Partners in UK offshore wind

MORGAN OFFSHORE WIND PROJECT GENERATION ASSETS

Preliminary Environmental Information Report

Volume 4, annex 15.4: Seascape, landscape and visual impact assessment methodology technical report

Image of an offshore wind farm

April 2023
FINAL

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
Rev01	Draft for Client review	RPS	bpEnBW		17/01/2023
Rev02	Addressing client comments	RPS	bpEnBW		24/02/2023
Rev03	Final	RPS	bpEnBW	bpEnBW	03/03/2023

Prepared by:	Prepared for:
RPS	**Morgan Offshore Wind Ltd.**

Contents

1 SEASCAPE, LANDSCAPE AND VISUAL IMPACT ASSESSMENT METHODOLOGY 1
1.1 Introduction 1
1.2 Study area 1
1.3 Consultation 4
1.4 Overview of seascape, landscape and visual impact assessment (SLVIA) methodology 4
1.4.1 Introduction 4
1.4.2 Note on significance and proportionality 5
1.4.3 Assumptions and limitations 5
1.5 Iterative assessment and design 5
1.5.2 Potential effects during construction and decommissioning 5
1.5.3 Potential effects during operations and maintenance 6
1.6 Guidance, data sources and site surveys 6
1.6.1 Guidance 6
1.6.2 Data sources 6
1.6.3 Desk-based studies and site survey work 7
1.7 Assessment of visual effects 7
1.7.1 Introduction 7
1.7.2 Zone of Theoretical Visibility 7
1.7.3 Representative Viewpoints 8
1.7.4 Evaluating visual sensitivity to change 8
Visual sensitivity criteria 8
1.7.5 Evaluating visual magnitude of impact 8
Size or scale 8
Geographical extent 9
Duration and reversibility 9
Visual magnitude of impact rating 9
1.7.6 Evaluating significance of visual effect 9
1.8 Assessment of seascape/landscape effects 10
1.8.1 Introduction 10
1.8.2 Evaluating seascape/landscape sensitivity to change 10
Value of the seascape/landscape receptor 10
Seascape and landscape susceptibility to change 10
Seascape and landscape sensitivity rating 11
1.8.3 Seascape and landscape magnitude of impact 11
Size or scale of change 11
Geographical extent 12
Duration and reversibility 12
Seascape/landscape magnitude of impact rating 12
1.8.4 Evaluating seascape/landscape significance of effect 12
1.8.5 Evaluation of significance of effect 13
1.10 Assessment of night-time effects 14
1.10.1 Introduction 14
1.10.2 Evaluating night-time effects and significance of effect 14
1.11 Cumulative seascape, landscape and visual effects 14
1.11.2 Types of cumulative effects in the SLVIA 14
1.11.3 Tiered approach to the CEA 15
1.11.4 Assessing cumulative seascape/landscape and visual effects 15
1.12 References 15

Tables

Table 1.1: Data sources used to inform the SLVIA. 7
Table 1.2: Summary of surveys undertaken to inform SLVIA. 7
Table 1.3: Visual sensitivity to change. 8
Table 1.4: Visual Magnitude of Impact Criteria. 9
Table 1.5: Sensitivity of seascape and landscape receptors. 11
Table 1.6: Definition of terms relating to the magnitude of impact upon seascape/ landscape receptors. 12
Table 1.7: Assessment of Significance of Effect Matrix 13
Table 1.8: Definitions of Significance Criteria 13

Table A 1: Technical Data – Visualisations. 19

Table B 1: Walney Island frequency of visibility. 21
Table B 2: Walney Island – percentage visibility. 22
Table B 3: Ronaldsway – frequency of visibility. 23
Table B 4: Ronaldsway – percentage visibility. 24

Figures

Figure 1.1: Seascape, landscape and visual resources study area. 2
Figure 1.2: Seascape, landscape and visual resources Cumulative Effects study area. 3
Figure 1.3: Assessment method summary. 4

Appendices

APPENDIX A : VISUAL REPRESENTATIONS 17
A.15 Visual representations 17
A.15.1 Overview 17
A.15.2 Zone of Theoretical Visibility (ZTV) 17
A.15.3 Baseline Photography 17
A.15.4 Visualisations 18
A.15.5 Night-time visualisations 18
A.15.6 Information on limitations of visualisations 19
A.15.7 Technical Data – Visualisations 19

APPENDIX B : METEOROLOGICAL OFFICE DATA 20
B 15.1 Meteorological Office Visibility Data 20
B.15.1.1 Introduction 20
B.15.1.2 Meteorological Office Explanatory Notes 20
B.15.1.3 High Level Analysis of Visibility Data 20

Glossary

Term	Meaning
Access Land	Land designated as open access as defined in the Countryside and Rights of Way Act 2000 (the CRoW Act)
Characteristics	Elements, or combinations of elements, which make a contribution to distinctive landscape character.
Designated landscapes	Areas of landscape identified as being of importance at international, national or local levels, either defined by statute or identified in development plans or other documents.
Elements	Individual parts which make up the landscape, such as, for example, trees, hedges and buildings.
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement.
Feature	Prominent elements in the landscape, such as tree clumps, church towers or wooded skylines.
Green infrastructure	Networks of green spaces and watercourses and water bodies that connect rural areas, villages, towns and cities.
Heritage	The historic environment and especially valued assets and qualities, such as historic buildings and cultural traditions.
Key characteristics	Elements which are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Landform	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape	An area, as perceived by people, the character of which is a result of the action and interaction of natural and/or human factors.
Landscape character	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse.
Landscape Character Areas	These are single unique areas which are the discrete geographical areas of a particular landscape type.
Landscape Character Assessment	The process of identifying and describing variation in the character of the landscape and using this information to assist in managing change in the landscape. It seeks to identify and explain the unique combination of elements and features that make landscape distinctive. The process results in the production of a Landscape Character Assessment.
Landscape Character Type	These are distinct types of landscape that are relatively homogeneous in character. They are generic in nature in that they may occur in different areas in different parts of the country, but wherever they occur they share broadly similar combinations of geology, topography, drainage patterns, vegetation, historical land use, and settlement pattern.
Landscape effects	Effects on the landscape as a resource in its own right.
Landscape quality (condition)	A measure of physical state of the landscape. It may include the extent to which typical character is represented in individual areas, the intactness of the landscape and the condition of individual elements.
Landscape receptors	Defined aspects of the landscape resource that have the potential to be affected by the proposal.
Landscape value	The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons
Magnitude (of impact)	A term that combines judgements about the size and scale of the impact or change, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short or long term in duration.
Photomontage	A visualisation which superimposes an image of a proposed development upon a photograph or series of photographs of the existing landscape.
Seascape	The visual and physical conjunction of land and sea which combines maritime, coast and hinterland character.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
Significance (of effect)	A judgement of the environmental effect resulting from a combination of the sensitivity of the receptor and the magnitude of the impact of a proposed development.
Special Qualities	A term usually used in relation to National Parks or Areas of Outstanding Natural Beauty. It is given to those qualities for which the area is designated.
Susceptibility	The ability of a defined landscape or visual receptor to accommodate the specific proposed development without undue negative consequences.
Tranquillity	A state of calm and quietude associated with peace, considered to be a significant feature in the landscape.
Visual amenity	The overall pleasantness of the views people enjoy in their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual effects	Effects on specific views and on general visual amenity experienced by people.
Visual receptors	Individuals and/or defined groups of people who have the potential to be affected by a proposal.
Visualisation	A computer simulation, photomontage or other technique illustrating the predicted appearance of a proposed development.
Zone of Theoretical Visibility	A map, usually digitally produced, showing areas of land within which, a development is theoretically visible.

Acronyms

Acronym	Description
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
CAA	Civil Aviation Authority
CEA	Cumulative Effect Assessment
EIA	Environmental Impact Assessment
ES	Environmental Statement
FoV	Field of View
GLVIA3	Guidelines for Landscape and Visual Impact Assessment (Third Edition)
IEMA	Institute of Environmental Management and Assessment
LAT	Lowest Astronomical Tide
LCA	Landscape Character Area
LCT	Landscape Character Type
LI	Landscape Institute
MLWS	Mean Low Water Springs
MCA	Marine Character Area
MDS	Maximum Design Scenario
MPA	Marine Policy Statement
NCA	National Character Area
NE	Natural England
NP	National Park
NPPF	National Planning Policy Framework
NPPG	National Planning Policy Guidance
NPS	National Policy Statements
NRW	Natural Resources Wales
OWF	Offshore Wind Farm
PA	Planning Act
PINS	Planning Inspectorate
PRoW	Public Right of Way
SCA	Seascape Character Area
SLA	Special Landscape Area
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPD	Supplementary Planning Document
SPG	Supplementary Planning Guidance
SSZ	Seascape Sensitivity Zone
WHS	World Heritage Site
ZTV	Zone of Theoretical Visibility

Units

Unit	Description
m	Metre
km	Kilometre
MW	Megawatt

1 SEASCAPE, LANDSCAPE AND VISUAL IMPACT ASSESSMENT METHODOLOGY

1.1 Introduction

1.1.1.1 This Seascape, landscape and visual impact assessment methodology Technical Report describes the methodology used to undertake the seascape, landscape and visual impact assessment (SLVIA) including the collection of baseline information and the assessment of likely significant effects contained in volume 2, chapter 15: Seascape, landscape and visual resources of the Preliminary Environmental Information Report (PEIR).

1.2 Study area

1.2.1.1 The Morgan Generation Assets seascape, landscape and visual resources study area is illustrated in Figure 1.1 of this Annex. It has been based on the findings of an analysis of the Zone of Theoretical Visibility (ZTV) and is described below:

- The area of sea to be temporarily and permanently occupied during construction, operation and maintenance and decommissioning of the generation assets with an additional 50km buffer from the outer edge of the Morgan Generation Assets Array Area Maximum Design Scenario (MDS), as described in volume 2, chapter 15: seascape, landscape and visual resources of the PEIR at Table 15.17 and volume 1, chapter 3: Project description of the PEIR.

1.2.1.2 This distance threshold aligns with recommendations in the ‘Seascape and Visual Buffer Study for Offshore Wind Farms’ (NRW, 2020) at section 9.19. In addition, the SLVIA study area extent is formulated in accordance with relevant standard industry practice guidance, in particular, Guidelines for Landscape and Visual Impact Assessment: Third Edition, 2013, Landscape Institute and Institute of Environmental Management and Assessment (GLVIA3). According to the GLVIA3, paragraph 1.17 – “*the emphasis is on the identification of likely significant environmental effects”*. It is judged that, due to distance, there is no potential for significant effects beyond 50km, the study area need not extend any further.

1.2.1.3 It is acknowledged that the study area has not yet been agreed with all relevant authorities/consultees, specifically The Lake District National Park Authority and Natural England, and that Natural England have requested, through scoping, a 60km buffer (see consultation section 1.3 for further details). Hence agreement will be sought through the PEIR consultation process, from the information provided in volume 2, chapter 15: Seascape, landscape and visual resources of the PEIR and its annexes.

1.2.1.4 The SLVIA Cumulative Effects Assessment (CEA) study area extends to 85km from the outer edges of the Morgan Array Area to capture existing and proposed onshore windfarms, and 100km from the outer edges of the Morgan Array Area to capture existing and proposed offshore windfarms. These study areas are based on the parameters listed in the table within paragraph 48 of, 'Visual Representation of Wind Farms' (NatureScot, 2017). The CEA study areas are illustrated on Figure 1.2 of this annex.

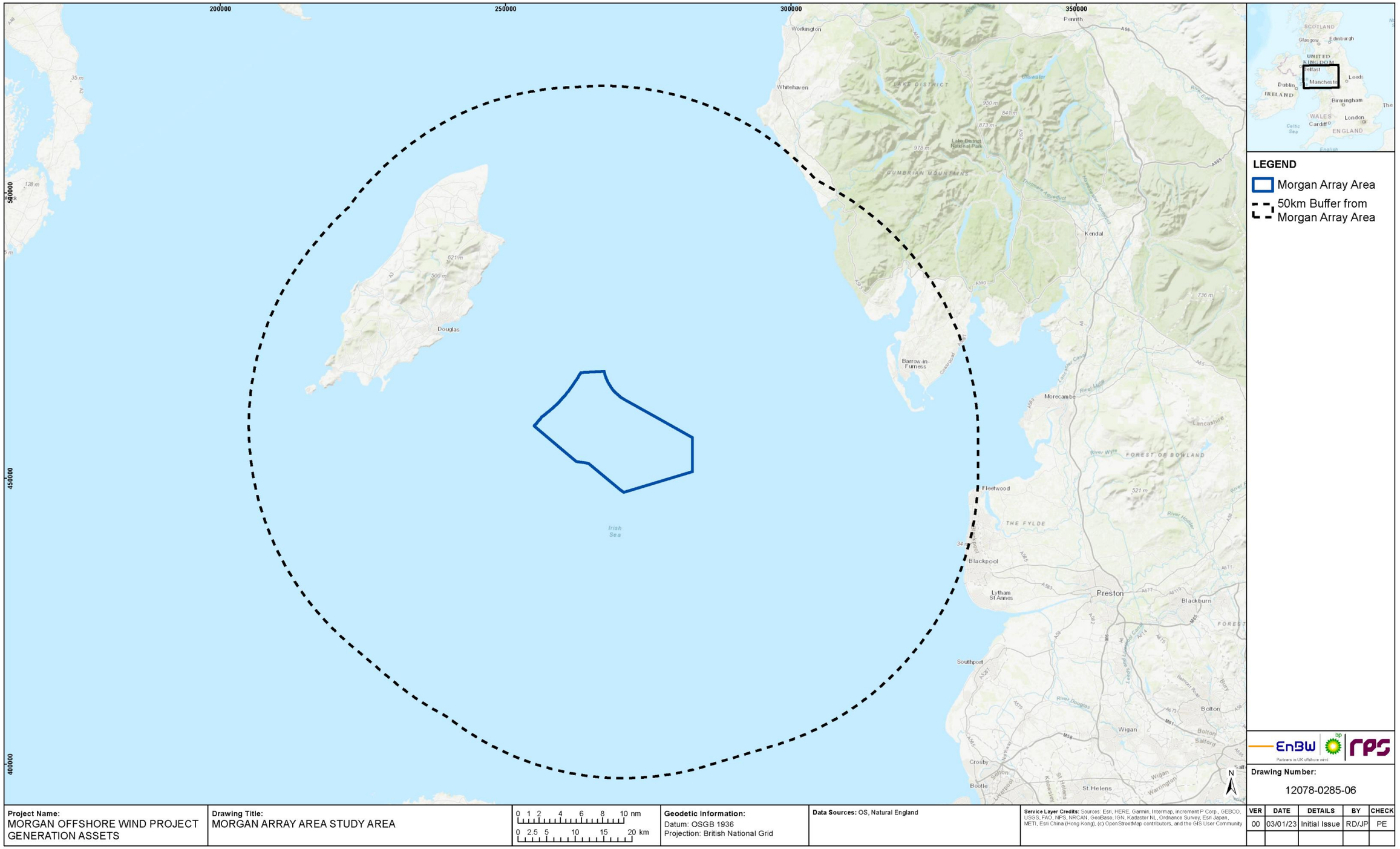

Figure 1.1: Seascape, landscape and visual resources study area.

