

12 OTHER EIA TOPICS

12.1 Introduction

12.1.1 This chapter considers the likely significant effects of the Proposed Scheme on the following environmental factors:

- Telecommunications (Section 12.2)
- Shadow Flicker (Section 12.3)
- Land Use (Section 12.4)
- Aviation (Section 12.5)
- Climate change (Green House Gas Emissions) (Section 12.6)
- Utilities (Section 12.7)

12.2 Telecommunications

Introduction

12.2.1 Radio waves and microwaves are used in a variety of communications, the introduction of any large structure has the potential to interfere with their transmission. The magnitude of the impact on a telecommunications receptor is principally dependent upon the size, shape, and materials of construction.

12.2.2 Wind turbines are slender, and the rotor is substantially constructed from non-conducting materials (Glass Reinforced Plastic), both of which reduce their potential for causing interference. However, the tower is usually steel, and the rotor blades contain some conductive materials, for lightning conduction, and in some cases structural carbon fibre.

Scope and Methodology

12.2.3 A Telecommunications Impact Assessment was undertaken to determine the potential impact of the Proposed Scheme on telecommunication receptors, and the requirement for any mitigation measures that may be required to overcome any identified potential effects. Refer to **Technical Appendix 12.1 (Volume 4)**. Where possible, the assessment was conducted through consultation with relevant operators of the telecommunication links located in the vicinity of the Site. Where this was not possible, an independent impact assessment was carried out by Pager Power.

Legislation, Policies and Guidance

12.2.4 *Future Wales: The National Plan 2040* provides a framework for planning change and development in Wales and has development plan status. Policy 17 on renewable and low carbon energy and associated infrastructure and Policy 18 on renewable and low carbon energy developments of national significance, provide the strategic spatial and detailed criteria-based policies for renewable and low carbon energy developments.

- 12.2.5 Policy 18 (7) refers to the need for “*proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance*” to demonstrate “*there are no unacceptable adverse impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic disturbance*”.

Consultation

- 12.2.6 Telecommunications operators were consulted, and information requested for telecommunications links in proximity to the Site. Where requested by the telecommunications operator, they were provided with the location and maximum dimensions of the proposed turbines at the Site. A summary of consultation undertaken is provided in **Table 12.1**.

Table 12.1: Consultation Responses

Consultee	Summary of Consultation	Comment / Action Taken
Arqiva	No Objection.	No action required.
Airwave	The Airwave Assessment confirmed that a wind farm development at the Site (based on the turbine co-ordinates provided) will not present a problem to Airwave Microwave Radio Links or Tetra Radio Network Coverage in the region. Airwave confirmed they have no objection to a wind farm development at the Site.	No action required.
Joint Radio Company (JRC)	The JRC initially raised an objection to the Proposed Scheme, relating specifically to T3 and T6. The JRC advised that they are not able to provide link details; however, they offered to undertake a more detailed investigation of alternative mitigation solutions to turbine movement. Further consultation with JRC identified a mitigation solution to the impacts predicted from T3 and T6. This would involve the following conditions being met: • Approval of the Link Owner to the mitigation solution, which may depend on capacity issues not addressed to date in JRC’s technical report. • The Applicant to meet the full implementation costs of mitigation as incurred by the Link Owner. • Satisfactory real-world measurements of predicted Received Signal Strength Indicator (RSSI) values as indicated in the consultation profiles of JRC’s technical report.	To be factored into the design and implementation of the Proposed Scheme.
Atkins	No Objection	No action required.
Vodafone	No Objection	No action required.

Consultee	Summary of Consultation	Comment / Action Taken
BT	No Objection	No action required.
MBNL	No Objection	No action required.

Baseline

- 12.2.7 The study area for the telecommunications assessment comprises the Site Boundary, please refer to **Figure 1.1 (Volume 3)**.
- 12.2.8 As identified through consultation with relevant telecommunication link operators, only one telecommunication link was identified within the Study Area. Details are presented in **Table 12.2**. Consultation also confirmed that there were no Airwave Microwave Radio Links or Tetra Radio Network Coverage within the Study Area.

Table 12.2: Modelled Telecommunication Links

Operator	Link ID / Ref	Recommended Buffer Zone
Joint Radio Company (JRC)	JEWABS1	1 km
	JEWABO10	

Assessment of Effects

- 12.2.9 Turbines T3 and T6 are both located within a 1 km exclusion zone of telecommunication links JEWABS1 and JEWABO10, both managed by the JRC on behalf of an unidentified link operator. The Proposed Scheme would therefore have a potential negative effect on both telecommunication links.

Mitigation

- 12.2.10 Consultation with the JRC has identified that a mitigation solution is available to the Applicant in resolving the potential negative effects on telecommunication links JEWABS1 and JEWABO10. The Applicant would be required to cover the implementation cost of reparenting links JEWABS1 and JEWABO10 from their existing scanner to another scanner in the locality.

Residual Effects

- 12.2.11 Following the successful implementation of the proposed mitigation measures, there would be no negative effects on telecommunication or airwave links as a result of the Proposed Scheme.

12.3 Shadow Flicker

Introduction

- 12.3.1 Shadow flicker may occur under certain combinations of geographical position and time of day when the sun passes behind the rotors of a wind turbine and casts a shadow over neighbouring properties. Rotating wind turbine blades can cause brightness levels to vary periodically at locations where they obstruct the sun's rays.
- 12.3.2 As the blades rotate, the shadow flicks on and off, an effect known as shadow flicker. The effect is most likely to be an issue inside buildings, where the flicker appears through a window opening. This can result in a nuisance when the shadow is cast over the windows of residential properties. Shadow flicker can be a cause of annoyance at residences near wind turbines if it occurs for a significant period during the year.

Legislation, Policies and Guidance

Legislative context

- 12.3.3 There is no specific legislation relating to shadow flicker in the UK. Policies which are relevant to the assessment of shadow flicker in Wales are listed in the 'Planning Policy' sub-section below.

Planning Policy

- 12.3.4 Published planning policy documents relevant to the assessment of shadow flicker in Wales include: *Future Wales: The National Plan 2040*, published by the Welsh Government in February 2021, and *National Policy Statement for Renewable Energy Infrastructure (NPS EN3)*, published by the Department for Energy and Climate Change (now the Department for Business, Energy, and Industrial Strategy) in 2011.
- 12.3.5 *Policy 18 (7) Renewable and Low Carbon Energy Developments of National Significance* from *Future Wales: The National Plan 2040* refers to the need for "proposals for renewable and low carbon energy projects (including repowering) qualifying as Developments of National Significance" to demonstrate "there are no unacceptable adverse impacts by way of shadow flicker, noise, reflected light, air quality or electromagnetic disturbance".
- 12.3.6 The *National Policy Statement for Renewable Energy Infrastructure (EN3)* includes more detailed guidance. Paragraph 2.7.63 of NPS EN3 describes shadow flicker as: "Research and computer modelling on flicker effects has demonstrated that there is unlikely to be a significant impact at distances greater than ten rotor diameters from a turbine. Therefore, if the turbine has 80m diameter blades, the potentially significant shadow flicker effect could be observed up to 800m from a turbine."

- 12.3.7 With regard to the requirements of the developer's assessment, paragraph 2.7.66 of NPS EN-3 states:

"The maximum frequency of the shadowing effect from commercial scale wind turbines is less than 1 hertz, which is well below the frequency known to affect sufferers of epilepsy (which is above 2.5 hertz³⁷). Therefore, shadow flicker frequencies are not in the region known to induce seizures in sufferers of epilepsy, and as such, where the frequency of potential flashes will not exceed 2.5 hertz..."

Technical guidance

- 12.3.8 There is no formal guidance on the amount of shadow flicker that is considered acceptable within the UK. Other European countries do have guidance on shadow flicker; however, these vary from one country to another. Guidance which has been utilised in Northern Ireland, Germany and Belgium suggests shadow flicker should not exceed 30 hours per year with a maximum of 30 minutes per day (Parsons, (Brinckerhoff, 2011).
- 12.3.9 Common practice indicates that shadow flicker effects in exceedance of 30 hours per year, with a maximum of 30 minutes per day are considered significant. If shadow flicker effects are predicted beyond this limit, mitigation may be required to mitigate or reduce the occurrence of shadow flicker. This is typically controlled by remote automatic wind turbine shutdown so that in effect, no neighbouring property will experience the occurrence of shadow flicker beyond the limits specified above. Additional mitigation, if necessary, may be achieved via the provision of sufficient screening between wind turbines and residential receptors.
- 12.3.10 Industry standard shadow flicker software, such as *ReSoft WindFarm Release 5*, adopt a "worst-case scenario" approach, as they do not factor in variables such as ambient climatic conditions (wind speed, cloud cover) which can reduce the duration of shadow flicker.

Approach and Methodology

- 12.3.11 The magnitude of the shadow flicker effect varies both spatially and temporally and depends on several environmental conditions coinciding at any particular point in time, including, the position and height of the sun, wind speed and direction, cloudiness, and proximity of the turbine to a sensitive receptor. To undertake a shadow flicker assessment, information on the Proposed Scheme, the location of potential residential receptors and other parameters are included in a computer model in order to predict and quantify the impact shadow flicker may have on receptors within the vicinity of the Proposed Scheme.
- 12.3.12 It is common to use a multiplier of the equivalent of 10 rotor diameters as a maximum separation distance between a turbine and an affected residence, within which significant shadow flicker effects can occur. The guidance on this particular criterion varies in different documents and countries, with some stating that effects can only occur within this distance and others stating that this is a general rule or that the risk beyond this distance is low.

- 12.3.13 Shadows are cast by the sun as it crosses the southern sky; therefore, shadow flicker can hypothetically take place 130° either side of north^{1,2}. Therefore, these parameters (10-rotor diameter from each turbine and 130° either side of north) have been considered within the analysis in order to establish the potential for shadow flicker to be experienced at relevant properties.
- 12.3.14 The locations of residential receptors and the locations and dimensions of turbines comprising the Proposed Scheme (as indicated in **Chapter 3: Proposed Scheme**) have been input into a model run on industry standard *ReSoft WindFarm Release 5* software. Subsequently, for each residential receptor that falls within the shadow flicker coverage area (listed in **Table 12.3** and illustrated on **Figure 12.1, Volume 3**), it has been assumed that there is a window centred at 2 m from ground level with 1 m x 1 m dimensions facing directly towards the Proposed Scheme. A minimum sun elevation of 2 degrees has been considered in the assessment.
- 12.3.15 Shadow flicker effects occur only on sunny days. In addition to consideration of proximity to the Proposed Scheme, the following variables can reduce shadow flicker effects:
- Wind direction.
 - Wind speed (as shadow flicker is not experienced if the blades are not turning).
 - Intervening obstacles and cloud cover.
- 12.3.16 The results of the assessment are therefore presented in two forms:
- A conservative, worst-case scenario.
 - A realistic scenario factoring associated ambient weather variables.
- 12.3.17 Whilst implementing monthly cloud coverage data to the predicted worst-case results, a realistic shadow flicker scenario reflecting ambient conditions is drawn. The utilised dataset is a combination of data secured from Met Office and CEDA, and covers all months between the years of 1982 and 2020.

