5.50	4,821	1,461 £	1,000,000 £	6,575 £	219,150
29	Peblic Mills	11.86	Some capacity for micro-scale	G4	0.50	4.94	4,332				
30	Llanyfrydog	11.42	Some potential for micro scale development	A8	0.50	4.76	4,171				
31	Llaingoch	10.01	No capacity	A1		-	4.17	3,656			
32	Gaerwen View	6.50	Some capacity for micro to small-scale	A12		2.71	2,374	719 £	500,000 £	3,287 £	109,575



Site_ID	Substation (RAG rating = final rating from tech assessment)	Area (ha)	Landscape Sensitivity Assessment comments	LCA	Max system size allowable from LSA (MW)	Total potential capacity from area (MW)	Total annual energy output (MWh)	No. household equivalent energy consumption	Worst case scenario connection cost (within LSA threshold)	Annual FiT	Potential annual Power Purchase Agreement/Export earnings
					2.50						
33	Caernarfon	8.56	Some capacity for micro-scale	G4	0.50	3.57	3,127				
34	Caergeiliog	7.40	Limited capacity for small to medium scale development	A5	5.00	3.08	2,703	819 £	6,654,167 £	43,748 £	135,143
35	Parc Menai	5.70	Some capacity for micro to small-scale	G1	2.50	2.38	2,082	631 £	951,667 £	6,257 £	104,096
37	Pentraeth	7.40	Some capacity	A17	5.00	3.08	2,703	819 £	71,667 £	471 £	135,143
38	Peblic Mills	7.31	Some capacity for micro-scale	G4	0.50	3.05	2,670				
39	RAF Valley	6.40	Limited capacity for small to medium scale development	A5/A18	5.00	2.67	2,338	708 £	9,583,333 £	63,006 £	116,880
40	Llangefni Industrial Estate	6.91	No capacity	A15		-	2.88	2,524			
41	Pentraeth	6.10	Limited capacity for micro scale	A9	0.50	2.54	2,228				
42	Pentraeth	5.70	Some capacity	A17	5.00	2.38	2,082	631 £	1,608,333 £	10,574 £	104,096
43	Llangefni Industrial Estate	5.69	No capacity	A15		-	2.37	2,078			
44	Waenfawr	5.66	Some capacity for development <1ha	G3	0.50	2.36	2,067				
45	Caergeiliog	4.00	Limited capacity for small to medium scale development	A5	5.00	1.67	1,461	443 £	6,000,000 £	39,447 £	73,050
46	Llaingoch	5.52	No capacity	A1		-	2.30	2,016			
47	Caergeiliog	5.00	Limited capacity for small to medium scale development	A5	5.00	2.08	1,826	553 £	3,675,000 £	24,161 £	91,313
48	Llandegfan	5.27	No capacity	A11		-	2.20	1,925			
49	Llandegfan	5.16	No capacity	A11		-	2.15	1,885			
50	Beaumaris	4.40	Some capacity for micro to small-scale	A12	2.50	1.83	1,607	487 £	533,333 £	3,506 £	80,355
51	Llangfair PG	5.10	Some capacity for micro to small-scale	A12	2.50	2.13	1,863	564 £	713,333 £	4,690 £	93,139

Site_ID	Substation (RAG rating = final rating from tech assessment)	Area (ha)	Landscape Sensitivity Assessment comments	LCA	Max system size allowable from LSA (MW)		Total potential capacity from area (MW)	Total annual energy output (MWh)	No. household equivalent energy consumption	Worst case scenario connection cost (within LSA threshold)		Annual FiT	Potential annual Power Purchase Agreement/Export earnings
52	Llangfair PG	3.50	Some capacity for micro to small-scale	A12	2.50		1.46	1,278	387 £	616,667 £		4,054 £	63,919
53	Llangfair PG	2.80	Some capacity	A17	5.00		1.17	1,023	310 £	1,200,000 £		7,889 £	51,135
54	Alpoco	2.78	No capacity	A1		-	1.16	1,015					
55	Llaingoch	4.63	No capacity	A1		-	1.93	1,691					
56	Pentraeth	4.40	Some capacity	A17	5.00		1.83	1,607	487 £	1,858,333 £		12,218 £	80,355
57	Llangefni	4.20	Some capacity	A17	5.00		1.75	1,534	465 £	1,100,000 £		7,232 £	76,703
58	Caergeiliog	4.10	Limited capacity for small to medium scale development	A5	5.00		1.71	1,498	454 £	3,376,667 £		22,200 £	74,876
59	Caergeiliog	2.30	Limited capacity for small to medium scale development	A5	5.00		0.96	840	255 £	2,976,667 £		19,570 £	42,004
60	Bangor Hospital	2.80	Some capacity for micro to small-scale	G1	2.50		1.17	1,023	310 £	416,667 £		2,739 £	51,135
61	Bangor Hospital	4.00	Some capacity for micro to small-scale	G1	2.50		1.67	1,461	443 £	439,167 £		2,887 £	73,050
62	Bangor Hospital	2.60	Some capacity for micro to small-scale	G1	2.50		1.08	950	288 £	430,000 £		2,827 £	47,483
63	Llaingoch	2.55	No capacity	A1		-	1.06	931					
64	Peblic Mills	2.52	Some capacity for micro-scale	G4	0.50		1.05	920					
65	Peblic Mills	2.49	Some capacity for micro-scale	G4	0.50		1.04	909					
66	Llangefni Industrial Estate	2.43	No capacity	A15		-	1.01	888					
67	Waenfawr	2.39	Some capacity for development <1ha	G3	0.50		1.00	873					
68	Peblic Mills	2.20	Some capacity for micro-scale	G4	0.50		0.92	804					
69	Pentraeth	2.19	Some capacity	A17	5.00		0.91	800	242 £	1,655,833 £		10,886 £	39,995
70	St Helen's Road	2.05	Some capacity for micro-scale	G4	0.50		0.85	749					