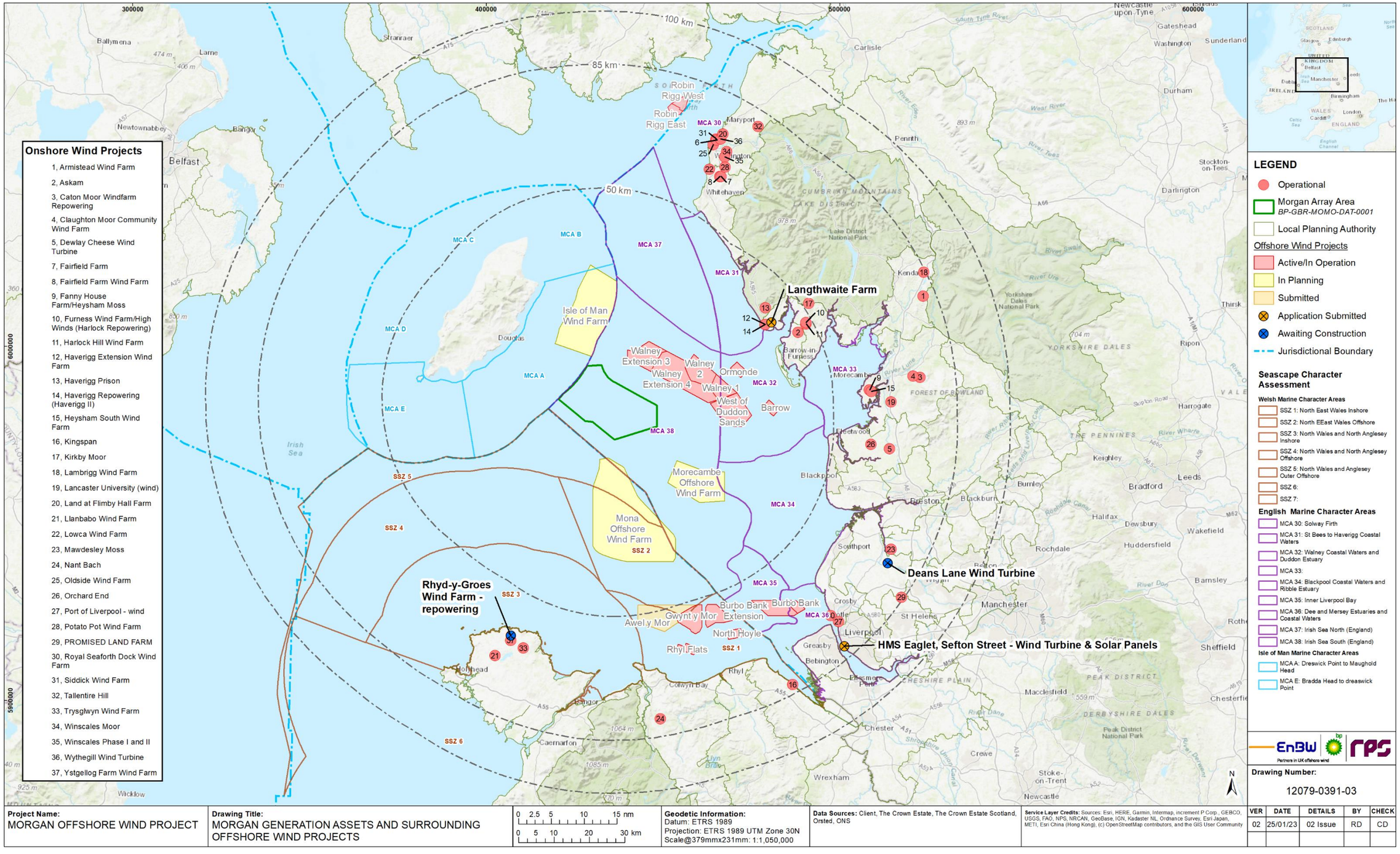

Figure 1.2: Seascape, landscape and visual resources Cumulative Effects study area.

1.3 Consultation

1.3.1.1 In line with best practice guidance in (GLVIA3) (engaging with stakeholders and the public, page 43, paragraphs 3.40-3.45), the scope and methodology of the SLVIA has been the subject of engagement and consultations with the relevant planning authorities, statutory bodies and other parties, and the public. Details of the consultees and others engaged, and consultations undertaken, together with a summary of the key issues raised by the parties pertinent to seascape, landscape and visual resources, are set out in the PEIR as follows:

- Volume 2, chapter 15: Seascape, landscape and visual resources of the PEIR
- Volume 4, annex 15.4: Visual baseline of the PEIR

1.3.1.2 Through the DCO consultation process (see volume 2, chapter 15: Seascape, landscape and visual resources of the PEIR) key information to inform the SLVIA methodology has been provided to relevant authorities/consultees for comment. Responses have not yet been received from the Lake District National Park Authority on candidate Representative Viewpoints and the proposed study area.

1.4 Overview of seascape, landscape and visual impact assessment (SLVIA) methodology

1.4.1 Introduction

1.4.1.1 The SLVIA has been undertaken based on the guidance on landscape and visual impact assessment within GLVIA3, and draws on other, relevant best practice guidance including:

- Technical Guidance Note 02/21: Assessing landscape value outside national designations (Landscape Institute, 2021)
- Technical Guidance Note 06/19: Visual Representation of Development Proposals (Landscape Institute, 2019).

1.4.1.2 An overview or summary of the SLVIA process is provided here and illustrated, diagrammatically in Figure 1.3.

1.4.1.3 The SLVIA assesses the likely significant effects of the construction, operations and maintenance and decommissioning of the Morgan Generation Assets on the seascape, landscape and visual receptors, within the seascape, landscape and visual resources study area.

1.4.1.4 GLVIA3 sets out the need to assess landscape and visual aspects separately, notwithstanding that they are related topics. This SLVIA follows the guidance recommendation in treating seascape/landscape and visual matters separately throughout the assessment.

1.4.1.5 GLVIA3 sets out broad guidelines rather than detailed prescriptive methodologies. The methodologies tailored for the assessment of the Morgan Generation Assets is based on GLVIA3 guidance, which recommends that an LVIA *"concentrates on principles and process"* and *"does not provide a detailed or formulaic recipe"* to assess effects, it being the *"responsibility of the professional to ensure that the approach and methodology are appropriate to the task in hand"* (preface to GLVIA3).

1.4.1.6 Potential seascape, landscape and visual effects (the impacts of the Morgan Generation Assets) are assessed by considering the amount or 'magnitude' of change (compared with the baseline conditions) likely to be experienced by the landscape and visual resources and receptors as a result of implementing the proposed development. Magnitude is then weighed against the sensitivity (to the proposed development) of the seascape, landscape or visual receptor in question to arrive at a judgement on the level of effect. The sensitivity of a given receptor is assessed by considering both its inherent value and its susceptibility to the type of development proposed. Finally, a judgement is made on whether the predicted seascape, landscape or visual effect is likely to be significant or not significant.

1.4.1.7 Regarding establishing the SLVIA baseline, in accordance with GLVIA3 (paragraph 7.13) and Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (The Planning Inspectorate, 2019) existing active/in operation development is considered as part of the baseline conditions. As such, this SLVIA is an assessment of the likely seascape, landscape and visual effects of the Morgan Generation Assets within its existing seascape, landscape and visual context, one which already contains operational wind farms, other infrastructure and associated activities.

1.4.1.8 The assessment methodology is summarised in Figure 1.3 below. These factors are determined through a combination of quantitative (objective) and qualitative (subjective) assessment using professional judgement.

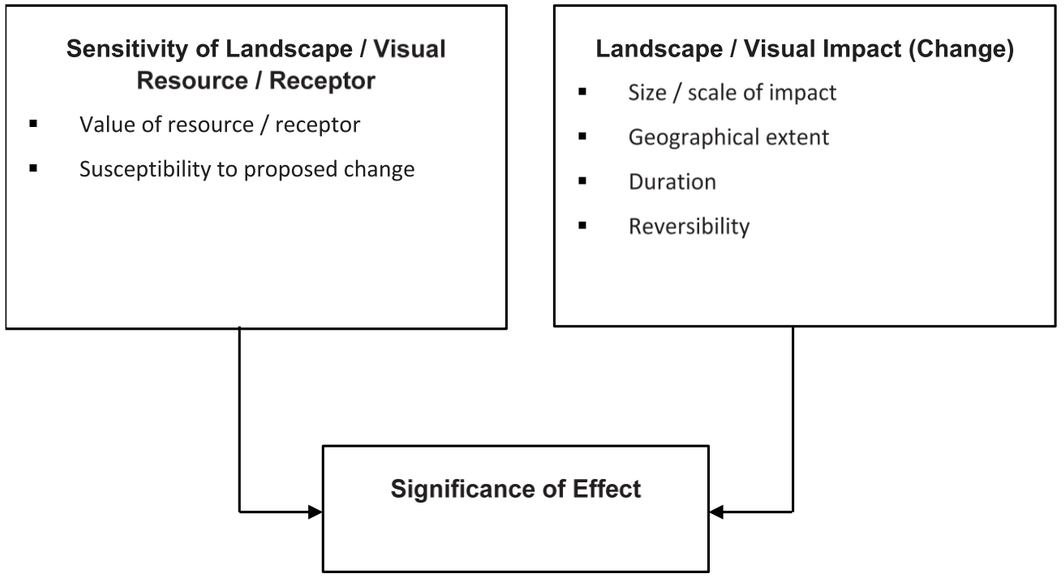

Figure 1.3: Assessment method summary.

1.4.1.9 The guidance emphasises the need for all assessments to be clear and transparent. It encourages the use of a simplified matrix of significance and warns against the use of other topics' significance criteria. The guidance also warns against reliance on

significance tables alone, the emphasis should be on well-argued narrative text, for clarity and transparency.

1.4.2 Note on significance and proportionality

1.4.2.1 The purpose of carrying out this SLVIA is to identify and assess the significant effects likely to arise from implementing the proposed development in question. Chapter 1 Introduction of GLVIA3 best practice guidance states:

"Identifying significant effects stresses the need for an approach that is in proportion to the scale of the project that is being assessed and the nature of its likely effects. Judgement needs to be exercised at all stages in terms of the scale of investigation that is appropriate and proportional. This does not mean that effects should be ignored, or their importance minimised but that the assessment should be tailored to the particular circumstances in each case" (paragraph 1.17).

1.4.2.2 This SLVIA and its findings and conclusions are steered by the proportionality principle expressed in the paragraph quoted above. When judging the overall significance of effect, GLVIA3 explains that there are no hard or fast rules about what effects should be deemed to be significant. It is important to clearly articulate and distinguish between effects which are significant and those which are not.

1.4.3 Assumptions and limitations

1.4.3.1 The SLVIA is subject to *inter alia* the following assumptions and limitations:

- The visual assessment is based on analysis of OS mapping of the site and surrounding area, and on field survey and analysis of views towards the Application Site from publicly accessible viewpoints in the surrounding landscape and from ferry routes. Although every effort has been made to include viewpoints in sensitive locations and locations from which the proposed development would be most visible, not all public viewpoints from which the proposed development would potentially be seen have necessarily been included in the assessment
- The fieldwork and visual assessment were undertaken during early spring when deciduous trees were not in leaf and late summer 2022 when deciduous trees were in leaf. The early spring photography has allowed an accurate projection of the 'worst case' scenario, i.e., the most visible conditions. However, visibility in some months can be more limited due to weather conditions (see Appendix B)
- Further fieldwork is proposed in 2023 to capture photography suggested during consultation and during more conducive atmospheric conditions. The fieldwork will also take any additional viewpoint locations that arise out of the responses to the PEIR, where it is considered appropriate
- The term 'host' seascape is understood to mean the seascape character unit in which the Morgan Array Area is located. In other words, the seascape character unit that is 'hosting' the proposed development
- The Morgan Array Area is treated as a permanent form of development with the potential of being reversed at some point in the future, although not necessarily at the end of its design life (i.e. 35 years in this particular case)
- A 'defining' change is understood to mean one that substantially and/or materially alters the existing situation. In this SLVIA, a 'defining' change to the existing seascape/landscape or visual resource will typically lead to a significant effect being recorded, whereas a 'non-defining' change will not
- Assumptions and limitations relating the visualisations and graphics production generally are set out in Appendix A.15.7 of this document.