Assessment Limitations

- 12.3.18 Site visits were not conducted at the identified receptors. Therefore, intervening physical structures or vegetation that may exist between the Proposed Scheme and receptors, were not recorded – the software only utilises a bare-earth digital terrain model.

¹ Parsons Brinckerhoff, 2011 – Update of UK Shadow Flicker Evidence Base.

² Department for Communities & Local Government (July 2013): Planning practice guidance for renewable and low carbon energy.

Consultation

- 12.3.19 The 2020 Scoping Direction received from the Planning Inspectorate (PINS), now Planning and Environment Decisions Wales (PEDW), in July 2020 identified that a shadow flicker assessment should be included in the ES. However, PINS agreed with the outline methodology presented in the 2020 Scoping Report and indicated that if there were no properties located within the shadow flicker range set out in paragraph 11.19 of the 2020 Scoping Report, there would be no need for a detailed assessment in the ES.
- 12.3.20 Following a design fix on the proposed locations of the wind turbines, an initial study of shadow flicker confirmed that there are residential properties located within the proposed Study Area. A shadow flicker assessment has therefore been included in the ES.

Study Area

- 12.3.21 In line with current guidance and the approach set out in the 2020 Scoping Report, the Study Area is defined as 10 x rotor diameter from the fixed turbine locations. The Study Area is therefore 1,490 m from the proposed wind turbines; this area is depicted in **Figure 12.1 (Volume 3)**. Additional information on the wind turbine specifications and characteristics can be found within **Chapter 3: Proposed Scheme** and **Figure 3.2 (Volume 3)**.

Baseline

- 12.3.22 A total of 24 residential properties have been identified within the Study Area. These are listed in **Table 12.3** and illustrated on **Figure 12.1 (Volume 3)**.

Table 12.3: Identified Residential Properties

Property Number (PN)	Easting	Northing	Closest Turbine	Distance from closest turbine (metres)
1	309041	208695	T6	1,461
2	309364	208904	T6	1,419
3	309369	208908	T6	1,418
4	307002	209106	T3	1,483
5	307009	209113	T3	1,473
6	307014	209120	T3	1,465
7	307002	209144	T3	1,458
8	306997	209149	T3	1,458
9	306984	209156	T3	1,463
10	306978	209160	T3	1,465
11	306966	209168	T3	1,469

Property Number (PN)	Easting	Northing	Closest Turbine	Distance from closest turbine (metres)
12	306959	209172	T3	1,472
13	306941	209183	T3	1,479
14	306934	209187	T3	1,482
15	306923	209196	T3	1,485
16	306916	209200	T3	1,488
17	310101	209795	T4	1,257
18	310108	209799	T4	1,260
19	310400	209947	T4	1,434
20	310449	210069	T4	1,431
21	310441	210083	T4	1,419
22	310481	210701	T4	1,382
23	307365	209383	T3	1,025
24	307362	209330	T3	1,056

12.3.23 The residential properties identified within the Study Area broadly constitute four different clusters:

- Two clusters to the south-west of the Proposed Scheme; by Plant Settlement, Merthyr Tydfil (PN 4-16), and by Blaen Morlais Farmhouse and farm cottage (PN 23-24);
- One to the south of the Proposed Scheme beyond the A465 (PN 1-3); and
- One to the south-east of the Proposed Scheme by Rhymney River (PN 17- 22).

Assessment of Effects

Worst-Case Scenario

12.3.24 The 'worst-case' scenario does not take into consideration physical intervening structures or vegetation, nor environmental and weather elements that may hinder shadow flicker effects, such as cloud coverage. The assessment results for the residential clusters identified are presented in **Table 12.4**. In addition, the shadow flicker coverage area is provided in **Figure 12.1 (Volume 3)**.

12.3.25 A description of the potential shadow flicker effects for each residential cluster is described below:

- **PN 1-3 and PN 4-16:** Due to the geographic positioning of PN 1-3 and PN 4-16, located to the south and south-west of the Proposed Scheme,

respectively, no shadow flicker effects would be experienced at these residential properties.

- **PN 17-22:** Due to the geographic positioning of PN 17-22, located east of the Proposed Scheme, and the orientation of the sun's monthly path, shadow flicker effects could occur on four of the residential properties during spring, summer, and autumn late hours. Effects on PN 19-22 are expected to occur from shadows cast from Turbine T4.
- **PN 23-24:** Due to the geographic positioning of PN 23-24, located south-west of the Proposed Scheme, and the orientation of the sun's monthly path, shadow flicker effects will occur on both properties during early summer hours. Effects on PN 23-24 are expected to occur from shadows cast from Turbine T6.

Table 12.4: Shadow Flicker Assessment Results

Property Number (PN)	Days per year of Shadow Flicker	Maximum hours per day	Mean hours per day	Total hours per year
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	76	0.46	0.41	31.1

Property Number (PN)	Days per year of Shadow Flicker	Maximum hours per day	Mean hours per day	Total hours per year
20	60	0.46	0.35	21.2
21	60	0.46	0.35	21.0
22	34	0.45	0.35	12.1
23	25	0.11	0.07	1.8
24	15	0.04	0.02	0.03

12.3.26 Prior to mitigation and based on the conservative “worst-case” approach adopted by the model, six residential properties have been identified within the study area that will experience shadow flicker impacts; PN 19-24.

12.3.27 The predicted shadow flicker effects of the Proposed Scheme on residential properties within PN 23-24 would not exceed 30 hours per year, or exceed 30 minutes per day. Therefore, predicted effects on residential properties within PN 23-24 are not considered to be significant.

12.3.28 The predicted shadow flicker effects of the Proposed Scheme on residential properties within PN 19-22 would exceed 30 minutes per day, and, in one instance, would exceed 30 hours per year. Therefore, the predicted effects on residential properties within PN 19-22 are considered to be **significant**.

Realistic Scenario

12.3.29 A ‘realistic’ shadow flicker scenario incorporates data on weather patterns in the surrounding area of the Proposed Scheme. Met Office and CEDA datasets were collated, analysed, and subsequently interpolated to the ‘worst-case’ scenario results from **Table 12.4**. Refer to **Technical Appendix 12.2 (Volume 4)** for the weather data.

12.3.30 The ‘worst-case’ scenario model predicted that shadow flicker effects could only occur between mid-March and late September due to sun’s monthly orientation relative to the Proposed Scheme and residential properties within the Study Area. Therefore, historical meteorological information in the form of time series within this time frame were included in the ‘realistic’ scenario assessment. Weather data from 1982 to 2020 indicated a lack of cloud coverage for 25.15 % of the examined duration.

12.3.31 Following the implementation of the above climatic conditions and parameters, the assessment results for the residential clusters identified are presented in **Table 12.5**. Residential properties within the study area that would not have any effects under the worst-case scenario were excluded from the realistic scenario analysis.

Table 12.5: Shadow Flicker Effects – Realistic Scenario

Receptor	Days per year of Shadow Flicker	Maximum hours per day	Mean hours per day	Total hours per year
19	19.11	0.12	0.10	7.82

Receptor	Days per year of Shadow Flicker	Maximum hours per day	Mean hours per day	Total hours per year
20	15.09	0.12	0.09	5.33
21	15.09	0.12	0.09	5.28
22	8.55	0.11	0.09	3.04

12.3.32 Prior to mitigation, and based on the 'realistic' scenario assessment, predicted shadow flicker effects of the Proposed Scheme on residential properties within PN 19-22 would not exceed 30 hours per year, or exceed 30 minutes per day. Therefore, predicted effects on residential properties within PN 23-24 are not considered to be significant.

Mitigation

12.3.33 Based on the 'realistic' scenario assessment, no significant adverse effects are expected on any of the identified shadow flicker receptors.

Residual Effects

12.3.34 Based on the 'realistic scenario' assessment, no significant residual effects are predicted on any of the identified residential receptors within the Study Area.

12.4 Land Use

Introduction

- 12.4.1 The potential effects of the Proposed Scheme during construction, operation and decommissioning on land use interests has been assessed. Specifically, this section considers the potential impact of the Proposed Scheme on Common Land Unit (CL38), Gelligaer and Merthyr Common, and adjacent Countryside and Rights of Way (CRoW) Access Land.
- 12.4.2 This section outlines the methodology of the assessment, the baseline conditions in terms of key receptors using the Site, and provides a qualitative assessment of the potential effects on these receptors.

Legislation, Policies and Guidance

Planning Policy

- 12.4.3 *Planning Policy Wales (PPW)* details the land use planning policies of the Welsh Government, with the objective to ensure the delivery of sustainable development. PPW notes that energy demand is expected to grow due to the growing electrification of transport and heat, and that significant investment will be needed in energy generation, transmission and distribution infrastructure. PPW identifies that low carbon electricity must become the main source of energy in Wales. Renewable and low carbon energy are seen as part of the overall commitment to tackle the climate emergency and increase energy security. PPW also recognises that wind energy forms a key part of meeting renewable energy production due to Wales's considerable wind resource.
- 12.4.4 *Future Wales: The National Plan 2040* provides a framework for planning change and development in Wales and has development plan status. Policy 17 on renewable and low carbon energy and associated infrastructure and Policy 18 on renewable and low carbon energy developments of national significance, provide the strategic spatial and detailed criteria-based policies for renewable and low carbon energy developments.
- 12.4.5 At the UK level, planning policy for energy generation of Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to land use, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1). Paragraph 5.10.5 of NPS EN-1 indicates that the "*Environmental Statement should identify existing and proposed land uses near the project and assess the effects of the development*".

Legislation

- 12.4.6 Legislation relevant to this topic includes the following:
- The Commons Act 2006, in relation to the loss and use of common land.
 - The Countryside and Rights of Way (CRoW) Act 2000, in relation to the public right of access to areas of Access Land as defined by Part 1 of the Act.