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72	Pebllic Mills	1.96	Some capacity for micro-scale	G4	0.50		0.82	716					
73	Llaingoch	1.92	No capacity	A1		-	0.80	701					
74	Caernarfon	1.91	Some capacity for micro-scale	G4	0.50		0.80	698					
75	Pebllic Mills	1.90	Some capacity for micro-scale	G4	0.50		0.79	694					
76	Llangefni	1.90	Some capacity	A17	5.00		0.79	694	210 £	988,333 £		6,498 £	34,699
77	Waenfawr	1.87	Some capacity for development <1ha	G3	0.50		0.78	683					
78	Pentraeth	1.86	Some capacity	A17	5.00		0.78	679	206 £	1,225,000 £		8,054 £	33,968
79	Llandegfan	1.73	No capacity	A11		-	0.72	632					
80	St Helen's Road	1.73	Some capacity for micro-scale	G4	0.50		0.72	632					
81	Caergeiliog	Limited capacity for small to medium scale 1.70 development		A5	5.00		0.71	621	188 £	2,491,667 £		16,381 £	31,046
82	Beaumaris	1.65	Some capacity for micro to small-scale	A12	2.50		0.69	603	183 £	575,833 £		3,786 £	30,133
83	Llandegfan	1.54	No capacity	A11		-	0.64	562					
84	Rhoslan	1.50	Some capacity for micro to small-scale	G10	2.50		0.63	548	166 £	474,167 £		3,117 £	27,394
85	Caergeiliog	Limited capacity for small to medium scale 1.49 development		A5	5.00		0.62	544	165 £	2,241,667 £		14,738 £	27,211
86	Mona	1.45	Some capacity	A17	5.00		0.60	530	160 £	1,271,667 £		8,361 £	26,481
87	Caergeiliog	Limited capacity for small to medium scale 1.36 development		A5	5.00		0.57	497	151 £	2,209,167 £		14,524 £	24,837
88	Llaingoch	1.36	No capacity	A1		-	0.57	497					
89	Eithinog	1.35	Some capacity for micro to small-scale	G1	2.50		0.56	493	149 £	471,667 £		3,101 £	24,654
90	Llaingoch	1.28	No capacity	A1		-	0.53	468					

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91	St Helen's Road	1.23	Some capacity for micro-scale	G4	0.50	0.51	449				
92	Llaingoch	3.31	No capacity	A1		-	1,209				
93	Llaingoch	2.60	No capacity	A1		-	950				

Key	
GREEN	Technical capacity within local grid; preferred location for new generation connections
AMBER	Some technical capacity within local grid; mid-priority location for new generation connections
RED	Minimal technical capacity within local grid; least preferred location for new generation connections
GREY	No potential for solar PV, or only micro systems possible

Calculation assumptions

DECC solar PV data

2.4 ha/MW	1MW
0.1 capacity factor	
8766 hours per year	
3.3 MWhpa	Annual consumption per household

Grid connection costs

£50,000 /MW	Max value for viable project (solar developer research)
£200 /kW	Maximum cost from National Grid

Revenue generation

0.15	p/kWh	Stand alone solar PV FiT Q4 2018	<a href="https://www.ofgem.gov.uk/system/files/docs/2016/04/01_april_2016_tariff_table.pdf">https://www.ofgem.gov.uk/system/files/docs/2016/04/01_april_2016_tariff_table.pdf</a>
4.91	p/kWh	Export tariff Q4 2018	<a href="https://www.ofgem.gov.uk/system/files/docs/2016/04/01_april_2016_tariff_table.pdf">https://www.ofgem.gov.uk/system/files/docs/2016/04/01_april_2016_tariff_table.pdf</a>
5.00	p/kWh	Typical PPA rate	<a href="http://www.sunedison.co.uk/residential-and-commercial/commercial-ppa.html">http://www.sunedison.co.uk/residential-and-commercial/commercial-ppa.html</a>