1.5 Iterative assessment and design

1.5.1.1 As described in volume 1, chapter 5: Environmental impact assessment methodology of the PEIR, section 5.3.5, the SLVIA is part of an ongoing iterative design process which aims to *"avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment"*. This iterative approach involves a feedback loop whereby if the initial assessment of a potential seascape/landscape and/or visual effect is deemed likely to result in a significant adverse effect, changes to the design of the Morgan Generation Assets is made (where reasonably practical) to avoid, reduce or offset that impact. The assessment is then repeated, and the process continues until the effect has been reduced to a level that is judged to be not significant or, having regard to other constraints, no further changes may be made to the Morgan Generation Assets in order to reduce the magnitude of impact (and hence its potential seascape, landscape and visual significance of effect). In such cases an overall effect that is still significant may be presented in the SLVIA section of the PEIR.

1.5.1.2 This iterative design process has been used to inform the design of the Morgan Generation Assets through the identification of likely significant seascape/landscape and/or visual effects, and (where possible within operation constraints) the development of mitigation measures to address these. Where practical, these measures have been incorporated into the design of the Morgan Generation Assets. They are referred to throughout the PEIR as 'measures adopted as part of the Morgan Generation Assets project'.

1.5.2 Potential effects during construction and decommissioning

1.5.2.1 Potential effects on the seascape, landscape and visual resources that may occur during the construction and decommissioning phases of the Morgan Generation Assets include the following:

1.5.2.2 Seascape effects:

- Potential effects on seascape character, which may arise as a result of the construction and decommissioning phase of the Morgan Generation Assets which may alter the seascape character of the Array Area itself and/or the perceived character of the wider seascape through the ability of people to see these changes within views.

1.5.2.3 Landscape effects:

- Potential effects on landscape character, which may arise as a result of the construction and decommissioning phase of the Morgan Generation Assets
- Potential effects on the special landscape qualities and integrity of designated landscapes (i.e. the Lake District National Park, and the English Lake District WHS within the study area) as a result of the construction and decommissioning phases of the Morgan Generation Assets.

1.5.2.4 Visual effects:

- Potential effects on views and visual amenity experienced by people, which may arise as a result of the construction and decommissioning phases of the Morgan Generation Assets.

1.5.3 Potential effects during operations and maintenance

1.5.3.1 Potential effects on the seascape, landscape and views that may occur during the operations and maintenance phase of the Morgan Generation Assets, include the following:

1.5.3.2 Seascape effects:

- Potential effects on seascape character, which may arise as a result of the operation of the Morgan Generation Assets and maintenance activities located within the Morgan Array Area, which may alter the character of the seascape area in which the Morgan wind turbine array is located (direct effects) or alter the character of adjoining seascape character areas (indirect effects).

1.5.3.3 Landscape effects:

- Potential effects on landscape character (including designated landscapes), arising as a result of the operation of the wind turbines, and maintenance activities
- Potential effects on the special landscape qualities and integrity of designated landscapes (i.e. the Lake District National Park and The English Lake District WHS within the study area) as a result of the operations and maintenance works during this phase.

1.5.3.4 Visual effects:

- Potential effects on views and visual amenity experienced by people, which may arise as a result of the operation of the wind turbines and maintenance activities, including marine navigation and aviation lighting.

1.5.3.5 Cumulative effects:

- The assessment also considers the cumulative effects likely to result from additional changes to seascape, landscape and visual resources caused by the Morgan Generation Assets in association with other planned developments that are likely to occur in the foreseeable future.

1.6 Guidance, data sources and site surveys

1.6.1 Guidance

1.6.1.1 As well as relevant planning policy and guidance detailed in volume 2, chapter 15: Seascape, landscape and visual resources of the PEIR, the methodology used for the SLVIA has regard to relevant guidance and requirements contained in published documents, including in the following:

- Council of Europe, The European Landscape Convention (2000, ratified 2006) ETS No. 176
- Countryside Agency and Scottish Natural Heritage (2004), Topic Paper 6: Techniques and Criteria for judging Capacity and Sensitivity
- Department of Energy and Climate Change (2011a), Overarching National Policy Statement for Energy (EN-1)
- Department of Energy and Climate Change (2011b), National Policy Statement for Renewable Energy (EN-3)
- Department of Energy and Climate Change (2011c), National Policy Statement for Electricity Networks Infrastructure (EN-5)
- Department of Energy and Climate Change, (2016), Offshore Energy Strategic Environment Assessment 3
- Department of Trade and Industry, (2005), Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report
- Department of Trade and Industry, BMT Cordah (2003), Offshore Wind Energy Generation: Phase 1 Proposals and Environment Report
- Hill *et al*. (2001), INTERREG Report No. 5: Guide to Best Practice in Seascape Assessment
- Landscape Institute (2019). Visual Representation of Development Proposals
- Natural England, (2012), An Approach to Seascape Character Assessment
- Natural England (2014), An Approach to Landscape Character Assessment
- Natural England (2022) Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase III: Expectations for data analysis and presentation at examination for offshore wind applications Final Report
- NatureScot (2017). Visual Representation of Wind farms, Guidance (Version 2.2)
- NatureScot (2022). Assessing the Cumulative Landscape and Visual Impacts of Onshore Wind Energy Developments
- White Consultants with Northumbria University, (2020), Offshore Energy Strategic Environmental Assessment: Review and Update of Seascape and Visual Buffer Study for Offshore Wind Farms – Final Report
- White *et al*. (2019a), Seascape and Visual Sensitivity to Offshore Wind Farms in Wales: Strategic Assessment and Guidance – Stage 1. Ready Reckoner of Visual Effects Related to Turbine Size (NRW Report No. 315)
- White et al. (2019b), Seascape and Visual Sensitivity to Offshore Wind Farms in Wales: Strategic Assessment and Guidance – Stage 2. Guidance on Siting Offshore Wind Farms (NRW Report No. 330)
- White et al. (2019c), Seascape and Visual Sensitivity to Offshore Wind Farms in Wales: Strategic Assessment and Guidance – Stage 3. Strategic Assessment and Guidance (NRW Report No. 331).
- Parker *et al*. (2022). Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards. Phase I: Expectations for pre-application baseline data for designated nature conservation and landscape receptors to support offshore wind applications. Natural England. Version 1.1. 79 pp.

1.6.2 Data sources

1.6.2.1 The data sources that have been collected and used to inform this SLVIA are summarised in Table 1.1

Table 1.1: Data sources used to inform the SLVIA.

Title	Source	Year	Author
A Landscape Strategy for Lancashire	Lancashire County Council	2000	Lancashire County Council
Supplementary Planning Guidance: Landscape Character Assessment of Sefton	Sefton Council	2003	Sefton Council
Isle of Man Landscape Character Assessment	Isle of Man Government	2008	Chris Blandford Associates
Cumbria Landscape Character Assessment	Cumbria County Council	2011	Cumbria County Council
National Character Area Profile	Natural England http://publications.naturalengland.org.uk/	Various (2012 to 2014)	Natural England
Marine Plan Areas in England	Marine Management Organisation	2014	Marine Management Organisation
National Seascape Assessment for Wales	Natural Resources Wales	2015	Land use Consultants
The Partnership's Plan – The Management Plan for The English Lake District (2015-2020) (A National Park and Proposed World Heritage Site)	Lake District National Park Partnership	2015	Lake District National Park Partnership
Seascape Character Assessment for the North West Inshore and Offshore Marine Plan Areas	Marine Management Organisation	2018	Land Use Consultants
Welsh National Marine Plan	Welsh Government	2019	Welsh Government
Seascape and visual sensitivity to offshore wind farms in Wales: Strategic assessment and guidance – Stage 3, Report No. 331	Natural Resources Wales	2019	White, S. Michaels, S. King, H.
Lake District National Park Landscape Character Assessment 2008	Lake District National Park Authority	2008, revised 2018 and 2021	Lake District National Park Authority
Lake District Local Plan 2020 to 2035	Lake District National Park Authority	2021	Lake District National Park Authority

1.6.3 Desk-based studies and site survey work

1.6.3.1 The SLVIA has been informed by desk-based studies, stakeholder consultations and field survey work undertaken as described in Table 1.2 below.

Table 1.2: Summary of surveys undertaken to inform SLVIA.

Title	Extent of survey	Overview of survey	Survey contractor	Date
SLVIA Photography (see Appendix A.15.3)	Isle of Man and ferry route	Offshore viewpoint photography	RPS	22/03/2022 to 14/03/2023
SLVIA Photography (see Appendix A.15.3)	England	Offshore viewpoint photography	RPS	O7/09/2023
SLVIA Fieldwork and photography (see Appendix A.15.3)	England	Offshore and onshore viewpoint and character surveys and photography	RPS	14/09/2022-16/09/2022

1.7 Assessment of visual effects

1.7.1 Introduction

1.7.1.1 Visual effects are concerned with effects on views and visual amenity, defined as '*the overall pleasantness of the views people enjoy of their surroundings…'* (GLVIA3, p.158). They relate to the effects on views experienced by visual receptors (e.g., footpath users, road users, people in their places of work etc).

1.7.1.2 Visual receptors are always people "An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity" (GLVIA3, paragraph 6.1). The assessment of visual effects is thus concerned with the potential visual change experienced by people as a result of implementing the Morgan Array Area and may include changes to existing static and sequential views, or the wider visual amenity.

1.7.1.3 The level of visual effect (and whether this is significant or not) is determined through consideration of the sensitivity of each visual receptor (or group) and the magnitude of impact that will potentially be brought about by the construction, operation, maintenance and decommissioning of the Morgan Generation Assets.

1.7.2 Zone of Theoretical Visibility

1.7.2.1 Plans mapping the ZTV for the Morgan Array Area (see Appendix A.15.2) are used to establish the extent of its theoretical visibility throughout the study area and to assist with representative viewpoint selection. The ZTVs take account the screening effects of buildings, landform and significant vegetation, as shown on the 1:25,000 Ordnance Survey mapping. They do not reflect local topographical variations, hedgerows, individual trees or smaller built structures, such as walls. A ZTV is only an indication of where a proposed structure might be seen from. It does not indicate how much of the proposed development can be seen or reflect the effects of perspective. It simply shows that part of the development is visible, however small or distant. As such it is a worst-case scenario, a tool to be followed up by fieldwork, which verifies what of the Morgan Generation Array Area, might actually be visible.

1.7.3 Representative Viewpoints

1.7.3.1 Representative Viewpoints (see Appendix A.15.3) are used to assist the assessment and cover a range of viewpoints within the seascape, landscape and visual resources study area at differing distances and orientations relative to the Morgan Generation Assets. The purpose of these is to help assess both the level of visual effect for particular visual receptors and guide the design process, and generally focus the assessment.

1.7.3.2 The representative viewpoints used in the SLVIA have been agreed with the relevant consultees as part of the Morgan Generation Assets consultation process, as referred to previously in Section 1.3 above.

1.7.3.3 The assessment process involved visiting the representative viewpoint location and viewing wireline visualisations of the proposed development prepared for each (see Appendix A.15.4 for day-time visualisations and Appendix A.15.5 for night-time visualisations). The fieldwork was conducted in periods of favourable visibility, during both the summer and winter months to take account of the seasonal variation in vegetation cover. The changes in visibility over the year are set out in volume 4, annex 15.6, Appendix B.

1.7.4 Evaluating visual sensitivity to change

1.7.4.1 The sensitivity of each visual receptor (the particular person or group of people likely to be affected at a specific viewpoint) *"should be assessed in terms of both their susceptibility to change in views and visual amenity and also the value attached to particular views"* (GLVIA3, para 6.31). In this SLVIA, susceptibility and value of visual receptors are defined as follows:

- Visual Susceptibility: "The susceptibility of different visual receptors to changes in views and visual amenity is mainly a function of:
  - *the occupation or activity of people experiencing views at the particular locations; and*
  - *the extent to which their attention or interest may therefore be focused on the views and the visual amenity they experience at particular locations*" (GLVIA3, para 6.32)
- Value of views: Professional judgements made about the value of views should take account of: "recognition of the value attached to particular views, for example in relation to heritage assets, or through planning designations; and, indicators of value attached to views by visitors, for example through appearances in guidebooks or on tourist maps, provision of facilities for their enjoyment (such as parking places, sign boards or interpretive material) and references to them in literature or art…" (GLVIA3, para 6.37).

Visual sensitivity criteria

1.7.4.2 Sensitivity is not readily graded in bands and GLVIA notes, with regards to visual sensitivity, that the division of who may or may not be sensitive to a particular change *"is not black and white and in reality, there will be a gradation in susceptibility to change"* (GLVIA, para 6.35). In order to provide both consistency and transparency to the assessment process, however, Table 1.3 below defines the criteria which have guided the judgement as to the intrinsic susceptibility and value of the visual receptor and their subsequent sensitivity to changes to views brought about by the Morgan Generation Assets.

Table 1.3: Visual sensitivity to change.