Consultation

EIA Scoping

- 12.4.7 A request for a Scoping Opinion was submitted to the Planning Inspectorate (the Inspectorate) on 22 May 2020. Chapter 11 of the 2020 Scoping Report set out the intention to consider the potential effects of the Proposed Scheme on 'land use'.
- 12.4.8 The 2020 Scoping Direction received in July 2020 from the Inspectorate did not set out any additional considerations or requirements to the method and approach presented.
- 12.4.9 As part of their Scoping response, Caerphilly County Borough Council did request that, "*in accordance with PPW, the impact of the Proposed Scheme on the common land should be explored through a Green Infrastructure Assessment*". This has been considered as part of the **Planning Statement** which supports the Application.

Active Commoners

- 12.4.10 As part of the pre-application consultation, discussions have been held with some of the active commoners who hold grazing rights over Gelligaer and Merthyr Common and representatives the Gelligaer and Merthyr Commoners Association.

Scope and Methodology

- 12.4.11 As set out in the EIA Scoping Report submitted in May 2020, this land use section provides a qualitative assessment of the Proposed Scheme's potential impact on current farming practices and land use associated with Gelligaer and Merthyr Common. In addition, consideration has been given to the potential impact on the CRoW Access Land which is located in the north-western corner of the Site.

Baseline Environment

Common Land

- 12.4.12 The majority of the Site is registered as Common Land and makes up part of Common Land Unit 38 (Gelligaer and Merthyr Common), which also extends to the south of the A465, please refer to **Figure 1** of the accompanying Common Application. Gelligaer and Merthyr common extends in total to approximately 2,648 hectares (ha), approximately 543 ha of which is located on land north of the A465 Heads of the Valleys road (hereafter, 'Northern Common').
- 12.4.13 The general public has the right to take air and exercise over the land due to its status as urban common pursuant to s193 of the Law of Property Act 1925. There are additional rights for identified holdings and registered people or 'commoners', which go beyond the right to take air and exercise and extend, in the case of this Common, to grazing sheep, cattle and horses, taking fern, or rushes, and or stone. The Common is grazed and the public exercise their rights over the Common.
- 12.4.14 Consultation with registered commoners and the Gelligaer and Merthyr Commoners Association has identified that there are 10 active commoners (who use the Site for grazing rights) and eight non-active commoners, using, or likely to use, the Northern

Common. The grazing rights held by the 10 active commoners using the Northern Common primarily relate to the right to graze sheep and horses.

CRoW Land

- 12.4.15 The Site includes an area of CRoW Access Land, please refer to **Figure 1.2 (Volume 3)** and **Figure 3** of the accompanying Common Application. The Act gives a right of access on foot for the purpose of open-air recreation.
- 12.4.16 The CRoW Access Land is located adjacent to the Northern Common. Whilst it is separated on its own eastern boundary by stockproof fencing and/or stone walls from other enclosed fields, its western boundary with the Northern Common is unfenced.

Future Baseline

- 12.4.17 No changes to the current baseline are anticipated before 2025 (the anticipated start of the construction period).

Primary mitigation

- 12.4.18 A number of measures have been designed-in to the Proposed Scheme to reduce the potential for impacts on land use, please refer to the measures outlined below and **Chapter 3: Proposed Scheme**.

Replacement Land

- 12.4.19 In order to construct (and operate) the Proposed Scheme, 34.72 ha of the Northern Common will need to be deregistered as Common Land ('the Release Land'). The area of Release Land will be the same during the construction and operational phases of the wind farm in absolute terms. As part of the Proposed Scheme, and in accordance with Section 16 of the Commons Act 2006, the Applicant will provide 34.72 ha of Replacement Land. The land offered to be given in replacement for the Release Land will become common land with exactly the same common land rights attached to it as were attached to the Release Land. Please refer to **Figure 2** of the accompanying Common Application.
- 12.4.20 The Release Land is open common grassland with grass species typically found on extensively grassed upland areas. The Replacement Land is located adjacent to the Northern Common and is of a similar botanical composition, predominantly unimproved grassland. This suitable and physically convenient land is offered to ensure that commoners with grazing rights are not disadvantaged in terms of the area and type of grazing available to them and their grazing livestock.
- 12.4.21 The nature of wind farm construction and the common land consenting regime means that a larger area of common land will need to be released to facilitate the construction phase than is required during the operational phase. The Applicant has sought to minimise the amount of land needing to be released.
- 12.4.22 Once the wind farm has been constructed, the Applicant will grant grazing and access rights over that part of the Release Land not physically occupied by infrastructure for the wind farm, such as the turbines and control building and electrical compound. This will equate to approximately 31.18 ha. This commitment will be delivered via a

Unilateral Undertaking under Section 106 of the Town and Country Planning Act 1990. The rights will be similar to those that existed prior to the land being released from Common and, in practice, use will be indistinguishable from the surrounding common land.

Temporary fencing during construction

- 12.4.23 Temporary fencing will be required to comply with health and safety requirements during the construction phase, particularly protecting deep excavations when the turbine bases are being constructed. The temporary fencing required during the construction phase will be located on Release Land and will be kept to the minimum necessary. There will be no fencing situated on common land.

Agricultural and Environmental Support Scheme Shortfall Sum

- 12.4.24 In addition to receiving income from rearing and selling livestock, farmers receive financial assistance in the form of agricultural and environmental support payments from the Welsh Government which have evolved over a period of time and form an important part of their annual income.
- 12.4.25 To ensure that no active grazier using the Northern Common suffers any financial loss due to areas of land being unavailable (for use to be claimed under current or any future support mechanism), the Applicant are proposing to make available an Agricultural and Environmental Support Scheme Shortfall Sum.
- 12.4.26 The Agricultural and Environmental Support Scheme Shortfall Sum will be secured in a Unilateral Undertaking under Section 106 of the Town and Country Planning Act 1990. Only claims for the actual financial loss of Agricultural and or Environmental Support Scheme Payments due to a reduction in the available common land will be eligible. The loss of available common land must be as a direct consequence of the construction and operation of the Proposed Scheme from those active commoners with registered grazing rights over the Northern Common that are Agricultural and or Environmental Support Scheme claimants.

Assessment of Effects

Construction Phase

- 12.4.27 The provision of Replacement Land will mitigate the loss of any common land being Released due to the construction of the Proposed Scheme. The Replacement land, to which the same rights would be attached as those currently extant on the Northern Common, will be available to active graziers and members of the public prior to construction works starting.
- 12.4.28 The amount of fencing during the construction phase will be minimised to avoid severing the Northern Common and CRoW Access Land. In order to reduce any restrictions over the movement of grazier's livestock across the common, and public access across the common and CRoW Access Land, fencing will only be installed to adhere to health and safety requirements, particularly protecting deep excavations when the turbine bases are being constructed. Access to certain areas of the

common and CRoW Access Land will therefore only be restricted when health and safety regulations dictate.

- 12.4.29 Taking into account the proposed mitigation outlined during the construction phase of the Proposed Scheme, effects on land use are not deemed to be significant.
- 12.4.30 Any potential impacts on the visual amenity of recreational users using the common land and CRoW Access Land during the construction phase are addressed in **Chapter 5: Landscape and Visual** of this ES.

Operational Phase

- 12.4.31 The provision of Replacement Land to which the same rights would be attached as those currently extant on the Northern Common will mitigate the loss of any common being released due to the operation of the Proposed Scheme. The Replacement Land, together with the additional rights granted over the Released Land, will provide a larger area of common land for active graziers to utilise and members of the public to explore.
- 12.4.32 The loss of common land due to the physical constraints of the Proposed Scheme (i.e. the wind turbine towers and control building and electrical compound) will only equate to approximately 0.51 ha. Therefore, the overall gain in land available to the public for recreation will equate to approximately 34.21 ha. However, it is noted that the access tracks are unlikely to be available for grazing and therefore the total area of additional land available for grazing equates to 31.18 ha.
- 12.4.33 Taking into account the proposed mitigation outlined during the operational phase of the Proposed Scheme, effects on land use are not deemed to be significant.
- 12.4.34 Any potential impacts on the visual amenity of recreational users using the common land and CRoW Access Land during the operational phase are addressed in **Chapter 5: Landscape and Visual** of this ES.

Decommissioning Phase

- 12.4.35 Once the Proposed Scheme has reached the end of its operational life, two options will arise concerning the future status of the Release Land:
- Option 1: The statutory re-registration provisions in the Commons Act 2006 will have come into force and so the whole of the Release Land can be reregistered as common land.
 - Option 2: The statutory provisions are not in force and therefore the rights granted under the Unilateral Undertaking over the Release Land not occupied by infrastructure during the operational life of the wind farm, will continue. Once the decommissioning has been completed the same rights will be granted over that Release Land where infrastructure was in place during the operational phase.
- 12.4.36 Regardless of which option is followed, the overall stock of common land and or land over which the graziers and public have rights of grazing and access will be more than they currently have during the operational phase of the wind farm. Any potential

effects on land use following decommissioning of the Proposed Scheme are therefore not deemed to be significant.

Mitigation

12.4.37 No further mitigation is proposed in relation to land use receptors.

Summary

12.4.38 Any potential effects on land use (related to the Northern Common and CRoW Access Land) have been suitably mitigated as part of the Proposed Scheme such that no significant effects have been identified.

12.5 Aviation

Introduction

- 12.5.1 The potential effects of the Proposed Scheme during construction, operation and decommissioning on aviation (including radar) interests has been assessed. This section outlines the methodology of the assessment, the baseline conditions in terms of aviation in the vicinity of the Proposed Scheme, and provides an assessment of the potential effects on aviation (and radar). The potential mitigation requirements are outlined and the overall risks are then categorised to provide a summary of the potential impact on receptors.
- 12.5.2 The potential cumulative effects with other committed developments is presented in **Chapter 13: Cumulative Effects**.

Scope of Assessment

- 12.5.3 In general terms, the potential effects of wind turbine generators (WTGs) on aviation are widely understood, however, the primary concern in assessing the effect of a wind farm is to ensure that the safety of aircraft is not compromised. In essence, there are two dominant scenarios that lead to potential effects on aviation:
- Physical obstruction: WTGs can create physical obstructions to aircraft in flight.
 - Aviation radar systems: WTGs can create unwanted interference with radar systems such that 'radar clutter' can appear on radar displays; this can seriously affect air traffic controllers' ability to provide Air Traffic Services (ATS) in a safe and effective manner. Radar clutter (or false radar returns) can confuse air traffic controllers by making it difficult to differentiate between real aircraft returns and returns that result from the detection of wind turbines. The appearance of multiple false returns in close proximity can also inhibit the radar's processing capacity such that false aircraft tracks can be presented in place of real aircraft.

Legislation, Policy and Guidance

- 12.5.4 The aviation and radar assessment has been carried out with reference to the Civil Aviation Authority (CAA) and Military Aviation Authority (MAA) documents that provide the legislation, policy and guidance framework for dealing with the impacts of onshore wind farm developments on aviation stakeholders.
- 12.5.5 The following relevant legislation, policy and guidance documents were used in the preparation of this section:

Legislation

- Civil Aviation Publication (CAP) 393 – Air Navigation, The Order and the Regulations, 2016 (Version 6, 12 February 2021): Contains the Air Navigation Order (ANO) 2016 and Regulations made under the order; and defines the Rules of the Air regarding civil aviation in the United Kingdom (UK).

Policy

- CAP 670 – Air Traffic Services Safety Requirements (Issue 3, 7 June 2019): Sets out the safety regulatory framework and requirements associated with the provision of Air Traffic Services (ATS).
- CAP 764 – CAA Policy and Guidelines on Wind Turbines (Version 6, February 2016): Provides CAA policy and guidance on a range of issues associated with WTGs and their effect on aviation that need to be considered by aviation stakeholders, wind energy developers and Local Planning Authorities (LPAs) when assessing the viability of wind turbine developments.
- CAP 774 – The UK Flight Information Services (Version 4, 15 December 2021): Details the suite of ATS which (excluding aerodrome services) are the only services provided in Class G airspace within the UK Flight Information Region (FIR). This document is equally applicable to civilian and military pilots and air traffic controllers.
- MAA Regulatory Publication 3000 Series: Air Traffic Management Regulations (last updated 28 March 2023): Provides the regulatory framework and instructions to military personnel for provision of military Air Traffic Control (ATC).
- MAA Manual of Military Air Traffic Management (last updated 30 September 2019): Provides regulations for military ATC and emergency procedures and utilisation of military designated airspace.

Guidance

- MoD Obstruction Lighting Guidance (1 January 2020): Sets out the MoD's minimum requirements and standards for installation of aviation lighting of onshore and offshore wind turbine developments.
- CAA 1:500,000 Visual Flight Rules (VFR) Aviation Chart (2023): Designed to assist in the navigation of aircraft. Enables pilots to determine their position, safe altitude and route to a destination, highlighting navigation aids along the way, alternative landing areas in case of an in-flight emergency, and other useful information such as radio frequencies and airspace boundaries.
- CAP 168 – Licensing of Aerodromes (Version 12, 14 January 2022): Sets out the standards required at UK licensed aerodromes in terms of operational procedures, physical characteristics, assessment and treatment of obstacles, visual aids, rescue and fire-fighting services and medical services.
- UK Integrated Aeronautical Information Package (UK IAIP) (2023): Provides comprehensive information on UK civilian aerodromes and aviation procedures within UK airspace.

- UK Military Aeronautical Information Publication (UK Mil AIP) (2023): Provides comprehensive information on UK military aerodromes and guidance to military aircrew on in-flight navigation procedures.

Scoping and Consultation

12.5.6 In preparation for the 2020 Scoping Report and following the subsequent 2020 Scoping Direction, relevant organisations have been contacted with regards to the Proposed Scheme. **Table 12.6** outlines the consultation responses received in relation to aviation (and radar).

Table 12.6: Scoping and Consultation Responses

Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
Planning Inspectorate – 2020 Scoping Direction	As the initial scoping assessments identified potential aviation constraints, the Planning Inspectorate does not agree to fully scope out effects on aviation at this stage. The Planning Inspectorate agrees that where no objections are raised by the stakeholders, and no technical mitigation is required to overcome significant effects, there will be no need for a detailed assessment in the ES. The intention to include justification within the project description chapter is welcomed.	The Applicant agrees that aviation should not be scoped out of the EIA.
MoD – Pre-planning assessment request	MoD assessment response dated 31 March 2021, confirmed that the Proposed Scheme may have an impact on low flying operations but that the operational impact of the development had not been confirmed at that stage. A full operational assessment would be carried out on receipt of the formal planning application. Regardless of whether MoD object to the Proposed Scheme, they would likely request that the turbines be fitted with MoD accredited visible or infrared aviation safety lighting. MoD response confirmed no impact on Military ATC or Air Defence (AD) radar systems.	The Applicant agrees that appropriate aviation lighting should be installed on the Proposed Scheme's WTGs. Further detail on aviation lighting is provided in Chapter 3: Proposed Scheme .
NATS – Pre-planning Technical and Operational Assessment (TOPA) request	NATS TOPA dated March 2021 confirmed that the proposed turbines would adversely impact the Cardiff Airport ATC radar and infringes the safeguarded area of the Brecon VOR/DME navigation beacon. NATS TOPA also confirmed no impact on Bristol Airport's ATC radar.	Further detail on Cardiff Airport ATC radar operations provided in this chapter.

Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
Cardiff Airport – consultation meeting	Consultation meeting held with Cardiff Airport on 13 June 2022. Impact on ATC operations and potential radar mitigation options discussed.	Further detail on Cardiff Airport ATC radar operations provided in this chapter.
Cardiff Airport – email engagement	The Applicant wrote (by e-mail) to Cardiff Airport on 26 October 2022 and 4 January 2023 requesting confirmation that the airport's Instrument Flight Procedures (IFPs) would not be affected by the Proposed Scheme and that a formal IFP assessment would not be required. Cardiff Airport responded on 6 January 2023 stating that, while the turbines appear to be just outside the areas where an impact would be observed, a full IFP assessment should be carried out by a CAA Approved Procedure Design Organisation (APDO).	The Applicant agreed that an IFP assessment be commissioned from NATS who are Cardiff Airport's contracted APDO. At the time of submitting the EIAR, Cardiff Airport are yet to finalise the contracting arrangements to commission this work. As a result, potential impact on Cardiff Airport IFPs remains scoped in and further detail is provided in this chapter.
NATS – PAC response	NATS responded to the PAC on 3 November 2022 noting that the risk to the Brecon DVOR had been acknowledged within the submitted documentation (section 12.5.14) and that NATS remain committed to keeping the Applicant abreast of the plans for the Brecon DVOR decommissioning in order to try and ensure that this risk is not realised.	Further detail on the NATS Brecon DVOR is provided in this chapter.

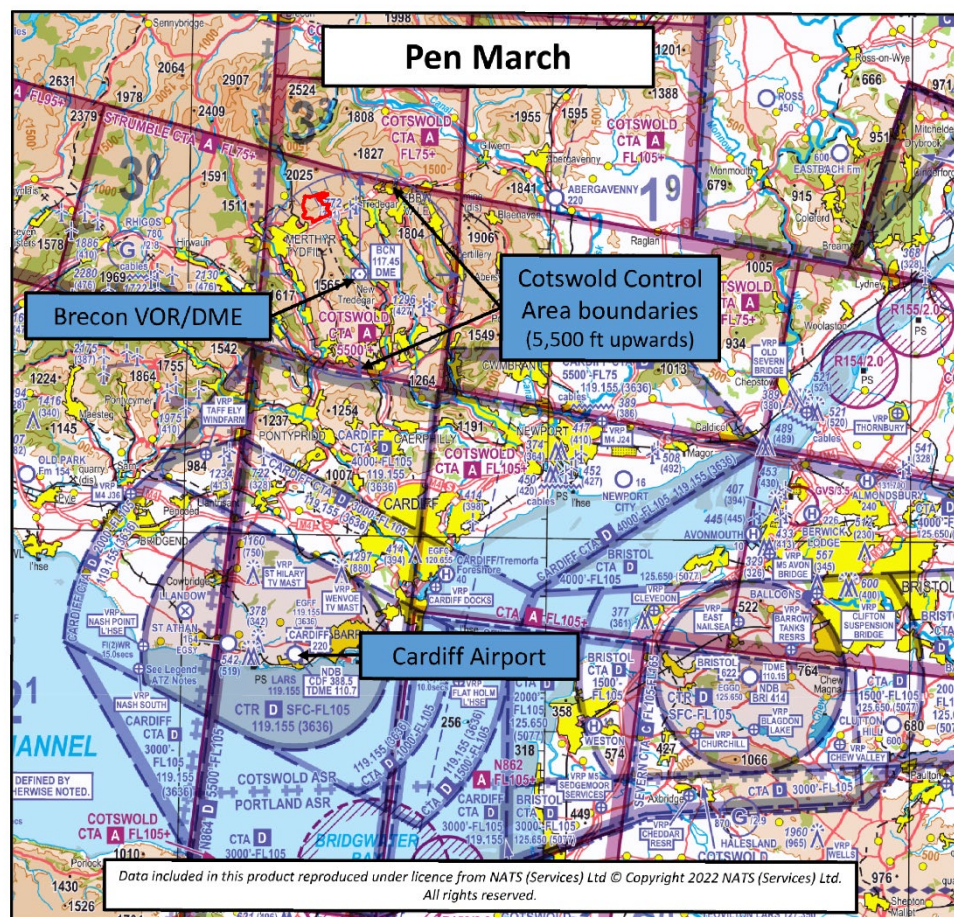
Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
MoD – PAC response	MoD responded to the PAC on 15 November 2022 re-iterating their previous concerns (dated 31 March 2021) that the Proposed Scheme's WTGs may have an impact on low flying operations and that they would likely request the turbines be fitted with MoD accredited visible or infrared aviation safety lighting. MoD further explained that the Met Office is now a statutory consultee for planning relating to their technical infrastructure, therefore the MoD has not informed the Met Office of this pre-application. If the development falls within any of the Met Office safeguarded zones the Applicant would need to contact the Met Office directly. More information would be available on the Met Office website.	The Applicant agrees that appropriate aviation lighting should be installed on the Proposed Scheme's WTGs. Further detail on aviation lighting is provided in Chapter 3: Proposed Scheme. The Applicant has checked the Met Office website and the Proposed Scheme's WTGs do not fall within any of the Met Office safeguarded zones. Consequently, this issue has been scoped out of the EIAR.
Bristol Airport – PAC response	Bristol Airport responded to the PAC on 2 November 2022 requesting further information on the specification of the WTGs to be installed. The requested details were forwarded to Bristol Airport by the Applicant but no further response from Bristol Airport was received. The Applicant re-contacted Bristol Airport prior to finalisation of this EIAR following which Bristol Airport confirmed in writing on 27 June 2023 that there would be no technical or operational safeguarding objection to the Proposed Scheme with respect to Bristol Airport's operations.	Any potential impact on Bristol Airport's operations has been scoped out of the EIAR.