Sensitivity	Typical Descriptors	
	Visual Receptor Susceptibility	Value of View
Very High	Observers, drawn to a particular view, including those who have travelled from around Britain and overseas to experience the views.	See paragraph 1.7.4.1 above
High	Observers on the public rights of way network in the countryside are more sensitive to visual change.	See paragraph 1.7.4.1 above
Medium	Observers enjoying the countryside from vehicles on quiet/promoted routes or pedestrians on less scenic/urban rights of way are moderately sensitive to visual change.	See paragraph 1.7.4.1 above
Low	Observers in vehicles or people involved in outdoor activities where attention is not focused on landscape are less sensitive to visual change.	See paragraph 1.7.4.1 above
Negligible	Observers in vehicles or people involved in frequent or frequently repeated activities are less sensitive to visual change.	See paragraph 1.7.4.1 above

1.7.5 Evaluating visual magnitude of impact

1.7.5.1 The magnitude of impact affecting visual receptors depends on the size or scale of the development, the geographical extent of the area influenced and its duration and reversibility. These factors are described below:

Size or scale

1.7.5.2 An assessment is made about the size or scale of change in the view that is likely to be experienced as a result of the introduction of the Morgan Generation Assets under the MDS, based on the following criteria:

- Distance: the distance between the visual receptor/viewpoint and the Morgan Array Area. Generally, the greater the distance, the lower the magnitude of impact, as the Morgan Array Area will constitute a smaller scale component of the view. Distance can be quantified and described objectively
- Size: the amount and size of the Morgan Array Area that will be seen. Visibility may range from small or partial visibility of the Morgan Array Area wind turbines to all of the offshore elements of the Morgan Array Area being visible. Generally, the closer and greater the number of elements/activities, associated with the Morgan Generation Assets, appearing in the view, the higher the magnitude of impact. This is also related to the degree to which the Morgan Array Area may be wholly or partly screened by landform, vegetation (seasonal) and/or built form. Conversely, open views are likely to reveal more of the Morgan Array Area, particularly where this is a key characteristic of the seascape. The amount of development visible can be described objectively in part by reference to the proportion of the whole in view

- Scale: the scale of change in the view with respect to the loss or addition of features in the view and changes in its composition. The scale of the Morgan Array Area may appear larger or smaller relative to the existing view composition
- Field of view (FoV): the extent or proportion of the view that is affected by the Morgan Array Area. Generally, the greater the extent or proportion impacted, the higher the impact magnitude will be. If the Morgan Array Area extends across the whole of the view, the magnitude of impact will generally be higher. Conversely, if the Morgan Array Area occupies just a narrow portion of the view, the magnitude of impact is likely to be reduced. This can in part be described objectively by reference to the horizontal and vertical FoVs affected relative to the extent available view
- Contrast: the character and context within which the Morgan Array Area will be seen and the degree of contrast or integration of any new features with existing seascape or landscape elements, in terms of scale, form, mass, line, height, colour, luminance and (e.g., in the case of the wind turbines) motion. Contrasts and changes may arise as a result of the rotation movement of the wind turbine blades, as a particular characteristic that gives rise to effects. Developments which contrast or appear incongruous in terms of colour, scale and form are likely to be more visible and have a higher magnitude of impact. Conversely, congruity with existing surroundings is likely to be less impactful
- Consistency of image: the consistency of image of the Morgan Array Area in relation to other developments. The magnitude of impact is likely to be lower if its wind turbine height, arrangement, and layout design are broadly similar to other developments in the seascape, in terms of its scale, form and general appearance
- Skyline/background: Whether the Morgan Array Area will be viewed against the skyline, or a landform or seascape backdrop may affect the level of contrast and magnitude. If it adds to an already developed backdrop or skyline the magnitude of impact will tend to be lower
- Number: generally, the greater the number of separate elements within a proposed development seen simultaneously or sequentially, the higher the magnitude of impact. This can usually be quantified and described objectively
- Nature of visibility: the nature of visibility is a further factor for consideration. The Morgan Array Area may be subject to various phases of development and the way it is viewed will vary throughout the year due to differing weather and atmospheric conditions/visibility (see Appendix B) and seasonal variations including vegetation cover.

Geographical extent

1.7.5.3 The geographic extent over which the visual effect will be experienced is distinct from the size or scale of effect and is described in terms of the physical area or location over which it will be experienced (quantifiable as a linear or area measurement). The extent of effects will vary according to the specific nature of the Morgan Generation Assets and is principally assessed through consideration of the ZTV, field survey and analysis of the extent of visibility likely to be experienced by visual receptors on the ground at the representative viewpoints.

Duration and reversibility

1.7.5.4 The duration and reversibility of visual effects are based on the period over which the Morgan Generation Assets are likely to exist (i.e. during construction, operations and maintenance and decommissioning), with effects being reversed at the end of that period.

1.7.5.5 Long-term, medium-term and short-term visual effects are defined as follows:

- Long-term: more than 10 years (may be permanent or reversible)
- Medium-term: six to 10 years (reversible)
- Short-term: one to five years (reversible).

Visual magnitude of impact rating

1.7.5.6 The magnitude of impact resulting from the Morgan Generation Assets Array Area is described as large, medium, small, negligible and no change as defined in Table 1.4 below.

Table 1.4: Visual Magnitude of Impact Criteria.

Magnitude of Impact	Definition
Large	Complete or very substantial visual change involving complete or very substantial obstruction of existing view or complete change in character and composition of visual baseline (i.e., pre- development view), e.g. through removal of key elements.
Medium	Moderate visual change, which may involve partial obstruction of existing view or partial change in character and composition of visual baseline (i.e., pre- development view) through the introduction of new elements or removal of existing elements. Change may be prominent but would not substantially alter the scale and character of the surroundings and the wider setting. Composition of views would alter. View character may be partially changed through the introduction of features which, although uncharacteristic, may not necessarily be visually discordant.
Small	Minor change to the visual baseline (i.e., pre-development view) – change would be distinguishable from the surroundings whilst view composition and character would be similar to the pre- change circumstances.
Negligible	Very slight change in visual baseline (i.e., pre- development view) – change barely distinguishable from the surroundings. Composition and character of view substantially unaltered.
No Change	No alteration to the existing view.

1.7.6 Evaluating significance of visual effect

1.7.6.1 The significance of a visual effect is evaluated through the combination of visual sensitivity and magnitude of impact. Once the level of effect has been established, a judgement is then made as to whether the effect is ‘significant’ as required by the relevant EIA Regulations. This process is assisted by the matrix in Table 1.7 below, which is used to guide the assessment.

1.7.6.2 A significant effect is more likely to occur where a combination of the variables results in the Morgan Generation Assets having a defining effect on the view or visual amenity, or where changes materially affect a visual receptor of high sensitivity. An effect is more likely to be assessed as not significant when the combination of variables results in the Morgan Generation Assets having a non-defining effect on the view or visual amenity, or where predicted changes affect a low sensitivity visual receptor.

1.8 Assessment of seascape/landscape effects

1.8.1 Introduction

1.8.1.1 The Marine Policy Statement (MPS) (UK Government, 2011) states “references to seascape should be taken as meaning landscapes with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other.”. In England, seascape characterisation includes both the sea surface and what lies below the waterline.

1.8.1.2 Regarding Welsh waters, INTERREG 2001 defines seascape to include: “views from land to sea; views from sea to land; views along coastline; the effect on landscape of the conjunction of sea and land.”

1.8.1.3 National Character Areas (NCAs) and Marine Character Areas (MCAs) are considered to be appropriate for the assessment of effects on seascape character. Where there is a gap in these and other published assessments, RPS have identified and described its own seascape character areas using available information.

1.8.1.4 Other sources of seascape and landscape character information which have informed this assessment are listed above in Table 1.1.

1.8.2 Evaluating seascape/landscape sensitivity to change

1.8.2.1 The sensitivity of a seascape/landscape receptor is a combination of *“judgements of their susceptibility to the type of change or development proposed and the value attached to the landscape”* (GLVIA3, para 5.39). In this SLVIA, susceptibility and value of seascape/landscape receptors are defined as follows:

- Landscape susceptibility: “the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular landscape type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed change without undue consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies” (GLVIA3, para 5.40)
- Value of the landscape receptor: “The value of the Landscape Character Types or Areas that may be affected, based on review of designations at both national and local levels, and, where there are no designations, judgements based on criteria that can be used to establish landscape value; and, the value of individual contributors to landscape character, especially the key characteristics, which may include individual elements of the landscape, particularly landscape features, notable aesthetic, perceptual or experiential qualities, and combinations of these contributors” (GLVIA3, para 5.44).

1.8.2.2 The assessment of seascape/landscape sensitivity has regard to published landscape and seascape sensitivity studies including NRW Report No. 331 (White, *et al*., 2019c).

Value of the seascape/landscape receptor

1.8.2.3 The value of a seascape/landscape has been classified as very high, high, medium, low or negligible. The assessment has been made using evidence and professional judgement based on the following criteria.

- Seascape or landscape designations: A receptor that lies within the boundary of a recognised landscape related planning designation will be of increased value, depend on the proportion of the receptor that is so influenced and the level of importance of the designation (i.e., international, national, regional or local). The absence of designations does not however preclude value, as an undesignated landscape character receptor may be valued as a resource in the local or immediate environment. Landscape Institute Technical Guidance Note 02/21: Assessing landscape value outside national designations is a helpful when considering the value of landscape receptors
- Seascape or landscape quality: The quality of a seascape/landscape character receptor is a reflection of its attributes, such as scenic quality, sense of place, rarity and representativeness, and the extent to which its valued attributes have remained intact. A seascape or landscape with consistent, intact, well-defined and distinctive attributes is considered to be of higher quality and, in turn, higher value, than a less intact landscape containing elements that detract from its character
- Seascape or landscape experience: The experiential qualities evoked by a landscape receptor can add to its value. This relates to a number of factors including the perceptual responses it evokes, the cultural associations that may exist in literature or history, or the iconic status of the seascape/landscape in its own right. Other factors include the recreational value of the seascape/landscape and those relating to the nature conservation and/or archaeology value of the area.

1.8.2.4 Due to the distance from land, the assessment of the effects of the Morgan Generation Assets, volume 2, chapter 15: Seascape landscape and visual resources of the PEIR has considered nationally and internationally designated landscapes and areas only.

Seascape and landscape susceptibility to change

1.8.2.5 The susceptibility of a seascape/landscape character receptor to change is a reflection of its ability to accommodate the changes that would result from the introduction of the Morgan Array Area without detrimental consequences for the maintenance of the baseline situation and/or fulfilment of landscape planning policies and strategies. Some seascape and landscape receptors are better able to accommodate development than others due to certain characteristics indicative of their capacity to accommodate change.

1.8.2.6 The susceptibility of a seascape or landscape receptor to change has been classified as very high, high, medium, low or negligible. The assessment has been made using evidence and professional judgement based on the following criteria:

- Overall strength and robustness: Collectively the overall characteristics and qualities of a particular seascape/landscape result in a strong and robust character that is capable of reasonably accommodating the influence of the Morgan Generation Assets Array Area without undue adverse effects on the special qualities (in the case of a designated landscape), or the key characteristics for which an area of seascape or landscape character is valued

- Seascape and landscape scale and topography: The scale and topography are large enough to physically accommodate the influence of the Morgan Generation Assets Array Area. Topographical features such as more complex, distinctive or small-scale landforms are likely to be more susceptible than larger scale, simple, expansive and homogenous landforms
- Openness and enclosure: Openness in the seascape or landscape may increase susceptibility to change because it can result in wider visibility. However an open seascape/landscape may also be larger scale and simple which will decrease its susceptibility. Conversely, enclosed seascape/landscapes can offer more screening potential, limiting visibility to a smaller area. However, they may also be smaller scale and more complex which will increase susceptibility. In general, broad and open seascapes/landscapes are likely to be less susceptible to the Morgan Generation Assets Array Area than more enclosed, complex seascapes and landscapes (such as indented bays, headlands, small-scale and varied coastal landscapes, etc.)
- Skyline: Prominent and distinctive skylines and horizons with important landmark features identified in seascape/landscape character assessments are generally considered to be more susceptible to development compared with broad, simple skylines/horizons which lack landmark features or contain built features and human activities
- Relationship with other development and landmarks: Contemporary landscapes where there are existing similar developments (e.g. windfarms) or other forms of development and related activities (industry, mineral extraction, masts, urban fringe/large settlement, major transport/shipping routes) that already have a characterising influence result in a lower susceptibility to development as opposed to areas characterised by smaller scale, historic development and landmarks
- Perceptual qualities: Notable landscapes acknowledged to be particularly scenic, wild or tranquil are generally considered to be more susceptible to development in comparison to ordinary, cultivated, farmed or developed landscapes where perceptions of ‘wildness’ and tranquillity are less tangible or more diluted. However, landscapes which are either remote or appear natural may vary in their susceptibility to development. Dynamic landscapes/seascapes (i.e., supporting human generated activity/movement) are considered less susceptible than the converse described above
- Seascape/landscape context and association: the extent to which the Morgan Array Area will influence the character of the seascape, landscape and visual resource study area relates to existing associations between the host seascape or landscape receptor and the receptor from which it is being experienced. In some situations, this association will be strong (i.e. where the seascapes/landscapes are directly related) whereas in others it will be less marked (i.e. where the seascape or landscape association is weak). The seascape/landscape context and visual connections with areas of adjacent seascape or landscape character or designations has a bearing on the susceptibility to development.

Seascape and landscape sensitivity rating

1.8.2.7 As with visual sensitivity described above (Table 1.3) seascape and landscape sensitivity is not readily graded into bands. That said, in order to provide both consistency and transparency to the assessment process, descriptions of landscape susceptibility and value are based on the same sliding scale as visual receptors (i.e., negligible, low, medium, high and very high) as set out in Table 1.5 below.

Table 1.5: Sensitivity of seascape and landscape receptors.

Sensitivity	Typical Descriptors Seascape/Landscape Resource / Recept`or Susceptibility	Seascape/Landscape Resource / Receptor Value
Very High	Exceptional seascape/landscape quality; absence of seascape/landscape detractors; no or limited potential for substitution. Key elements / features well known to the wider public.	Nationally/internationally designated seascape/landscape, or key elements or features of nationally / internationally designated seascape/landscape.
High	Strong/distinctive seascape/landscape character; relatively free of seascape/landscape detractors.	Regionally/nationally designated seascape/landscape areas or features.
Medium	Some distinctive seascape/landscape characteristics; presence of seascape/landscape detractors.	Locally/regionally designated/valued seascape/landscape and features.
Low	Absence of distinctive seascape/landscape characteristics; unavoidable presence of seascape/landscape detractors.	Undesignated seascape/landscape and features.
Negligible	Absence of positive seascape/landscape characteristics. Significant presence of seascape/landscape detractors.	Undesignated seascape/landscape and features.

1.8.3 Seascape and landscape magnitude of impact

1.8.3.1 As with the magnitude of visual impacts, the magnitude of impact or change affecting the seascape or landscape resource depends on the size or scale, geographical extent of the area influenced and its duration and reversibility. These factors are described below:

Size or scale of change

1.8.3.2 This criterion relates to the size or scale of change to the seascape or landscape resource that will arise as a result of a proposed development, based on the following factors.