Study Area

12.5.7 To assess the impact on aviation (and radar), a study area has been devised that takes into account the immediate vicinity of the Proposed Scheme, the consultation

criteria for aviation assets as described in CAP 764 (Policy and Guidelines on WTGs) and a wider study area determined by the range of potentially affected radar systems; both ATC and AD radar systems. A pictorial representation of the Site and potential aviation receptors (airspace, airports and radar locations) is depicted on an aviation chart and shown at **Inset 12.1**.

Inset 12.1: Aviation and Radar Receptor Locations



Methodology

12.5.8 A desk-based review of literature and available data sources has been undertaken to support this assessment. The potential aviation issues that have been considered for the assessment are as follows:

- Civil airport IFPs (including navigation aids)
- Military aerodrome IFPs (including navigation aids)
- Civil ATC radar
- Military ATC radar
- Military AD radar
- Low flying (military and civilian Emergency Helicopter Support Units (EHSUs))
- Local minor aerodromes

- Local airspace restrictions (Prohibited/Restricted/Danger Areas and Military Exercise and Training Areas (MEXAs))
- Meteorological (Met) Office radars

12.5.9 As described in paragraph 11.17 of the 2020 Scoping Report, defining grades of receptor sensitivity and effect magnitude is not considered appropriate in relation to aviation and radar. Instead, any restriction on aviation operations or compromise to required operational standards of navigational or ATC equipment are treated as significant.

Baseline / Existing Environment

12.5.10 There are a number of civilian and military aviation interests within the vicinity of the Proposed Scheme (refer to **Inset 12.1**) which can be described as follows:

Airspace

12.5.11 The Proposed Scheme is situated in an area of Class G uncontrolled airspace which is established from the surface up to 5,500 feet (ft) above mean sea level (amsl). Above 5,500 ft, the airspace is Class A controlled airspace known as the Cotswold Control Area (CTA) which forms part of the airways structure used by passenger carrying airliners up to Flight Level (FL) 195 (19,500 ft). Above FL 195, the airspace is Class C controlled airspace. In Class A, C and G airspace, the following rules applies:

- Class A airspace - the most strictly regulated airspace where pilots must comply with ATC instructions at all times. Aircraft are separated from all other traffic and the users of this airspace are mainly major airlines. All aircraft operating in this airspace must be in receipt of an air traffic service from National Air Traffic Services (En-Route) PLC (NERL) or military controllers located at the NERL Area Control Centre.
- Class C airspace - all aircraft operating within Class C controlled airspace (i.e. above FL 195) must be in receipt of an air traffic service from NERL or a separate authorised military service provider.
- Class G airspace - any aircraft can operate in this area of uncontrolled airspace without any mandatory requirement to be in communication with, or receive a radar service from, any ATC unit. Pilots of aircraft operating under Visual Flight Rules (VFR) in Class G airspace are ultimately responsible for seeing and avoiding other aircraft and obstructions.

Civil Airports IFPs (including navigation aids)

12.5.12 The nearest major civil airports to the Proposed Scheme are Cardiff Airport, 23 nm (43 km) to the south, and Bristol Airport, 33 nm (65 km) to the south-east.

12.5.13 Although the Proposed Scheme's WTGs will be outside the safeguarded Obstacle Limitation Surfaces (OLS) of both airports, Cardiff Airport indicated in their consultation response dated 6 January 2023 (see **Table 12.6**) that, while the turbines appear to be just outside the areas where an impact would be observed, a full IFP assessment should be carried out by a CAA Approved Procedure Design

Organisation (APDO) to ensure that there will be no adverse impact on the airport's IFPs. This issue is discussed further in paragraphs 12.5.31, 12.5.40 and 12.5.41.

- 12.5.14 The Site is also located within the safeguarded zone for the Brecon VOR/DME navigational beacon (see **Inset 12.1**) and this was confirmed by NATS in their TOPA report (see Follow-up consultation with NATS has confirmed that the Brecon VOR/DME beacon is due to be decommissioned from service and that this is expected before the Proposed Scheme is constructed. The beacon is not expected to be replaced; consequently, no adverse impact is envisaged.

Civil ATC Radars

- 12.5.15 The Proposed Scheme is within the operating range of a number of civil ATC radars including the Cardiff and Bristol Airport ATC radars. However, NATS confirmed in their TOPA report (see **Table 12.6**) that it is only the Cardiff Airport ATC radar that will be affected by the Proposed Scheme.

Military aerodrome IFPs (including navigation aids);

- 12.5.16 No military aerodrome IFPs (including navigation aids) will be affected by the Proposed Scheme's WTGs; as confirmed in the MoD pre-planning assessment response (see **Table 12.6**).

Military ATC and AD Radars

- 12.5.17 No military ATC or AD radars will be affected by the Proposed Scheme; as confirmed in the MoD scoping response (see **Table 12.6**).

Low flying (military and civilian EHSUs)

- 12.5.18 The Proposed Scheme is located in Low Flying Area (LFA) 7, which covers the geographical area of Wales. Military aircraft can fly down to a minimum of 250 feet (ft) above ground level (agl). Helicopters normally operate down to 100 ft agl but due to the nature of their task, and for specific training purposes, are occasionally permitted to fly lower.
- 12.5.19 When conducting operational missions, UK Search and Rescue (SAR) helicopters and other emergency helicopter operators, such as the Welsh Air Ambulance unit and the South and East Wales Police Air Support unit, are not constrained by the normal rules of the air, which allows them flexibility to manoeuvre, as required, for the particular mission being carried out. A detailed Lighting and Marking Plan (LMP) will be agreed with all the relevant aviation stakeholders pre-construction.

Local Minor Aerodromes

- 12.5.20 No local minor aerodromes will be affected by the Proposed Scheme.

Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military MEXAs)

- 12.5.21 There are no local airspace restrictions within the vicinity of the Site that will be affected by the Proposed Scheme.

Met Office Radar

- 12.5.22 The closest Met Office radar systems are located at Crug-y-Gorllwyn and Clee Hill, 44 nm (82 km) and 47 nm (87 km), respectively, from the Proposed Scheme. The Site is therefore outside the 20 km safeguarding area for radars of this nature.

Modifying Influences

- 12.5.23 There are no anticipated future changes to the airspace and aviation environment in the vicinity of the Proposed Scheme that affect this assessment on the impact on aviation and radar.

Field Survey

- 12.5.24 No field studies have been carried out to inform this assessment.

Assumptions and Information Gaps

- 12.5.25 With the exception of some awaited consultee responses (see **Table 12.6**), there are no assumptions or known information gaps affecting this assessment.

Summary of Baseline Environment

- 12.5.26 The key sensitive receptors identified from the baseline characterisation study that form the focus of the assessment are as follows:
- Potential impact on Cardiff Airport IFPs;
 - Potential impact on Cardiff Airport ATC Radar; and
 - Potential impact on military low flying and civilian EHSU operations.

Impacts Scoped Out of the Assessment

- 12.5.27 The following impacts were scoped out of the assessment following the desk-top review:
- Military Aerodrome IFPs (including navigation aids) - MoD confirmed in their scoping response (**Table 12.6**) no impact on military aerodrome operations;
 - Military ATC radar - MoD confirmed in their scoping response (**Table 12.6**) no impact on military ATC radar systems;
 - Military AD radar - MoD confirmed in their scoping response (**Table 12.6**) no impact on military AD radar systems;
 - Local minor aerodromes – There are no local aerodromes in the vicinity of the Proposed Scheme;
 - Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military MEXAs) - The Proposed Scheme is situated outside the boundaries of any active Prohibited/Restricted/Danger Areas; consequently, there will be no impact on MoD operations within restricted airspace.
 - Met Office radar – The Proposed Scheme is outside the 20 km safeguarding area for any Met Office radar.

Primary Mitigation

12.5.28 As part of the Proposed Scheme design process, a number of designed-in measures and management plans have been proposed to reduce the potential for impacts on aviation and radar receptors, please refer to **Table 12.7**. As there is a commitment to implementing these measures, which will likely be secured through appropriate planning conditions, they are considered inherently part of the design of the Proposed Scheme and have therefore been considered in the assessment presented below. These measures are considered standard industry practice for this type of development.

Table 12.7: Mitigation Measures specific to Aviation and Radar

Mitigation Measures	Justification
Approval and implementation of an LMP, which will set out specific requirements in terms of aviation lighting to be installed on the WTGs, as required under CAA (2016). CAP 393, Air Navigation: The Order and the Regulations (2016).	The LMP will be prepared in consultation with the CAA and MoD and will take into account requirements for aviation lighting as specified in Article 223 of the UK ANO, 2016 and changes to ICAO Annex 14 Volume 2, Chapter 6, paragraph 6.2.4 promulgated in November 2016. The production and approval of a LMP will be a condition of the Application. Measures will be adopted to ensure that the potential for risk of aircraft collision with the Proposed Scheme is minimised.
All structures of more than 91.4 m in height will be charted on aeronautical charts and reported to the Defence Geographic Centre (DGC), which maintains the UK's database of tall structures (Digital Vertical Obstruction File) at least ten weeks prior to construction.	Consultation with the CAA and MoD prior to agreement of the LMP. The LMP will be a condition of the Application. These measures will be adopted to ensure that the potential for risk of aircraft collision with the Proposed Scheme is minimised.
Any temporary obstacles associated with wind farms which are of more than 91.4 m in height are to be alerted to aircrews by means of the Notice to Airmen (NOTAM) system.	Consultation with the CAA will be required to ensure that temporary obstacles of more than 91.4 m are identified to aircrews by NOTAM. Notification of temporary obstacles will be a condition of the Application. NOTAM measures will be adopted to ensure that the potential for risk of aircraft collision with the Proposed Scheme is minimised.
CAA will be informed of the locations, heights and lighting status of the WTGs including estimated and actual dates of construction and the maximum heights of any construction equipment to be used, prior to the start of construction.	Consultation with the CAA will be required. Inclusion of locations, heights and lighting status of the WTGs on aviation charts and in the UK IAIP will be a condition of the Application.