- Seascape elements: The degree to which the pattern of elements that makes up the seascape character will be altered by the Morgan Array Area, by removal or addition of elements compared with the baseline situation. The magnitude of impact will generally be higher if the seascape features are extensively removed or altered, and/or if many new elements are added to the seascape/landscape
- Seascape characteristics: This relates to the extent to which the effect of the Morgan Array Area changes, physically or perceptually, the key characteristics of the seascape that may be important to its distinctive character. This may include, for example, the scale of the seascape, its relative simplicity or irregularity, and the seascape context. Also relevant are the grain or orientation of the seascape, the degree to which the receptor is influenced by external

features, and the juxtaposition of the Morgan Array Area is in relation to these and other baseline characteristics. If the Morgan turbine array is located in a seascape resource that is already affected by other similar development, this may reduce the magnitude of impact

- Seascape or landscape designation: In the case of designated seascapes/landscapes, the degree of change is considered in light of potential effects on the special qualities for which the area is designated which in turn underpin the integrity of the designation. All seascapes/landscapes change over time and much of that change is managed or planned. Designated seascapes and landscapes often have management objectives for 'protection' from or 'accommodation' of development. The scale of change may be localised, occurring over limited parts of a designated area, or more widespread affecting a large part of designation, in which latter case the overall integrity of the designated area may potentially be affected
- Distance: The size and scale of change is also strongly influenced by the proximity of the Morgan turbine array to the receptor and the extent to which the development has a characterising influence on the seascape/landscape. Consequently, the scale or magnitude of impact is likely to be lower in respect of receptors that are distant from the Morgan Array Area and/or screened by intervening landform, vegetation and built form. This is because the scale of its influence on such seascape/landscape receptors is small or limited. Conversely, seascapes/landscapes closest to the development are likely to be most affected. Host seascapes/landscapes will be directly affected whilst adjacent areas of seascape/landscape character will be indirectly affected
- Amount and nature of change: The amount of development components and context in which the Morgan Array Area will be seen has a bearing on impact magnitude. Visibility of it may range from one wind turbine blade tip to all of the wind turbines. Broadly speaking, the greater the amount of development that can be seen, the higher the scale of change. The degree to which the Morgan Array Area is perceived to be on the horizon or 'within' the seascape/landscape also has a bearing on the amount and nature of change. In general, the magnitude of impact is likely to be lower when the Morgan Array Area is perceived to be on the horizon, or beyond it, at distance, rather than 'within' the seascape.

Geographical extent

1.8.3.3 The geographic extent over which the seascape or landscape effects would be experienced is distinct from the size or scale of effect. This evaluation is an expression of the geographic extent of the receptor that will experience a particular magnitude of impact and the corresponding extents of potential significant and non-significant effect. This will vary depending on the specific nature of the Morgan Array Area.

1.8.3.4 and is principally assessed through analysis of the extent of its visibility and the likely geographic extent of perceived changes to seascape/landscape character.

Duration and reversibility

1.8.3.5 The duration and reversibility of seascape/landscape effects has been based on the period over which the Morgan Array Area is likely to exist (during construction, operations and maintenance and decommissioning) and the extent to which it has been removed and its effects reversed at the end of that period (during decommissioning). Long-term, medium-term and short-term seascape/landscape effects are defined as follows:

- Long-term: more than 10 years (may be defined as permanent or reversible)
- Medium-term: six to 10 years (reversible)
- Short-term: one to five years (reversible).

Seascape/landscape magnitude of impact rating

1.8.3.6 The magnitude of impact resulting from the Morgan Array Area is described as large, medium, small, negligible or no change. In assessing magnitude of impact, the assessment focuses on the size or scale of change. The geographic extent, duration and reversibility are stated separately in relation to the assessed effects (i.e., as short/medium /long-term and temporary/permanent in the case of the latter two). The assessment of magnitude for each receptor is based on evidence and professional judgement. The levels of magnitude of impact that can occur are defined in Table 1.6 below.

Table 1.6: Definition of terms relating to the magnitude of impact upon seascape/ landscape receptors.

Magnitude of Impact	Definition
Large	Total loss, or/very substantial loss or addition of key elements/features/patterns of the baseline (i.e., pre-development seascape/landscape) and/or introduction of dominant, uncharacteristic elements compared with the attributes of the receiving seascape/landscape.
Medium	Partial loss or addition of, or moderate alteration to, one or more key elements/features/patterns of the baseline (i.e`., pre-development seascape/landscape) and/or introduction of elements that may be prominent but would not be substantially uncharacteristic in comparison to the attributes of the receiving seascape/landscape.
Small	Minor loss or addition of, or alteration to, one or more key elements/features/patterns of the baseline, i.e., pre-development seascape/landscape and/or introduction of elements that may not be uncharacteristic compared with the surrounding seascape/landscape.
Negligible	Very minor loss or addition of, or alteration to, one or more key elements/features /patterns of the baseline (i.e., pre-development seascape/landscape) and/or introduction of elements that are not uncharacteristic in comparison to the surrounding seascape/landscape; approximating to a 'no-change' situation.
No Change	No loss, alteration or addition to the receiving seascape/landscape resource.

1.8.4 Evaluating seascape/landscape significance of effect

1.8.4.1 The level of seascape/landscape effect is evaluated through the combination of receptor sensitivity and magnitude of impact. Once the level of effect has been assessed, a judgement is then made as to whether the level of effect is 'significant' or 'not significant' as required by the relevant EIA Regulations. This process is assisted by the matrix in Table 1.7 which is used to guide the assessment.

1.8.4.2 A significant effect would occur where the combination of the variables results in the Morgan Array Area having a defining effect on the seascape or landscape receptor,

or where changes of a lower magnitude clearly and demonstrably affect a seascape or landscape receptor of particularly high sensitivity. A major loss or irreversible effect over an extensive area of seascape or landscape character, affecting nationally or internationally valued elements, characteristics and/or perceptual aspects is likely to be significant.

1.8.4.3 An effect that is not significant would occur where the Morgan Array Area is not defining, and the seascape/landscape receptor continues to be characterised principally by its baseline character. Equally, a small-scale change experienced by a receptor of high sensitivity may not significantly affect the special landscape qualities or integrity of a designation. Reversible seascape and landscape effects that are of small-scale or affecting lower value receptors are unlikely to be significant.

1.8.5 Evaluation of significance of effect

1.8.5.1 The significance of an effect upon seascape, landscape and visual receptors is determined by correlating the magnitude of the impact and the sensitivity of the receptor, as presented in Table 1.7.

1.8.5.2 For the purposes of this assessment, any effects with a significance level of substantial or major have been deemed significant. An accumulation of individual moderate effects, for instance experienced during a journey undertaken by the same visual receptor, may also be judged as significant in some circumstances.

1.8.5.3 Effects are assessed as being adverse, neutral or positive. The judgements regarding the significance of effect and that relating to whether an effect is beneficial or adverse are entirely separate. The assessment of whether an effect is positive, neutral or adverse is based on professional judgement having regard to the relevant objective factors.

Table 1.7: Assessment of Significance of Effect Matrix

Sensitivity of Receptor	Magnitude of impact				
	No Change	Negligible	Small	Medium	Large
Negligible	No change	Negligible	Negligible to Minor	Negligible to Minor	Negligible to Minor
Low	No change	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate
Medium	No change	Negligible to Minor	Minor	Moderate	Moderate to Major
High	No change	Negligible to Minor	Minor to Moderate	Moderate to Major	Major
Very High	No change	Minor	Moderate to Major	Major	Substantial

1.8.5.4 A description of these terms is provided in Table 1.8 below.

Table 1.8: Definitions of Significance Criteria

Level of Significance	Typical Descriptors	
	Seascape/Landscape Resource	Visual Resource
Substantial	Where proposed changes would be uncharacteristic and/or would significantly alter a landscape of exceptional landscape quality (e.g., internationally designated landscapes), or key elements known to the wider public of nationally designated seascape/landscapes (where there is no or limited potential for substitution nationally).	Where proposed changes would be uncharacteristic and/or would significantly alter a view of remarkable scenic quality, within internationally designated landscapes or key features or elements of nationally designated seascapes/landscapes that are well known to the wider public.
Major	Where proposed changes would be uncharacteristic and/or would significantly alter a valued aspect of (or a high quality) seascape/landscape.	Where proposed changes would be uncharacteristic and/or would significantly alter a valued view or a view of high scenic quality.
Moderate	Where proposed changes would be demonstrably out of scale or at variance with the character of an area.	Where proposed changes to views would be demonstrably out of scale or at variance with the existing view.
Minor	Where proposed changes would be at slight variance with the character of an area.	Where proposed changes to views, although discernible, would only be at slight variance with the existing view.
Negligible	Where proposed changes would have an indiscernible effect on the character of an area.	Where proposed changes would have a barely noticeable effect on views/visual amenity.
No Change	No discernible loss or alteration to seascape/landscape character, features or elements.	No part of the Morgan Offshore Wind Project MDS is discernible.

1.10 Assessment of night-time effects

1.10.1 Introduction

1.10.1.1 The assessment of night-time effects is based on the description of lighting for the Morgan Array Area as set out in the project description in volume 1, chapter 3: Project description of the PEIR and the MDS tables in volume 2, chapter 15: Seascape, landscape and visual resources) of the PEIR.

1.10.1.2 The seascape, landscape and visual resources study area for the assessment of night-time effects is the same as that for daytime, informed by the likely patterns of human use or activities at night-time (see section 1.2). The assessment of night-time effects considers the potential effects upon night-time views, seascape and landscape for both the onshore and offshore elements of the Morgan Array Area during its construction, operations and maintenance, and decommissioning phases. Having regard to the proportionality principle, the focus of the night-time assessment is on areas/locations where potential seascape, landscape and visual effects are likely to be experienced by the greatest number of people.

1.10.2 Evaluating night-time effects and significance of effect

1.10.2.1 Whilst the nature of daytime and night-time effects of the Morgan Array Area is very different, in that during daylight hours the visibility of moving rotors gives rise to effects that are very different to the pinpoint effects of lighting at night, the same criteria are considered appropriate for assessment of its potential night-time effects.

1.10.2.2 As with the assessment of daytime effects, the significance of the potential night-time effects of the Morgan Array Area are assessed through a correlation of the seascape/landscape or visual receptor sensitivity and the magnitude of impact that would result from lighting of the Morgan Array Area.

1.10.2.3 A significant night-time effect is likely where implementation of the Morgan Array Area would have a defining influence on a landscape/seascape or visual receptor at night. In contrast, a non-significant night-time effect is likely to occur when the effect of lighting is non-defining, and the existing baseline characteristics of the night-time view, visual receptor or area of seascape/landscape continue to provide the defining influence.

1.11 Cumulative seascape, landscape and visual effects

1.11.1.1 This section should be read in association with section 5.4 cumulative effects assessment (CEA) of volume 1, chapter 5: Environmental impact assessment methodology of the PEIR. The CEA is concerned with the potential cumulative effects that may result from incremental changes caused by other reasonably foreseeable proposed projects, plans and activities, that were not present at the time of data collection or survey, considered alongside the project in question. It also considers the 'in combination' and 'sequential' effects of adding the same type of development to the existing situation, e.g., would adding a windfarm to an area of seascape that already contains windfarms, change the defining characteristic of the seascape area.

1.11.1.2 GLVIA3 (p.120) defines cumulative landscape and visual effects as those that "result from additional changes to the landscape and visual amenity caused by the proposal in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future."

1.11.1.3 The approach to cumulative assessment adopted in this SLVIA and outlined below accords with the recommendations set out in GLVIA3. Both the likely daytime and night-time cumulative effects of the Morgan Array Area are considered in the cumulative SLVIA.

1.11.2 Types of cumulative effects in the SLVIA

1.11.2.1 The LI and IEMA (GLVIA3) guidance on assessing cumulative seascape, landscape and visual effects uses the definition used in GLVIA2 (LI and IEMA 2002). Cumulative seascape, landscape and visual effects *"result from additional changes to the landscape and visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future"* (GLVIA3, paragraph 7.2).

1.11.2.2 GLVIA3 notes that since GLVIA2 was published "there has been particular emphasis on exploring the cumulative effects of wind farm development. This results from the number of such schemes requiring assessment and the potentially high level of visibility of these tall structures, which means that cumulative visual effects in particular may be more likely" (GLVIA3, paragraph 7.3)

1.11.2.3 Guidance from Scotland has led the way in this field, due to the maturity of the wind energy sector in Scotland and SNH (now NatureScot) 2012 guidance was taken forward by the LI in GLVIA3. NatureScot updated its guidance on the Cumulative Landscape and Visual Impact Assessment (CLVIA) effects in March 2021 (NatureScot, 2021), this in turn cross-refers back to GLVIA3, section 7, which explains that the (then) SNH guidance defines cumulative effects as *"the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments, taken together;"* Specifically:

- Cumulative landscape effects – effects that *"can impact on either the physical fabric or character of the landscape, or any special values attached to it"* (SNH, 2012)
- Cumulative visual effects – effects that *"can be caused by combined visibility, which occurs where the observer is able to see two or more developments from one viewpoint and/or sequential effects which occur when the observer has to move to another viewpoint to see different developments"* (SNH, 2012).

1.11.2.4 GLVIA3 explains that there are many different types of cumulative landscape and visual effect that may need to be considered and that these can include:

- The effects of extensions to an existing development, which intensifies the seascape, landscape or visual effects of the original development
- The 'filling' of an area with either the same or a different type of development, which may substantially alter the seascape, landscape resource, views or visual amenity
- The interaction between different types of development, with different seascape, landscape and visual effects, that may together have a greater effect than the sum of their parts

- Incremental change resulting from successive individual developments such that the combined seascape, landscape or visual effect is significant even though the individual effects may not be
- Temporal effects that occur when simultaneous and/or successive projects affect seascape, landscape or visual receptors
- Effects of development that have indirect effects, by enabling other development to follow, or disabling it, by sterilising areas of sea or land
- Effects resulting from a future action, such as removal of screening vegetation which would reveal a development (GLVIA3, paragraph 7.17).

1.11.2.5 Not all of these potential types of cumulative effect are relevant to the Morgan Generation Assets CEA in all cases. The type of cumulative effects mentioned above, include effects in combination with existing projects, which forms a cumulative baseline. Only those effects with onshore and offshore wind farms will be considered as part of the CEA baseline.

1.11.3 Tiered approach to the CEA

1.11.3.1 As stated in volume 1, chapter 5: Environmental impact assessment methodology of the PEIR, a tiered approach to the CEA has been adopted by identifying a set of appropriate 'cumulative development scenarios'. This approach takes into account the different stages that other planned projects are at in the planning/consenting process and the varying potential of each for proceeding to an operational stage. Hence, their differing potential to ultimately contribute to a cumulative impact in conjunction with the Morgan Generation Assets is considered, within the study area stated in the cumulative effects assessment section of volume 2, chapter 15: Seascape, landscape and visual resources of the PEIR.

1.11.3.2 The tiered CEA approach, set out in the Planning Inspectorate Advice Note 17: Cumulative Effects Assessment (2019) has been adopted to assess the complexity of cumulative development scenarios, keeping in mind the principle of proportionality, is summarised as follows:

- Tier 1
  - Under construction
  - Permitted application
  - Submitted application
- Tier 2
  - Scoping report has been submitted
- Tier 3
  - Scoping report has not been submitted
  - Identified in a relevant development plan
  - Identified in other plans and programmes.

1.11.3.3 Advice Note 17 adds a note to the Tier 1 'under construction' category – "Where other projects are expected to be completed before construction of the proposed NSIP and the effects of those projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of both the construction and operational assessment" (page 6).

1.11.3.4 The development projects selected as relevant to the CEA and included in the SLVIA are based upon the results of a screening exercise and informed by consultations with the relevant authorities (see volume 3, annex 5.1 of the PEIR).

1.11.4 Assessing cumulative seascape/landscape and visual effects

1.11.4.1 The same conclusions as to the assessment of sensitivity of the various seascape/landscape and visual receptors are carried forward from the SLVIA and applied in the cumulative SLVIA.

1.11.4.2 The same method as in the SLVIA is used to assess the magnitude and significance of cumulative effect of the Morgan Generation Assets, considered in conjunction with each of the cumulative development scenarios, using the tiered approach referred to previously.

1.12 References

BMT Cordah (2003) Offshore Wind Energy Generation: Phase 1 Proposals and Environment Report. For the consideration of the Department of Trade and Industry. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/194363/offshore_wind_SEA_final.pdf. Accessed February 2023.

Chris Blandford Associates (2008) Isle of Man Landscape Character Assessment.

Council of Europe (2000, ratified 2006), The European Landscape Convention ETS No. 176.

Countryside Agency and Scottish Natural Heritage (2004), Topic Paper 6: Techniques and Criteria for judging Capacity and Sensitivity. Available: http://publications.naturalengland.org.uk/file/6668877391986688. Accessed February 2023.

Cumbria County Council (2011), Cumbria Landscape Character Assessment.

Department of Energy and Climate Change (2011a) Overarching National Policy Statement for Energy (EN-1). Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf. Accessed February 2023

Department of Energy and Climate Change (2011b) National Policy Statement for Renewable Energy (EN-3). Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47856/1940-nps-renewable-energy-en3.pdf. Accessed February 2023.

Department of Energy and Climate Change (2011c) National Policy Statement for Electricity Networks Infrastructure (EN-5). Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47858/1942-national-policy-statement-electricity-networks.pdf. Accessed February 2023.

Department of Energy and Climate Change (2016) Offshore Energy Strategic Environmental Assessment 3 (OESEA 3). Available: https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-3-oesea3. Accessed February 2023

Hill M., Briggs J., Minto P., Bagnall D., Foley K., Williams A., (2001), INTERREG Report No. 5: Guide to Best Practice in Seascape Assessment. Countryside Council for Wales, Brady Shipman Martin, University College Dublin.

HM Government (2011) UK Marine Policy Statement. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf. Accessed February 2023.

Lancashire County Council (2000), A landscape Strategy for Lancashire.

Landscape Institute with the Institute of Environmental Management and Assessment (2013), Guidelines for Landscape and Visual Impact Assessment: Third Edition.

Landscape Institute (2019), Technical Guidance Note 2/19 Residential Visual Amenity Assessment.

Landscape Institute (2019), Technical Guidance Note 06/19 Visual Representation of Development Proposals

Landscape Institute (2021), Technical Guidance Note 02/21: Assessing landscape value outside national designations.

Land Use Consultants on behalf of the Marine Management Organisation (2018), Seascape Character Assessment for the North West Inshore and Offshore Marine Plan Areas.

Lake District National Park Authority (2008, revised 2018 and 2021), Lake District National Park Landscape Character Assessment 2008.

Lake District National Park Authority (2021), Lake District Local Plan 2020 to 2035.

Lake District National Park Partnership (2015), The Partnership's Plan – The Management Plan for The English Lake District (2015-2020) (A National Park and Proposed World Heritage Site).

Marine Management Organisation (2014), Marine Plan Areas in England. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/325688/marine_plan_areas.pdf. Accessed February 2023.

Meteorological Office (2022), Visibility analysis reports from Walney Island, Rona.ldsway, Rhyl No.2 and Mona Meteorological Office weather stations.

Natural England (2014a) National Character Area Profile. Available: http://publications.naturalengland.org.uk/category/587130 Accessed January 2023

Natural England (2014b) An Approach to Landscape Character Assessment. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/691184/landscape-character-assessment.pdf. Accessed February 2023.

Natural England (2022) Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase III: Expectations for data analysis and presentation at examination for offshore wind applications Final Report

Natural Resources Wales (2015) National Seascape Assessment for Wales Available: https://naturalresources.wales/media/682028/mca-00-technical-report-summary-method-appendix.pdf. Accessed February 2023.

NatureScot (2021) Assessing the Cumulative Landscape and Visual Impact of Onshore Wind Energy Developments. Available: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments. Access February 2023.

RenewableUK (2013), Cumulative Impact Assessment Guidelines: Guiding Principles For Cumulative Impacts Assessment In Offshore Wind Farms. Available: https://tethys.pnnl.gov/sites/default/files/publications/Cumulative-Impact-Assessment-Guidelines.pdf. Accessed February 2023.

Morgan Offshore Wind Ltd (2022) Morgan Generation Assets EIA Scoping Report. Available: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010136/EN010136-000039-Morgan%20Offshore%20Wind%20Farm%20-%20EIA%20Scoping%20Report.pdf. Accessed February 2023.

Scottish Natural Heritage (2017) Visual Representation of Windfarms: Guidance. Version 2.2. Available: https://www.nature.scot/sites/default/files/2019-09/Guidance%20-%20Visual%20representation%20of%20wind%20farms%20-%20Feb%202017.pdf. Accessed February 2023.

Sefton Council (2003), Supplementary Planning Guidance: Landscape Character Assessment of Sefton.

The PIanning Inspectorate (2019) Advice Note 17: Cumulative Effects Assessment (version 2).

Welsh Government (2019), Welsh National Marine Plan. Available: https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan-document_0.pdf. Accessed February 2023.

White, S., Michaels, S. and King, H. (2019a) Seascape and Visual Sensitivity to Offshore Wind Farms in Wales: Strategic Assessment and Guidance – Stage 1. Ready Reckoner of Visual Effects Related to Turbine Size (NRW Report No. 315).

White, S., Michaels, S. and King, H. (2019b) Seascape and Visual Sensitivity to Offshore Wind Farms in Wales: Strategic Assessment and Guidance – Stage 2. Guidance on Siting Offshore Wind Farms (NRW Report No. 330).

White, S., Michaels, S. and King, H. (2019c) Seascape and Visual Sensitivity to Offshore Wind Farms in Wales: Strategic Assessment and Guidance – Stage 3. Strategic Assessment and Guidance (NRW Report No. 331).

White Consultants (with Northumbria University) (March 2020), Review and Update of Seascape and Visual Buffer study for Offshore Wind farms.

Appendix A: Visual Representations

A.15 Visual representations

A.15.1 Overview

1.12.1.1 ZTVs and visualisations (wirelines or wirelines and photomontages) are graphical images produced to assist and illustrate the SLVIA and the cumulative assessment. The methodology used for viewpoint photography and photomontages (see Appendix A.15.4 for day-time visualisations and Appendix A.15.5 for night-time visualisations) has been produced in accordance with the NatureScot guidance on Visual Representation of Wind Farms, Version 2.2 (2017), the Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA 3) (Landscape Institute and IEMA, 2013) and the Landscape Institute Technical Guidance Note on Visual Representation of Development Proposals (2019).

1.12.1.2 ZTVs are produced on the assumption that the Morgan Array Area turbines are modelled relative to Lowest Astronomical Tide (LAT) sea level at their maximum blade tip height (324 m). The closest tidal stations show LAT as between 4.9m and 3.85m Below Ordnance Datum (BOD). As a worse case the turbines were modelled at 324m Above Ordnance Datum (AOD).

A.15.2 Zone of Theoretical Visibility

1.12.1.3 The ZTVs have been calculated using GIS software to generate a ZTV of Morgan Generation Assets to demonstrate the theoretical extent of visibility from any point in the study area.

1.12.1.4 Within England the Ordnance Survey Terrain 50 Digital Terrain Model (DTM) was used.

1.12.1.5 The Isle of Man Government 20m DTM product was used to provide coverage of the Isle of Man. An issue was identified with data quality in the Snaefell Mountain area and NASA Shuttle Radar Topography Mission data at 1 arcsecond resolution was used to replace this area.

1.12.1.6 Each source DTM was reprojected to the UTM Zone 30N coordinate system at a 50m sampling using bilinear interpolation.

1.12.1.7 The computer model includes the entire study area and takes account of atmospheric refraction and the Earth's curvature. The resulting ZTV plots have been overlaid on mapping at an appropriate scale and presented as figures using desktop publishing or graphic design software.

1.12.1.8 Cumulative ZTV plots based on the intervisibility of the Morgan Array Area and other relevant developments within the study area have also been produced.

1.12.1.9 There are limitations which should be considered in the interpretation and use of the ZTV as follows.

- The ZTV does not account for the screening effects of vegetation or built form
- The ZTVs are based on theoretical visibility from 2m above ground level
- The Blade Tip ZTV does not indicate the decrease in visibility that occurs with increased distance from the Morgan Array Area. The nature of what is visible from 3km away will differ markedly from what is visible from say 10km or greater distances away, although both are indicated on the Blade Tip ZTV as having the same level of visibility
- There is a wide range of variation within the visibility shown on the ZTV. For example, an area shown on the blade tip ZTV as having visibility of seven wind turbine may gain views of the smallest extremity of blade tips, or alternatively of seven full wind turbines. This can make a significant difference in the effects of the Morgan Generation Assets array on that area.

1.12.1.10 These limitations mean that, while the ZTV is useful as a starting point and aid to assessment, providing an indication of where the Morgan Array Area will be theoretically visible, it will tend to present a worst-case or over-estimate the actual visibility. The information drawn from the ZTV is checked by field survey observation and interpreted using professional judgement.

1.12.1.11 The SLVIA includes a Horizontal Angle ZTV to show the horizontal field of view (in degrees) that may be affected by views of the Morgan Array Area.

A.15.3 Baseline Photography

Overview

1.12.1.12 Once a view has been selected, the location is visited, confirmed, and assessed with the aid of a wireline or similar visualisation in the field. A photographic record is taken to record the view and the details of the viewpoint location and associated data are recorded to assist in the production of visualisations and to validate their accuracy.

1.12.1.13 The following photographic information is recorded:

- Date, time, weather conditions and visual range
- GPS recorded 12 figure grid reference accurate to ~5-10 m
- GPS recorded AOD height data
- Use of a fixed 50 mm focal length lens is confirmed
- Horizontal field of view (in degrees)
- Bearing to Morgan Array Area.

1.12.1.14 The photographs used to produce the photomontages were taken at the locations agreed with the consultees using Canon EOS 5D and 6D Digital SLR cameras, with a fixed lens and a full-frame (35mm negative size) complementary metal oxide semiconductor (CMOS) sensor. The photographs were taken on a tripod with a pano-head at a height of approximately 1.5m above ground (see Appendix A.15.3).

1.12.1.15 Whilst no two-dimensional image can fully represent the real viewing experience, the visualisation aims to provide a realistic representation of the offshore elements, based on current information and photomontage methodology.

- Guidelines for LVIA (GLVIA3) para 8.22 state – “In preparing photomontages, weather conditions shown in the photographs should (with justification provided for the choice) be either:

representative of those generally prevailing in the area; or

taken in good visibility, seeking to represent a maximum visibility scenario when the development may be highly visible".

1.12.1.16 In preparing photomontages for the SLVIA, as far as possible in order to represent when the Morgan Array Area may be most visible (a maximum visibility scenario), photographs have been taken in favourable weather conditions during periods of good or better visibility. The time of day that the views were taken was mainly governed by the position of the sun relative to the viewpoint location, and that part of the Morgan Generation Assets array for which an existing view photograph was being taken.

1.12.1.17 Various weather forecasts were checked in advance of field survey in order to ensure favourable weather conditions. These included the Met Office, however, visibility changes throughout the year. Meteorological Office visibility data is presented in Appendix B and provides analysis of 10 years of visibility data from weather stations at Ronaldsway, and Walney Island.

A.15.4 Visualisations

1.12.1.18 Wirelines of the Morgan Array Area for use in the PEIR have been produced in accordance with NatureScot Visual Representation of Windfarms Guidance (NatureScot, 2017) and Landscape Institute (2019) Technical Guidance Note (TGN) 06/19 Visual Representation of Development Proposals. Wirelines for the Morgan Array Area have been produced for the PEIR and are presented in volume 2, chapter 15: Seascape, landscape and visual resources of the PEIR. Photomontages of the Morgan Generation Assets will be produced at the final Environment Statement stage.