Assessment of Effects/ Approach to Assessment and Methods

- 12.5.29 Given the safety critical function of aviation receptors, any predicted effect upon aviation stakeholders which results in restricted activities or has the potential to affect aviation or navigation abilities is regarded as unacceptable and therefore significant in the context of the EIA Regulations.
- 12.5.30 All other effects are deemed acceptable and therefore not significant. Only those aviation receptors considered as having the potential to be affected by the Proposed Scheme are assessed further within this section.

Construction Phase – Cardiff Airport IFPs

- 12.5.31 The infrastructure required during construction and installation of the Proposed Scheme would have no significant effect on ATC radar systems. The static nature of the infrastructure is such that it would not be processed or presented onto ATC radar displays. However, the presence of WTGs during construction, and the construction infrastructure itself, could create issues with civilian airport IFPs. Cardiff Airport, as the nearest civilian airport to the Proposed Scheme has indicated that while the turbines appear to be outside the areas where an impact would be observed, a full IFP assessment should be carried out by a CAA APDO to ensure there will be no adverse impact on the airport's IFPs. At the time of submitting this EIAR, Cardiff Airport are finalising the contracting arrangements to commission an IFP assessment. Potential mitigation, if required, is discussed in paragraphs 12.5.40 and 12.5.41.
- 12.5.32 The overall impact, therefore, of the Proposed Scheme on Cardiff Airport IFPs is assessed as **significant** (prior to mitigation (if required)).

Construction Phase - Low Flying (military and civilian EHSUs)

- 12.5.33 The Proposed Scheme is located within LFA 7; an area which covers the geographical area of Wales. LFA 7 is considered by MoD to be an area of key importance for military low flying training due to the area having challenging terrain and a generally sparse population. In addition, the area has a high incidence of unrestricted airspace above 2,000 ft, which gives increased flexibility to military aircraft to enter and leave the low flying environment.
- 12.5.34 Aircraft completing low flying training in these areas would be considered to be operating in Visual Meteorological Conditions (VMC). This means that aircraft will be operating in weather conditions in which pilots would have sufficient visibility to maintain visual separation from terrain, obstacles and other aircraft. The Proposed Scheme's WTGs would be additional obstacles that low flying aircraft would have to avoid. Furthermore, such aircraft must also carry appropriate mapping detailing the relevant terrain and any obstacles. This mapping would have to display the Proposed Scheme if approved and constructed.
- 12.5.35 The overall impact, therefore, of the Proposed Scheme on military low flying and civilian EHSUs is assessed as significant (prior to mitigation).

Operational Phase – Cardiff Airport ATC Radar

- 12.5.36 During the operational phase, the impact of the Proposed Scheme on the identified aviation receptor (Cardiff Airport ATC radar) would be realised if mitigation was not available.
- 12.5.37 The proposed turbines would create radar clutter that potentially conflicts with the routing of Cardiff Airport aircraft joining or departing controlled airspace in the vicinity of the Brecon VOR/DME navigation beacon. Cardiff Airport also provides a Lower Airspace Radar Service (LARS) within 40 nm of the aerodrome and the area around the Brecon VOR/DME is particularly vulnerable to infringement by light aircraft. Consequently, it is important that Cardiff Airport maintain comprehensive surveillance coverage in the vicinity of the Proposed Scheme to ensure aircraft safety.
- 12.5.38 In the absence of additional mitigation, the impact of the Proposed Scheme on the Cardiff Airport ATC Radar is therefore assessed as **significant** (prior to mitigation).

Decommissioning Phase

- 12.5.39 No effects on aviation and radar are expected during the decommissioning phase further to effects highlighted in relation to the construction phase.

Mitigation

Cardiff Airport IFPs

- 12.5.40 The Applicant has discussed any potential impact on IFPs with Cardiff Airport and both parties agree that there is only a small potential that any adverse impact exists. However, if an APDO IFP assessment determines that there is an impact, it is likely to involve the ATC Surveillance Minimum Altitude Chart (ATCSMAC) and Minimum Safety Altitudes (MSAs) in certain areas of some procedures. ATCSMACs and MSAs stipulate the lowest altitude below which aircraft, either under sequencing instructions from air traffic controllers or when self-positioning, must not descend in order to maintain 1,000 ft vertical separation from the tallest ground obstacle in a given area. In terms of the Proposed Scheme, the highest elevation is Turbine 2 at 530.92 m (1,742 ft). Therefore, with a maximum turbine tip height of 180 m, the highest overall elevation will be 710.92 m which equates to 2,333 ft. Adding 1,000 ft (obstacle clearance criteria) makes 3,333 ft which, in order to determine an ATCSMAC or MSA sector safe altitude, is then rounded up to the next 100 ft, making an overall MSA over the Pen March site of 3,400 ft amsl. Given that Cardiff Airport's 25 nm ATCSMAC MSA in that area is 3,900 ft amsl, the Proposed Scheme should not infringe that safeguarded airspace by more than 500 ft.
- 12.5.41 Cardiff Airport also expressed concern that the Terminal Arrival Area (TAA) for certain procedures may encompass the turbine location laterally; in particular, the Runway 12 TAA 10 nm subsector altitude which is 3000 ft. While the turbines appear to be outside the area where an impact would be observed, Cardiff Airport require this to be assessed by an APDO. If an adverse impact is observed however, the necessary mitigation would be to amend the relevant safety altitudes to be no lower than 3,400 ft to ensure that at least 1,000 ft vertical separation from the Proposed Scheme's tallest obstacle (Turbine 2) is maintained. Overall, mitigation (if required) would

involve relatively minor changes to some airport IFPs. The Applicant will request Cardiff Airport to update the planning authorities once the APDO IFP assessment has been carried out and Cardiff Airport has assessed whether any IFPs will need to be amended.

Cardiff Airport ATC Radar

12.5.42 Consultation with Cardiff Airport following submission of the 2020 Scoping Report resulted in a preliminary agreement that the ATC radar objection could be withdrawn subject to the imposition of a suspensive planning condition. It was agreed at that time that all 6 of the turbines were likely to have an impact on the ATC radar.

12.5.43 Cardiff Airport is currently in discussions with other developers regarding installation of a wind farm mitigation system and positive discussions are ongoing between the airport and the Applicant to agree the way forward in delivering a mitigation solution. It is expected that an agreement will be reached and that a suitable suspensive condition will be agreed with Cardiff Airport prior to the determination of the application.

Low Flying (military and civilian EHSUs)

12.5.44 In their response to the Applicant's pre-planning request dated 31 March 2021, MoD assessed that the Proposed Scheme may have an impact on low flying operations. However, DIO staff were not able to provide any information regarding the operational impact of the development at that stage. A full operational assessment would be carried out on receipt of the formal planning application. The MoD indicated that, regardless of whether MoD object to the Proposed Scheme, they would likely request that the turbines be fitted with MoD accredited visible or infrared aviation safety lighting.

12.5.45 It is anticipated that, on submission of the Application, any potential impact on military low flying operations will be operationally acceptable subject to installation of appropriate aviation lighting. It is also expected that MoD will stipulate the following in their planning response:

- The Proposed Scheme be fitted with MoD-accredited aviation safety lighting in accordance with the UK Air Navigation Order 2016.
- Prior to commencement of construction, MoD be advised of:
 - The date of the commencement of the erection of wind turbine generators.
 - The maximum height of any construction equipment to be used in the erection of the WTGs.
 - The date any wind turbine generators are brought into use.
 - The latitude and longitude and maximum heights of each wind turbine generator, and any anemometer mast(s).

12.5.46 Given the requirement for visible aviation lighting due to the tip height of the Proposed Scheme's turbines, the requirement for MoD accredited aviation safety lighting will be superseded and is not anticipated to be an additional requirement to visible lighting required by the CAA.

Residual Effect

- 12.5.47 The effects of the Proposed Scheme have been minimised, as industry standard risk control measures would be put in place during the construction and operational phases of the wind farm. These mitigation measures will further serve to reduce the impact of the Proposed Scheme and ensure the project conforms to regular requirements and industry good practice. As such, no residual significant effects are expected post mitigation.

12.6 Climate Change

Introduction

- 12.6.1 In addition to the value wind farms provide in terms of the electricity they produce, wind turbines and other renewable technologies provide an important mechanism for the reduction of carbon dioxide (CO₂), and other greenhouse gas (GHG) emissions into the atmosphere.
- 12.6.2 Operational wind farms achieve emissions savings by reducing the consumption of fossil fuel generated mains electricity. However, during their manufacture, construction and decommissioning, wind farms can themselves result in GHG emissions of CO₂ gas, particularly in such instances as where natural carbon stores such as peat are present and potentially impacted by the development.
- 12.6.3 This assessment provides an approximation of the CO₂ emissions associated with the manufacture, construction and decommission of the Proposed Scheme. It further provides an estimate of the contribution which the Proposed Scheme would make towards the reduction of emissions which would otherwise be produced by fossil fuel power generation. This provides an indication of the whole life carbon balance of the Proposed Scheme, together with an understanding of the emissions 'pay-back' period.
- 12.6.4 Once emissions resulting from the manufacture, construction and decommission of the Proposed Scheme have been paid back (offset) by the wind farm, then each subsequent unit of wind generated electricity would displace a unit of conventionally generated electricity, thereby contributing to the overall reduction in emissions into the atmosphere.

Scope and methodology

Approach to the assessment

- 12.6.5 The assessment of the carbon balance of the Proposed Scheme is based upon a detailed baseline description of the Proposed Scheme and its location. All calculations are premised upon site-specific data, where available. Where site-specific data are not available, national/regional information has been used.
- 12.6.6 The methodology used to calculate CO₂ emissions which would result from the Proposed Scheme is based upon the work of Nayak et al. (2008, 2010) and Smith et al. (2011)³, which are the basis for the latest version (V1.7.0) of the Scottish Government's Carbon Calculator Tool. This tool enables carbon losses and carbon savings to be quantified across the project lifecycle stages (construction, operation and decommissioning/site restoration), and these losses and savings are combined to establish the overall (net) carbon effect of the Proposed Scheme, as well as its 'carbon payback period'.

³ Smith, J.U., Graves, P., Nayak, D.R., Smith, P., Perks, M., Gardiner, B., Miller, D., Nolan, A., Morrice, J., Xenakis, G., Waldron, S., and Drew, S. (2011) Carbon implications of windfarms located on peatlands – Update of the Scottish Government Carbon Calculator tool. Final Report, RERAD Report CR/2010/05.

12.6.7 The Proposed Scheme is anticipated to have an operational life of 35 years, after which it would be decommissioned, and the turbines dismantled and removed in accordance with best practice (e.g., SEPA Guidance (2016)⁴) regarding ‘Life Extension and Decommissioning of Onshore Windfarms’). Specifically, that is to:

- Remove infrastructure unless the potential environmental risks posed by removal (e.g., carbon loss, impacts on the water environment) would outweigh the benefits.
- Maximise recovery of materials from removed infrastructure and treat as high up on the waste hierarchy as possible.
- Optimise habitat restoration of area affected by infrastructure removal.
- Implement a long-term aftercare programme established to monitor/manage any potential long-term environmental risks.

12.6.8 Results from the above assessment are reported below in accordance with the Institute of Environmental Management and Assessment’s Environmental Impact Assessment guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance (2022)⁵.

Carbon and Peatland

12.6.9 Wind farm developments in upland areas are often sited on areas of peatland which hold stocks of poorly protected carbon. If disturbed, these stocks have the potential to release carbon into the atmosphere in the form of CO₂. For this reason, this carbon balance assessment must consider the implications of all parts of the Proposed Scheme which could lead to the release of CO₂ due to the disturbance of peat.

12.6.10 The disturbance of peat has been considered during the design process which has avoided areas of deep peat. The site design process is described in **Chapter 2: Site Selection and Design Evolution** whilst specific details relating to peat depth are included in **Chapter 6: Hydrology, Hydrogeology, Geology and Peat**.

12.6.11 The loss of carbon from the carbon fixing potential of vegetation on peatland is small but is calculated for the area from which peat is removed and the area affected by drainage. The carbon stored in the peat itself represents a much larger potential source of carbon loss.

12.6.12 When flooded, peat soils emit lower amounts of CO₂ than when they are drained, as the water-logged conditions slow plant decomposition and the subsequent release of organic-bound carbon back into the atmosphere. In flooded soils, any CO₂ emissions are usually exceeded by plant fixation, so the net exchange of carbon within the atmosphere is negative and soil stocks increase.

12.6.13 When soils are aerated, CO₂ emissions usually exceed plant fixation, so the net exchange of carbon within the atmosphere is positive. Methane (CH₄) emissions

⁴ SEPA Guidance regarding Life Extension and Decommissioning of Onshore Windfarms; 2016. Available at: <https://www.sepa.org.uk/media/219689/sepa-guidance-regarding-life-extension-and-decommissioning-of-onshore-windfarms.pdf>

⁵ IEMA (2022) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance. Available at: <https://www.iema.net/preview-document/assessing-greenhouse-gas-emissions-and-evaluating-their-significance>, accessed May 2023

increase from flooded peat soils, however due to their small contribution (3% – 5% of peat-related GHG emissions) and shorter atmospheric lifetime, the climatic effects of increased methane flux to the atmosphere do not outweigh the climatic benefits of increased carbon sequestration from flooded soils (Günther et al., 2020)⁶.

- 12.6.14 To calculate the CO₂ emissions attributable to the removal or drainage of the peat, emissions occurring if the soil had remained *in situ* and undrained are subtracted from the emissions occurring after removal or drainage. The indirect loss of CO₂ uptake (fixation) by plants originally on the surface of the site but eliminated by construction activity including the destruction of active bog plants and felling, is calculated using site-specific data collected as part of the EIA process and based upon blanket bog.
- 12.6.15 Emissions due to the indirect, long-term liberation of CO₂ from carbon stored in peat due to drying and oxidation processes caused by on-site construction can also be calculated from site-specific data for the Proposed Scheme. The resultant figure is a reasonable worst-case scenario, as peat would be reused on-site to minimise carbon losses for restoration of the renewables project, and for habitat restoration.

Turbine Manufacture

- 12.6.16 Emissions arising from the fabrication of the turbines and associated components of the Proposed Scheme are based on the full life-cycle analysis of a typical turbine and include CO₂ emissions resulting from transportation, erection, operation, dismantling and removal of turbines and foundations and transmission grid connection equipment from the existing electricity grid system.
- 12.6.17 With respect to the turbines, emissions from material production are the dominant source of CO₂. Emissions arising from the construction (including transportation of components, quarrying, building foundations, access tracks and hard standing) and commissioning are also included in the calculations. This assessment has used Nayak et al. (2008, 2010)⁷ default values for ‘turbine life’ emissions, calculated with respect to installed capacity.
- 12.6.18 A number of technical papers (detailed in Nayak et al., 2008, 2010) have reported a wide range of wind farm emissions values; these being between 6 and 34 tCO₂ GWh¹.

⁶ Günther, A., Barthelmes, A., Huth, V., Joosten, H., Jurasinki, G., Koebsch, F. and Couwenberg, J. (2020) Prompt rewetting of drained peatlands reduces climate warming despite methane emissions. Nat Commun 11, 1644. <https://doi.org/10.1038/s41467-020-15499-z>

⁷ Nayak, D.R., Miller, D., Nolan, A., Smith, P., and Smith, J. (2008, revised 2010) Calculating carbon savings from wind farms on Scottish peat lands: a new approach. Available at: <https://www.gov.scot/publications/calculating-carbon-savings-wind-farms-scottish-peat-lands-new-approach/>, accessed May 2023.

^{7cont'd} Nayak D.R., Miller D., Nolan A., Smith P., and Smith J. (2010) Calculating carbon budgets of wind farms on Scottish peatlands; Mires and Peat (Article 09), 4, 1-23. Available at: <http://mires-and-peat.net/pages/volumes/map04/map0409.php>, accessed May 2023

- 12.6.19 These emissions are considerable, and so it is essential that they are considered in relation to calculating the CO₂ payback period of the Proposed Scheme. However, it should be noted that this may still compare very favourably with the life cycle analysis of other means of non-fossil-fuel-based power generation, such as nuclear, particularly when the full energy costs of construction, operation, maintenance and decommissioning, uranium mining and transportation as well as long-term waste management are taken into account.
- 12.6.20 It should be noted that the Scottish Government's Carbon Calculator Tool does not have the capacity to account for battery energy storage systems (BESS) as part of the Proposed Scheme, and therefore does not include any emissions arising from the manufacture of these.

Statutory and Planning Context

International Context - The Paris Agreement⁸

- 12.6.21 The Paris Agreement is a legally binding international treaty which commits Parties to the United Nations Framework Convention on Climate Change to the reduction of GHG emissions, with the view to limiting global average temperature rise to well below 2 °C above pre-industrial levels, whilst “*pursuing efforts to limit the temperature increase to 1.5°C*”. With this objective in mind, the Agreement is revisited on a five-yearly basis to allow Parties to the Convention to evaluate and enhance the level of ambition of their climate action plans, known as nationally determined contributions (NDCs). In the lead up to COP26, which took place in Glasgow in November 2021, Parties to the Convention submitted updated NDCs which aim to deliver enhanced ambition in comparison to those submitted previously.

National Context - The Environment Wales Act 2016⁹

- 12.6.22 The Environment (Wales) Act 2016 sets a net emission reduction target of 80 %, relative to its 1995/1996 baseline year, by 2050. However, in 2021 the Senedd approved a net zero target of 2050.
- 12.6.23 The Climate Change (Carbon Budgets) (Wales) Regulation 2018 further requires Welsh Ministers to set Carbon budgets for each five-year budgetary period between 2016 and 2050. The carbon budget for the budgetary period 2021 – 2025 is aimed at reducing emissions to 33 % of that of the baseline.
- 12.6.24 In March 2021, the climate change regulation was amended by the Senedd which sets a target of net-zero emissions by 2050 (in line with the recommendations of the Committee on Climate Change). The interim targets of the Act are:
- 63 % reduction in emissions by 2030 of which 70 % will be from renewable energy;
 - 89 % reduction in emissions by 2040; and
 - 100 % reduction in emissions by 2050.

⁸ United Nations Framework Convention on Climate Change (2015) Adoption of the Paris Agreement, 21st Conference of the Parties, Paris: United Nations. Available at: <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

⁹ Environment (Wales) Act 2016, Available at: <https://www.legislation.gov.uk/anaw/2016/3/contents/enacted>

National Context - Planning Policy Wales

- 12.6.25 The Planning Policy Wales (PPW) delivers on the vision set out in the well-being of Future Generations Act 2019 by outlining policies which provide clear direction towards a low carbon, resilient society. As such, the PPW states (5.9) that *‘Planning authorities should facilitate all forms of renewable and low carbon energy development. In doing so, planning authorities should seek to ensure their area’s full potential for renewable and low carbon generation is maximised and renewable energy targets are achieved.’*
- 12.6.26 The PPW further states that *‘peat bogs are significant nature conservation interest and are frequently important for archaeological interest as well as providing a carbon sink and sources should be protected and conserved for future generations.’*

Local Context - Cardiff Capital Region (CCR) Energy Strategy

- 12.6.27 The overall objective of the strategy is to develop a strategic pathway, identifying key interventions on the region’s ambitions for decarbonisation and achieving a net zero energy system by 2050. The CCR’s energy vision includes increasing onshore wind capacity to over 70 % with a target of 50 % by 2035.

Local Context - Caerphilly Council

- 12.6.28 In 2019, Caerphilly Council declared a climate emergency with the resolve to being Carbon Neutral by 2030. Therefore, a Decarbonisation Strategy has been adopted, which will enhance the Council’s work in reducing carbon emissions and investing in efficiency measures. The strategy acknowledges the focus of the Cardiff Capital Region and its ambition that the region generates 50 % of its total emissions from regional renewable energy sources by 2035. In order to make radical carbon reductions necessary, the authority is working with the Welsh Government Energy Service to review land assets with a view to establishing large scale renewable technologies, including the development for onshore wind farms.

Local Context - Merthyr Tydfil Council

- 12.6.29 Merthyr Tydfil recognises that low carbon energy, including onshore wind, is prioritised in the energy hierarchy by Planning Policy Wales. Renewable energy proposals and associated infrastructure must respect the existence and amenities of neighbouring residential and sensitive properties including approved development.

Consultation

- 12.6.30 A number of responses were received in relation to the detailed scoping exercise which commenced on 29th May 2020. Those which concerned climate change mitigation are as follows:
- **Merthyr Tydfil County Borough Council:** The proposed assessment and methodologies relating to geology, hydrogeology, and peat, were found to be acceptable. The only direct mention of climate change was an agreement with regards to its coverage as an additional EIA topic.