1.12.1.19 A photomontage is a visualisation which superimposes an image of a proposed development upon a photograph or series of photographs. Photomontage is a widespread and popular visualisation technique which allows changes in views and visual amenity to be illustrated and assessed, as well as being compared and tested with existing views on the ground.

1.12.1.20 To create the baseline panorama, individual frames are cylindrically projected and then digitally joined to create a fully cylindrically projected panorama using Adobe Photoshop or PTGui software. This process avoids the wide-angle effect that will result should these frames be arranged in a perspective projection, namely one where the image is not faceted to allow for the cylindrical nature of the full 360°Horizontal Field of View (HFoV) but appears essentially as a flat plane.

1.12.1.21 Tonal alterations are made using Adobe software to create an even range of tones across the photographs once joined.

1.12.1.22 The baseline photographs and cumulative wireline visualisations shown for each selected viewpoint cover a 90° HFoV (or in some cases, up to 360°), which accords with NatureScot guidance. These are cylindrically projected images and should be viewed flat at a comfortable arm's length.

1.12.1.23 The photographs are also joined to create planar projection panoramas using PTGui software. These are used in the creation of the 53.5° HFoV photomontages.

1.12.1.24 Wireline representations illustrating the Morgan Array Area set within a computer-generated image of the landform. These are used in the SLVIA to predict the appearance of the wind turbines and assess the likely visual effect arising. The wirelines are produced with Resoft WindFarm software and are based on OS Terrain 5 DTM. There are limitations in the accuracy of DTM data so that landform may not be picked up precisely and may result in wind turbines being more or less visible than is shown. However, the use of OS Terrain 5 minimises these limitations. Where descriptions within the assessment identify the numbers of wind turbines visible these refer to the illustrations generated (as described above) and therefore the reality on the ground may differ to a minor degree from these impressions.

1.12.1.25 Daytime visualisations and wirelines show a wind turbine model which represents the maximum development scenario of the Morgan Array Area. The visualisations and allow the potential proportions of the wind turbines to be appreciated and assessed.

1.12.1.26 Fully rendered photomontages have been produced for the agreed viewpoints using Resoft WindFarm software, to provide a photorealistic image of the appearance of the Morgan Array Area. Regarding the daytime photomontages, modelled representations are combined with the baseline view photographs to create a photorealistic rendered photomontage image of the development.

1.12.1.27 'Panoramic photomontages' presented in the SLVIA are produced with a 53.5° HFoV. This format is based on relevant guidance (Scottish Natural Heritage, 2017) due to its suitability to encompass the horizontal spread of the Morgan Array Area and show the turbines at a representative scale and distance. In some views, two adjacent 53.5° photomontages will be required to capture the full horizontal spread of the Morgan Array Area.

1.12.1.28 The 53.5° HFoV wirelines and photomontages are prepared using a planar projected image and should also be viewed flat at a comfortable arm's length. These images are each printed on paper 841 x 297mm (half A1) which provides for a relatively large-scale image.

1.12.1.29 In the wirelines, the wind turbines are shown with the central wind turbines facing the viewer directly, with the full rotor diameter visible at its tallest extent. In the photomontages, the wind turbine rotors are shown with a random position with the central wind turbines facing the viewer directly.

1.12.1.30 Rendering of the wind turbine s in the photomontages is as photorealistic as possible to the conditions shown in each viewpoint photograph. There may be some variation in the appearance and visibility of the wind turbine s between the viewpoints, as they are rendered to suit the conditions shown in each of the different viewpoint photographs, which unavoidably have some degree of variation in terms of lighting and weather conditions. The key requirement is that the wind turbine s need to be rendered with sufficient contrast against the skyline backdrop to illustrate the maximum visibility scenario in each image. Photomontages have been prepared to depict the worst-case of how the Morgan Array Area will appear. The full suite of viewpoint photomontages should be viewed to gain an impression of the likely visual effects of the Morgan Generation Assets in the round.

A.15.5 Night-time visualisations

1.12.1.31 The potential visual impacts of the Morgan Array Area at night have also been assessed. This has been informed by the night-time photomontage visualisations

produced from a number of representative viewpoints, to visually represent aviation and marine navigation lighting at night.

A.15.6 Information on limitations of visualisations

1.12.1.32 The photographs and other graphic material such as wirelines and photomontages used in this assessment are for illustrative purposes only and, whilst useful tools in the assessment, are not considered to be completely representative of what is now, or will be in the future, apparent to the human eye. The assessments are carried out from observations in the field and therefore may include elements that are not visible in the photographs. Limitations of photomontages are set out further below.

1.12.1.33 The photomontage visualisations of the Morgan Array Area (and any wind farm proposal) have a number of limitations when using them to form a judgement on visual impact. These include the following:

- A visualisation can never show exactly what the Morgan Array Area will look like in reality due to factors such as: different lighting, weather and seasonal conditions which vary through time and the resolution of the image
- The images provided give a reasonable impression of the scale of the wind turbines and the distance to the wind turbines but can never be 100% accurate
- A static image cannot convey turbine movement, or flicker or reflection from the sun on the turbine blades as they move
- The viewpoints illustrated are representative of views in the area, but cannot represent visibility at all locations
- To form the best impression of the impacts of the Morgan Array Area proposal these images are best viewed at the viewpoint location shown
- The images must be printed and viewed at the correct size (260mm by 820mm)
- Images should be held flat at a comfortable arm's length. If viewing these images on a wall or board at an exhibition, stand at arm's length from the image presented to gain the best impression
- It is preferable to view printed images rather than view images on screen. Images on screen should be viewed using a normal PC screen with the image enlarged to the full screen height to give a realistic impression
- There are practical limitations to shooting viewpoint photographs only in very good or excellent visibility and at particular times of day. The photographs shown in the visualisations show the most favourable weather conditions available during photographic survey work.

A.15.7 Technical Data – Visualisations

Table A 1: Technical Data – Visualisations.

Category	Details
Photography	
Visualisation Type	Type 4 – where survey of viewpoint locations is not required
Camera location	Established via hand-held Garmin GPS
Level of accuracy of location	1-3m (depending on satellites)
Camera	Canon EOS 5D Mark II and Canon EOS 6D Digital SLR. Full-frame (35mm negative size) CMOS sensor.
Lens	50mm fixed f1.4 lens
Tripod	Set to approximately 1.5m. Nodal Ninja panoramic head with Adjust Leveller. Nodal Ninja panoramic head set to take photographs at 20 degree increments
Photography process	Camera used on fully manual settings. Photographs taken in RAW image format. Bracketed exposures are taken for each view and those depicting the clearest images are selected to prepare the panoramic image
Preparation of panoramic photographs	PTGUI v12.8 is used to join and cylindrically project the images. Adobe Photoshop 2021 used to correct tonal alterations and create an even range of exposure across the photographs so that the individual photographs are not apparent. Planar panoramic images are prepared using Resoft Windfarm software or Hugin Panorama Stitcher
3D Model / Visualisation	
Topographic height data	Ordnance Survey Terrain 5 (5m resolution). Ordnance Survey Terrain 50 (50m resolution)
Use of coordinates in software	Coordinates are brought in from the surveyed GPS coordinates. Positions checked using aerial photography.
Markers for horizontal alignment	Existing Offshore Wind Farm wind turbines and their known coordinates.
Markers for vertical alignment	Existing Offshore Wind Farm wind turbines and their known coordinates.
Rendering software	Resoft Windfarm v.5.2.5.3 (Wind turbines in wirelines and photomontages). Sketchup or AutoCAD Map 3D 2018 (OSPs, Met Mast and jacket foundations). Autodesk 3ds Max 2018. Visual Nature Studio V 3.10.
Limitations	
Terrain data	There may therefore be local, small-scale landform that is not reflected in the data and subsequently the visualisation but may alter the real visibility of the Morgan Array AreaArray Area, either by screening theoretical visibility or revealing parts of the Morgan Array AreaArray Area that are not theoretically visible.
Movement	Static images are unable to capture the movement within the view or of the wind turbines

Appendix B: Meteorological Office Data

B.1.1 Meteorological Office Visibility Data

B.1.1.1 Introduction

1.12.1.34 Visibility analysis reports were requested from four Meteorological Office weather stations:

- Walney Island (54.124387, -3.2577383)
- Ronaldsway, IOM (54.08507, -4.6307)
- Rhyl No.2 (53.2593, -3.50882)
- Mona, Anglesey (53.26051, -437599).

1.12.1.35 The analysis reports use ten years of historical data (2012 to 2021). The data is given both as meters (broken as follows: 0-999m, 1000 to 1999m, 2000 to 2999m etc, to 70000m or more) and percentages. The data goes beyond the 50km study area for the Morgan Generation Assets study area.

1.12.1.36 The data allows analysis of the different visibility conditions for each month of the year. This allows the visibility during the holiday seasons.

1.12.1.37 The visibility data from the Walney Island and Ronaldsway weather stations are applicable to the Morgan Generation Assets MDS, as they lie within the 50km study area. The data for the two weather stations is set out in Table B.15.1 to B.15.4, below.

B.1.1.2 Meteorological Office Explanatory Notes

1.12.1.38 Visibility is defined as the greatest distance at which an object can be seen and recognized in daylight, or at night could be seen and recognized if the general illumination were raised to daylight level. It is measured using visiometer at automatic sites but used to be done by observers at manual stations except at some Weather Centres and Climate Data Logger stations, where observations are made from a non-standard roof top exposure. The following notes apply:

- Visibility is measured horizontally
- Values are noted in metres
- A dash indicates data not available
- A value of 0.0 indicates less than 0.05%.
- The distances given in the assessment of the Morgan Generation Assets relate to these table and the Meteorological Office. Glossary definitions:
- Very Poor – visibility less than 1km
- Poor – visibility between 1km to 4km
- Moderate – visibility between 4km and 10km
- Good – visibility between 10km to 20km
- Very Good – visibility between 20km and 40km
- Excellent – visibility over 40km

B.1.1.3 High Level Analysis of Visibility Data

1.12.1.39 The closest part of the Morgan Array Area under the MDS lies:

- Approximately 22.5km from the closest point on the Isle of Man
- Approximately 36km from the closest point in England.

1.12.1.40 The Ronaldsway dataset has been used for visibility from the Isle of Man and the Walney dataset has been used for England.

Table B 1: Walney Island frequency of visibility.

Visibility (km)	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ALL OBS
< 1	108	43	62	65	26	12	2	3	39	13	35	101	**509**
1 to 1.9	73	67	31	31	18	9	9	9	25	19	48	59	**398**
2 to 2.9	138	100	90	42	34	32	22	33	50	48	95	115	**799**
3 to 3.9	147	122	126	57	39	54	57	49	75	97	111	146	**1080**
4 to 4.9	157	124	155	59	50	66	61	73	77	111	128	166	**1227**
5 to 5.9	208	153	181	57	58	60	66	56	85	133	136	219	**1412**
6 to 6.9	233	176	163	69	53	59	59	70	111	127	153	218	**1491**
7 to 7.9	291	211	190	96	65	68	85	62	110	140	189	290	**1797**
8 to 8.9	326	219	228	127	82	74	75	82	100	131	156	293	**1893**
9 to 9.9	336	254	287	125	109	72	86	85	132	190	183	312	**2171**
10 to 10.9	381	293	284	134	105	101	85	115	173	176	182	326	**2355**
11 to 11.9	344	271	275	135	101	113	96	111	170	199	204	307	**2326**
12 to 12.9	343	284	244	153	128	129	121	132	165	194	201	328	**2422**
13 to 13.9	349	283	214	161	132	143	125	109	183	207	217	303	**2426**
14 to 14.9	287	282	239	146	144	134	121	141	178	207	218	279	**2376**
15 to 1.59	278	252	209	151	160	123	110	132	174	195	211	295	**2290**
16 to 16.9	254	225	204	136	144	141	120	127	180	186	199	243	**2159**
17 to 17.9	223	217	204	157	158	149	124	134	164	158	188	208	**2084**
18 to 18.9	194	178	212	141	132	142	124	142	179	171	166	198	**1979**
19 to 19.9	177	187	161	153	133	136	135	173	160	173	169	210	**1967**
20 to 20.9	196	167	165	156	117	124	111	163	161	163	150	168	**1841**
21 to 21.9	150	132	150	144	148	130	121	134	166	159	172	158	**1764**
22 to 22.9	151	114	124	137	144	144	132	148	141	115	123	131	**1604**
23 to 23.9	118	98	128	121	143	159	129	138	149	155	127	129	**1594**
24 to 24.9	118	107	95	109	147	133	130	137	136	137	132	141	**1522**
25 to 25.9	94	97	122	112	130	141	143	157	144	130	122	93	**1485**
26 to 26.9	89	94	90	105	139	139	159	127	153	142	111	112	**1460**
27 to 27.9	67	88	105	114	139	152	138	143	137	114	98	107	**1402**
28 to 28.9	66	76	99	130	136	143	126	138	141	111	112	99	**1377**
29 to 29.9	64	92	92	117	123	119	157	153	128	105	103	71	**1324**
30 to 34.9	363	344	447	477	696	660	690	688	619	545	498	337	**6364**
35 to 39.9	259	316	356	548	672	637	755	662	606	541	465	278	**6095**
40 to 44.9	238	327	407	525	686	612	739	619	585	572	452	261	**6023**
45 to 49.9	233	321	382	621	644	668	750	659	607	654	510	298	**6347**
50 to 59.9	380	476	437	867	757	697	721	725	728	914	832	439	**7973**
60 to 69.9	0	0	0	0	0	0	0	0	0	0	0	0	**0**
>= 70	0	0	0	0	0	0	0	0	0	0	0	0	**0**
ALL OBS	**7433**	**6790**	**6958**	**6478**	**6692**	**6475**	**6684**	**6629**	**7131**	**7432**	**7196**	**7438**	**83336**

Table B 2: Walney Island – percentage visibility.