- **Caerphilly County Borough Council:** No reference was made to climate change.
- **Natural Resources Wales:** While peat is noted to be minimal across the site, Natural Resources Wales requests that the impact of the modification and drainage of the habitat, as well as the resulting habitat loss and CO₂ release, be fully assessed within the Environmental Statement (ES).
- **Cadw:** No reference was made to climate change.

Baseline Environment

12.6.31 Baseline environmental conditions in relation to potential climate change effects from the Proposed Scheme include existing carbon stored in the site (such as peat and forestry) that could be impacted by the Proposed Scheme resulting in CO₂ and other GHG emissions.

Peat

12.6.32 The Cranfield Soil and Agrifood Institutes ‘Soilscapes’ map was consulted to understand the soil information for the area in which the site was located. The area is noted to have a peaty or humose loamy texture, and is comprised of slowly permeable, wet, very acidic upland soils (soilscape 19). The habitat is grass moor and some heather with fluish and bog communities in wetter parts. The landcover is moorland rough grazing and forestry.

12.6.33 Site surveys have identified areas of peat within the Site, although most of the Site does not contain significant peat or peaty soils. Areas of deeper peat (>1m) are mostly restricted to pockets in more boggy areas of ground, with one area recording >5 m peat depth. Parts of the Site have widespread evidence of drainage with straightened or artificial watercourses in a number of areas. The area is mainly common land and is used extensively for rough grazing for sheep and horses. For further information on the peatland habitat within the Site please refer to **Chapter 6: Hydrology, Hydrogeology, Geology and Peat**.

Forestry

12.6.34 The Site does not contain any areas of forestry or woodland.

Assessment of Effects

12.6.35 The results of the carbon balance assessment carried out for the Proposed Scheme are presented below for each project stage. The inputs and outputs of the Scottish Government’s Carbon Calculator Tool are presented in **Appendix 12.3 (Volume 4)**.

Construction and Decommissioning

12.6.36 **Table 12.8** presents the results of the carbon balance assessment for the manufacture, construction, and decommissioning stages of the Proposed Scheme. The lack of trees on-site results in no predicted GHG emissions from felling of trees, although there are some emissions predicted due to disturbance of soils and peat.

- 12.6.37 The carbon balance tool does not include the option to account for embodied emissions associated with any BESS units, and these are therefore omitted. It does, however, calculate GHG emissions from the reliance of grid-provided back-up power as standard ('losses due to back-up power generation'), which would prove unnecessary with the use of BESS units. There is a lack of research into the embodied carbon of BESS units, but it is anticipated that emissions would be less than those from the back-up power generation included here.
- 12.6.38 Total GHG emissions of 64,845 tCO₂e are predicted from the manufacture, construction and decommissioning of the Proposed Scheme.

Table 12.8: Predicted GHG emissions from wind farm manufacture, construction and decommissioning

Source of GHG Emissions/Savings	GHG Emission (tCO ₂ e)
Losses due to turbine manufacture, construction and decommissioning	31,672
Losses due to back-up power generation	22,649
Losses due to reduced carbon fixing potential	400
Losses from soil organic matter	10,123
Losses due to Dissolved Oxygen Content and Particulate Oxygen Content	0
Losses due to forestry felling	0
Total	64,845

- 12.6.39 Any post-decommissioning site restoration and enhancement work, such as the restoration of heathland, will be aligned with the Outline Habitat Management Plan (HMP) (see **Technical Appendix 7.6, Volume 4**). These kinds of activities have the potential for carbon savings by promoting the growth of natural carbon stores such as peat. However, the Outline HMP has identified that provision of beneficial measures for peatland habitat are not feasible within the Site due to most of the Site being designated common land, and the highly degraded nature of the peatland habitat within the Site.
- 12.6.40 **Table 12.9** shows the total CO₂ gains acquired due to the improvement of the Site (tCO₂e). These are predicted to equate to gains of approximately 75 tCO₂e.

Table 12.9: Total CO₂ Gains Due to Improvement of the Site (tCO₂e)

Improvement	GHG Emissions (tCO ₂ e)
Change in emissions due to improvement of degraded bogs	0
Change in emissions due to improvement of felled forestry	0
Change in emissions due to restoration of peat from borrow pits	0

Improvement	GHG Emissions (tCO ₂ e)
Change in emissions due to removal of drainage from foundations and hardstanding	- 75
Total change in emissions due to improvements	- 75

12.6.41 Taking into account the predicted GHG emissions from wind farm manufacture, construction and decommissioning and any carbon savings from improvement of the Site, total net emissions for wind farm manufacture, construction and decommissioning are 64,770 tCO₂e (**Table 12.10**)

Table 12.10: Total net GHG emissions from wind farm manufacture, construction, decommissioning and improvement of site

GHG emissions (tCO ₂ e)	
Predicted GHG emissions from wind farm manufacture, construction and decommissioning	64,845
Total CO₂ Gains Due to Improvement of the Site	- 75
Total emissions	64,770

Operation

The operational stage of the Proposed Scheme has the greatest potential for emissions savings, and therefore beneficial climate change impacts. At this stage, GHG emissions from construction activities have ceased and the operation of the turbines would generate zero-carbon electricity for the remainder of their lifespan. **Table 12.11** presents the annual emissions savings that are predicted for the Proposed Scheme, as measured against the fossil fuel mix of the grid electricity, having consideration for the capacity factors (load factors) as provided by the Applicant (36.7 %, minimum 33.03 %, maximum 40.37 %).

Table 12.11: Annual emissions savings against fossil fuel electricity generation mix

Source of GHG savings	GHG savings (tCO ₂ e)		
	Expected value	Minimum value	Maximum value
Capacity Factor	36.7%	33.03%	40.37%
Wind farm operation	47,499	35,624	52,248
Total CO₂ savings per year	47,499	35,624	52,248

Emissions Payback Period

12.6.42 Dividing the net GHG emissions predicted for the manufacture, construction and decommissioning stages (**Table 12.10**: 64,770 tCO₂e) by the predicted annual carbon savings from wind farm operation (**Table 12.11**: 47,499 tCO₂e) gives a predicted emissions payback of 1.4 years. The net GHG emissions from the construction and decommissioning are therefore predicted to be offset by emissions savings from the Proposed Scheme within 1.4 years of it becoming operational.

Net GHG Effect

12.6.43 The Proposed Scheme is anticipated to have an operational life of 35 years. **Table 12.12** demonstrates that the total CO₂ emissions savings over the lifetime of the Proposed Scheme is expected to be 1,597,695 tCO₂e.

Table 12.12: Net GHG effect of the Proposed Scheme over 35 years

	GHG gains (GHG emissions saved/ avoided: tCO ₂ e)	GHG losses (GHG emissions: tCO ₂ e)
Operational GHG savings*	1,662,465	-
GHG emissions during manufacture, construction and decommissioning	-	64,770
Net GHG emissions avoided	1,597,695	-

***Operational GHG savings based on comparative analysis of windfarm against fossil fuel electricity mix over a lifetime of 35 years**

Mitigation

12.6.44 No further mitigation in relation to climate change is proposed at this stage.

Residual Effects

12.6.45 GHG emissions are predicted to arise from the manufacture, construction and decommissioning activities. In particular, the principal sources of emissions include turbine manufacture and the loss of peat from the construction of turbines and associated infrastructure. However, these GHG emissions are predicted to be offset 1.4 years after the Proposed Scheme becomes operational (against a fossil fuel mix of electricity). The Proposed Scheme is predicted to deliver total emissions savings of 1,597,695 tCO₂e (36.7 % capacity factor) over its 35 year operational lifetime.

- 12.6.46 IEMA's Guidance to Assessing GHG Significance states that "*GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit; as such any GHG emissions or reductions from a project might be considered to be Significant.*" The sensitivity of the receptor (i.e., global climate) to fluctuations in GHG emissions is always considered 'High', and so the significance of effects is determined by the magnitude of impact. Aligned with IEMA's Guidance to Assessing GHG Significance, any project that causes GHG to be avoided, or removed from the atmosphere, has a beneficial effect that is always significant.
- 12.6.47 The overall emissions impact is therefore considered to represent a **significant beneficial and long-term climate change effect**. Consequently, the Proposed Scheme contributes towards Wales's emissions reduction targets as set out in the Environment Wales Act 2016.

12.7 Utilities

- 12.7.1 This section evaluates the effects of the Proposed Scheme on existing utilities.
- 12.7.2 Effects relating to existing infrastructure are not environmental effects and there is no requirement to include an assessment of these effects under the EIA Regulations. However, given the nature of the Proposed Scheme, there is the potential to affect existing utility infrastructure above and below ground.
- 12.7.3 To identify any existing utilities which need to be considered as part of the design process, a desk-based study (including consultation with relevant operators) has been undertaken. The desk-based study focussed on existing utilities within the Site Boundary.
- 12.7.4 Relevant consultees who were engaged as part of the desk-based study have included water, gas and electricity utilities providers. Knowledge of the utilities during the design process allows any effects to be avoided either in the design of the Proposed Scheme or by the use of suitable structures to protect the utilities (in accordance and agreement with the relevant utility operator).
- 12.7.5 The desk-based study identified that the following utilities and infrastructure have the potential to be affected by the Proposed Scheme:
- National Grid high pressure gas pipeline which crosses the Site in a south-west to north-east direction.
 - Wales and West Utilities (WWU) high pressure gas pipeline which crosses the Site in an east to west direction.
 - WWU high pressure gas pipeline which crosses the Site in a north-west to south-east direction.
 - Dwr Cymru Welsh Water water main which crosses the Site in an east-west direction.
 - Two Western Power Distribution high voltage 33 kV overhead power lines which cross the Site in an east to west direction.
- 12.7.6 Please refer to **Figure 12.2 (Volume 3)** for the location of the above utilities in relation to the Site Boundary.
- 12.7.7 The design of the Proposed Scheme, as presented in **Chapter 3: Proposed Scheme**, has the potential to directly impact the National Grid high-pressure gas pipeline and WWU high-pressure gas pipeline (which crosses the Site in an east to west direction).
- 12.7.8 The Applicant has consulted with both National Grid and WWU to agree appropriate methods of crossing each pipeline during the construction of the Proposed Scheme and appropriate separation distances from the wind turbines themselves. Consultation with Dwr Cymru to agree an appropriate method of crossing is ongoing.
- 12.7.9 **Figure 3.11 (Volume 3)** shows an indicative high-pressure gas pipeline crossing, the final design of both pipeline crossings will be agreed with both utility operators.

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