Visibility (km)	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ALL OBS
< 1	1.45	0.63	0.89	1.00	0.39	0.19	0.03	0.05	0.55	0.17	0.49	1.36	**0.61**
1 to 1.9	0.98	0.99	0.45	0.48	0.27	0.14	0.13	0.14	0.35	0.26	0.67	0.79	**0.48**
2 to 2.9	1.86	1.47	1.29	0.65	0.51	0.49	0.33	0.50	0.70	0.65	1.32	1.55	**0.96**
3 to 3.9	1.98	1.80	1.81	0.88	0.58	0.83	0.85	0.74	1.05	1.31	1.54	1.96	**1.30**
4 to 4.9	2.11	1.83	2.23	0.91	0.75	1.02	0.91	1.10	1.08	1.49	1.78	2.23	**1.47**
5 to 5.9	2.80	2.25	2.60	0.88	0.87	0.93	0.99	0.84	1.19	1.79	1.89	2.94	**1.69**
6 to 6.9	3.13	2.59	2.34	1.07	0.79	0.91	0.88`	1.06	1.56	1.71	2.13	2.93	**1.79**
7 to 7.9	3.91	3.11	2.73	1.48	0.97	1.05	1.27	0.94	1.54	1.88	2.63	3.90	**2.16**
8 to 8.9	4.39	3.23	3.28	1.96	1.23	1.14	1.12	1.24	1.40	1.76	2.17	3.94	**2.27**
9 to 9.9	4.52	3.74	4.12	1.93	1.63	1.11	1.29	1.28	1.85	2.56	2.54	4.19	**2.61**
10 to 1.09	5.13	4.32	4.08	2.07	1.57	1.56	1.27	1.73	2.43	2.37	2.53	4.38	**2.83**
11 to 11.9	4.63	3.99	3.95	2.08	1.51	1.75	1.44	1.67	2.38	2.68	2.83	4.13	**2.79**
12 to 12.9	4.61	4.18	3.51	2.36	1.91	1.99	1.81	1.99	2.31	2.61	2.79	4.41	**2.91**
13 to 13.9	4.70	4.17	3.08	2.49	1.97	2.21	1.87	1.64	2.57	2.79	3.02	4.07	**2.91**
14 to 14.9	3.86	4.15	3.43	2.25	2.15	2.07	1.81	2.13	2.50	2.79	3.03	3.75	**2.85**
15 to 15.9	3.74	3.71	3.00	2.33	2.39	1.90	1.65	1.99	2.44	2.62	2.93	3.97	**2.75**
16 to 16.9	3.42	3.31	2.93	2.10	2.15	2.18	1.80	1.92	2.52	2.50	2.77	3.27	**2.59**
17 to 17.9	3.00	3.20	2.93	2.42	2.36	2.30	1.86	2.02	2.30	2.13	2.61	2.80	**2.50**
18 to 18.9	2.61	2.62	3.05	2.18	1.97	2.19	1.86	2.14	2.51	2.30	2.31	2.66	**2.37**
19 to 19.9	2.38	2.75	2.31	2.36	1.99	2.10	2.02	2.61	2.24	2.33	2.35	2.82	**2.36**
20 to 20.9	2.64	2.46	2.37	2.41	1.75	1.92	1.66	2.46	2.26	2.19	2.08	2.26	**2.21**
21 to 21.9	2.02	1.94	2.16	2.22	2.21	2.01	1.81	2.02	2.33	2.14	2.39	2.12	**2.12**
22 to 22.9	2.03	1.68	1.78	2.11	2.15	2.22	1.97	2.23	1.98	1.55	1.71	1.76	**1.92**
23 to 23.9	1.59	1.44	1.84	1.87	2.14	2.46	1.93	2.08	2.09	2.09	1.76	1.73	**1.91**
24 to 24.9	1.59	1.58	1.37	1.68	2.20	2.05	1.94	2.07	1.91	1.84	1.83	1.90	**1.83**
25 to 25.9	1.26	1.43	1.75	1.73	1.94	2.18	2.14	2.37	2.02	1.75	1.70	1.25	**1.78**
26 to 26.9	1.20	1.38	1.29	1.62	2.08	2.15	2.38	1.92	2.15	1.91	1.54	1.51	**1.75**
27 to 27.9	0.90	1.30	1.51	1.76	2.08	2.35	2.06	2.16	1.92	1.53	1.36	1.44	**1.68**
28 to 28.9	0.89	1.12	1.42	2.01	2.03	2.21	1.89	2.08	1.98	1.49	1.56	1.33	**1.65**
29 to 29.9	0.86	1.35	1.32	1.81	1.84	1.84	2.35	2.31	1.79	1.41	1.43	0.95	**1.59**
30 to 34.9	4.88	5.07	6.42	7.36	10.40	10.19	10.32	10.38	8.68	7.33	6.92	4.53	**7.64**
35 to 39.9	3.48	4.65	5.12	8.46	10.04	9.84	11.30	9.99	8.50	7.28	6.46	3.74	**7.31**
40 to 44.9	3.20	4.82	5.85	8.10	10.25	9.45	11.06	9.34	8.20	7.70	6.28	3.51	**7.23**
45 to 49.9	3.13	4.73	5.49	9.59	9.62	10.32	11.22	9.94	8.51	8.80	7.09	4.01	**7.62**
50 to 59.9	5.11	7.01	6.28	13.38	11.31	10.76	10.79	10.94	10.21	12.30	11.56	5.90	**9.57**
60 to 69.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
>= 70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
ALL OBS	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table B 3: Ronaldsway – frequency of visibility.

Visibility (km)	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ALL OBS
< 1	24	28	81	80	71	94	109	96	71	23	21	18	**716**
1 to 1.9	8	13	26	24	35	31	46	42	23	4	7	9	**268**
2 to 2.9	38	57	54	41	35	62	78	52	43	31	39	53	**583**
3 to 3.9	112	113	146	114	89	105	136	110	111	112	101	135	**1384**
4 to 4.9	144	160	177	108	106	124	108	85	109	112	99	157	**1489**
5 to 5.9	169	164	239	128	91	159	114	108	123	136	154	227	**1812**
6 to 6.9	130	150	206	97	97	118	116	92	110	97	117	173	**1503**
7 to 7.9	119	115	159	88	75	104	94	81	99	96	111	128	**1269**
8 to 8.9	233	297	269	191	146	171	165	138	184	253	217	263	**2527**
9 to 9.9	96	106	118	109	86	94	89	74	93	93	114	114	**1186**
10 to 10.9	318	278	260	230	215	189	232	192	278	224	221	250	**2887**
11 to 11.9	3	3	6	12	4	6	5	6	1	4	4	4	**58**
12 to 12.9	327	313	302	311	245	281	256	270	256	261	259	294	**3375**
13 to 13.9	20	21	19	36	21	19	9	22	39	15	9	25	**255**
14 to 14.9	21	29	25	12	25	25	10	14	15	14	10	9	**209**
15 to 15.9	650	677	615	516	512	515	532	540	489	555	489	591	**6681**
16 to 16.9	3	0	0	1	0	2	5	0	3	0	0	9	**23**
17 to 17.9	14	16	19	14	13	11	7	13	4	6	6	4	**127**
18 to 18.9	121	129	136	110	140	141	118	134	130	79	94	88	**1420**
19 to 19.9	0	0	0	0	0	0	0	0	0	0	0	0	**0**
20 to 20.9	1051	1010	800	708	848	841	748	1002	791	743	702	966	**10210**
21 to 21.9	0	0	0	0	0	0	0	0	0	0	0	0	**0**
22 to 22.9	12	13	10	14	11	23	16	12	17	19	12	12	**171**
23 to 23.9	0	0	0	0	0	1	0	0	0	0	0	0	**1**
24 to 24.9	2	0	1	1	0	0	0	0	2	0	0	1	**7**
25 to 25.9	975	773	837	695	821	828	713	881	704	803	748	870	**9648**
26 to 26.9	0	0	0	0	0	0	0	0	0	0	0	0	**0**
27 to 27.9	0	0	0	0	0	0	0	0	0	0	0	0	**0**
28 to 28.9	0	0	0	0	1	0	1	0	0	0	0	1	**3**
29 to 29.9	0	0	0	0	0	0	0	0	1	0	0	0	**1**
30 to 34.9	1298	1046	1354	1252	1485	1256	1316	1366	1438	1324	1305	1419	**15859**
35 to 39.9	50	20	33	41	33	25	22	15	33	31	59	66	**428**
40 to 44.9	1013	797	1016	1324	1285	1238	1527	1315	1324	1451	1425	972	**14687**
45 to 49.9	2	7	11	9	9	1	1	1	1	4	7	6	**59**
50 to 59.9	366	327	354	603	653	546	680	571	501	623	623	400	**6247**
60 to 69.9	65	80	86	214	106	100	91	130	116	147	122	82	**1339**
>= 70	4	9	15	28	10	22	23	11	31	45	42	11	**251**
ALL OBS	**7388**	**6751**	**7374**	**7111**	**7268**	**7132**	**7367**	**7373**	**7140**	**7305**	**7117**	**7357**	**86683**

Table B 4: Ronaldsway – percentage visibility.

Visibility (km)	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ALL OBS
< 1	0.32	0.41	1.10	1.13	0.98	1.32	1.48	1.30	0.99	0.31	0.30	0.24	**0.83**
1 to 1.9	0.11	0.19	0.35	0.34	0.48	0.43	0.62	0.57	0.32	0.05	0.10	0.12	**0.31**
2 to 2.9	0.51	0.84	0.73	0.58	0.48	0.87	1.06	0.71	0.60	0.42	0.55	0.72	**0.67**
3 to 3.9	1.52	1.67	1.98	1.60	1.22	1.47	1.85	1.49	1.55	1.53	1.42	1.83	**1.60**
4 to 4.9	1.95	2.37	2.40	1.52	1.46	1.74	1.47	1.15	1.53	1.53	1.39	2.13	**1.72**
5 to 5.9	2.29	2.43	3.24	1.80	1.25	2.23	1.55	1.46	1.72	1.86	2.16	3.09	**2.09**
6 to 6.9	1.76	2.22	2.79	1.36	1.33	1.65	1.57	1.25	1.54	1.33	1.64	2.35	**1.73**
7 to 7.9	1.61	1.70	2.16	1.24	1.03	1.46	1.28	1.10	1.39	1.31	1.56	1.74	**1.46**
8 to 8.9	3.15	4.40	3.65	2.69	2.01	2.40	2.24	1.87	2.58	3.46	3.05	3.57	**2.92**
9 to 9.9	1.30	1.57	1.60	1.53	1.18	1.32	1.21	1.00	1.30	1.27	1.60	1.55	**1.37**
10 to 10.9	4.30	4.12	3.53	3.23	2.96	2.65	3.15	2.60	3.89	3.07	3.11	3.40	**3.33**
11 to 11.9	0.04	0.04	0.08	0.17	0.06	0.08	0.07	0.08	0.01	0.05	0.06	0.05	**0.07**
12 to 12.9	4.43	4.64	4.10	4.37	3.37	3.94	3.47	3.66	3.59	3.57	3.64	4.00	**3.89**
13 to 13.9	0.27	0.31	0.26	0.51	0.29	0.27	0.12	0.30	0.55	0.21	0.13	0.34	**0.29**
14 to 14.9	0.28	0.43	0.34	0.17	0.34	0.35	0.14	0.19	0.21	0.19	0.14	0.12	**0.24**
15 to 15.9	8.80	10.03	8.34	7.26	7.04	7.22	7.22	7.32	6.85	7.60	6.87	8.03	**7.71**
16 to 16.9	0.04	0.00	0.00	0.01	0.00	0.03	0.07	0.00	0.04	0.00	0.00	0.12	**0.03**
17 to 17.9	0.19	0.24	0.26	0.20	0.18	0.15	0.10	0.18	0.06	0.08	0.08	0.05	**0.15**
18 to 18.9	1.64	1.91	1.84	1.55	1.93	1.98	1.60	1.82	1.82	1.08	1.32	1.20	**1.64**
19 to 19.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
20 to 20.9	14.23	14.96	10.85	9.96	11.67	11.79	10.15	13.59	11.08	10.17	9.86	13.13	**11.78**
21 to 21.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
22 to 22.9	0.16	0.19	0.14	0.20	0.15	0.32	0.22	0.16	0.24	0.26	0.17	0.16	**0.20**
23 to 23.9	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
24 to 24.9	0.03	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.01	**0.01**
25 to 25.9	13.20	11.45	11.35	9.77	11.30	11.61	9.68	11.95	9.86	10.99	10.51	11.83	**11.13**
26 to 26.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
27 to 27.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
28 to 28.9	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	**0.00**
29 to 29.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	**0.00**
30 to 34.9	17.57	15.49	18.36	17.61	20.43	17.61	17.86	18.53	20.14	18.12	18.34	19.29	**18.30**
35 to 39.9	0.68	0.30	0.45	0.58	0.45	0.35	0.30	0.20	0.46	0.42	0.83	0.90	**0.49**
40 to 44.9	13.71	11.81	13.78	18.62	17.68	17.36	20.73	17.84	18.54	19.86	20.02	13.21	**16.94**
45 to 49.9	0.03	0.10	0.15	0.13	0.12	0.01	0.01	0.01	0.01	0.05	0.10	0.08	**0.07**
50 to 59.9	4.95	4.84	4.80	8.48	8.98	7.66	9.23	7.74	7.02	8.53	8.75	5.44	**7.21**
60 to 69.9	0.88	1.19	1.17	3.01	1.46	1.40	1.24	1.76	1.62	2.01	1.71	1.11	**1.54**
>= 70	0.05	0.13	0.20	0.39	0.14	0.31	0.31	0.15	0.43	0.62	0.59	0.15	**0.29**
ALL OBS	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**