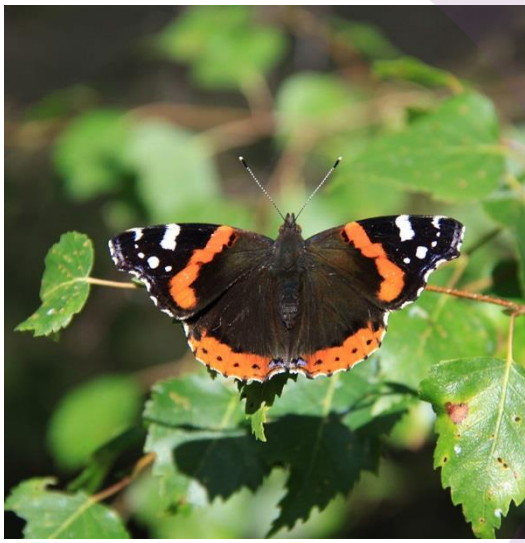
ScottishPower Renewables UK Limited

Land Adjacent to Whitelee Windfarm – Solar PV, Green Hydrogen Production and Battery Storage Facilities

Environmental Impact Assessment Report – Volume 2



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Wood Group UK Limited – March 2021

Report for

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Doc Ref. 43122-WOOD-ZZ-XX-RP-T-0001_S3_P01.1

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Document revisions

No.	Details	Date
3	Final	31.03.2021

Contents

1. Introduction

1.1 Overview of the Project

1.1.1 ScottishPower Renewables UK Limited have previously developed the Whitelee Windfarm and the Whitelee Windfarm Extension Project is a proposed renewable energy development that intends to make use of available renewable energy technologies to maximise and optimise the green energy potential of the entire Site. The Project is a term which is used to refer to two interconnected Proposed Developments; the first being a solar photovoltaic (PV) farm and a Battery Energy Storage System (BESS) with an associated high-voltage (HV) cable, haul/link road and associated access(es) and infrastructure. The second of the Proposed Developments is a green hydrogen production facility which connects to the proposed solar PV farm as well as the BESS via the HV cable.

1.1.2 The Site for the Project is located immediately adjacent (to west) of the Whitelee Windfarm and is situated in its entirety within the administrative boundary of East Ayrshire Council (EAC). The Project location plan is provided within Volume 7 of this Environmental Impact Assessment (EIA) Report.

1.1.3 The Project is submitted under two separate consenting regimes with elements being considered by the Scottish Ministers under Section 36 of the Electricity Act 1989 and elements being considered under Section 32 of the Town and Country Planning (Scotland) Act 1997, as amended (an application for Full Planning Permission). For ease of understanding, the following bullet point list identifies each of the primary components under the relevant consenting regimes:

- A green hydrogen production facility which will produce up to 10,000kg per day of green hydrogen and its associated access(es), infrastructure and a temporary laydown area – submitted to EAC (the local planning authority) under Section 32 of the Town and Country Planning (Scotland) Act 1997, as amended.
- A solar photovoltaic (PV) farm with a predicted rated output of up to 40 megawatts (MW) with its associated access(es), link/haul road, infrastructure and temporary laydown area – submitted to the Scottish Ministers under Section 36 of the Electricity Act 1989.
- A Battery Energy Storage System (BESS) with a storage capacity of up to 100 megawatt hours (MWh) and a maximum discharge capability of 50 MW with its associated access(es), infrastructure and temporary laydown area – submitted to the Scottish Ministers under Section 36 of the Electricity Act 1989.
- A high-voltage (HV) electrical cable connecting the solar PV farm to/from the BESS with associated maintenance tracks and infrastructure – submitted to the Scottish Ministers under Section 36 of the Electricity Act 1989.

1.1.4 It has been determined that given the inter-relationship between those components which form the Section 36 application and those which form the Full Planning application that in order to appropriately assess the potential environmental impacts which may arise, that both applications should be treated as a single EIA development and single Project. This EIA Report therefore considers all components (at a Project level) irrespective of the consenting regime and both applications (S36 and Full PP) are supported by this EIA Report.

1.2 The applicant and the Project team

1.2.1 This EIA Report has been prepared on behalf of the applicant ScottishPower Renewables UK Limited (hereafter referred to as ScottishPower/SPR) by Wood Group UK Ltd (hereafter referred to as Wood),

1.2.2 Wood is registered with the Institute of Environmental Management and Assessment (IEMA)'s EIA Quality Mark scheme. The scheme allows organisations that lead the co-ordination of EIAs in the UK to make a commitment to excellence in their EIA activities and have this commitment independently reviewed.

1.2.3 A statement outlining the relevant experience and qualifications of the competent experts who have prepared this EIA Report is provided in **Appendix 1A**.

1.3 Purpose of the Environmental Impact Assessment Report

1.3.1 This EIA Report has been prepared as part of an EIA relating to proposals on a site adjacent to Whitelee Windfarm comprising the erection and operation of a solar PV farm, BESS, HV cable and associated access and infrastructure as well as the erection of a green hydrogen production facility. EIA is required because the Scottish Ministers[1] consider that the Project meets the criteria for EIA development under *The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017* (hereinafter referred to as the EIA Regulations). This EIA Report has been prepared for the purpose of meeting those requirements of the EIA Regulations that pertain to EIA Reports. The EIA Report provides part of the information that will be used by the Energy Consents Unit (ECU) and EAC and others to inform the process of determining the application for permission, under both Section 36 of the Electricity Act 1989 (the Electricity Act) and Section 32 of the Town and Country Planning (Scotland) Act 1997, as amended (the Planning Act).

1.3.2 The EIA Report is available at https://www.scottishpowerrenewables.com/pages/whitelee_solar_hydrogen_bess.aspx. Under the requirements of Regulation 4 of the Town and Country Planning (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020, which in turn amends Regulation 25 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017, no hard copies of the EIA Report have been made available for inspection.

1.3.3 The Project requires EIA (i.e., it is '*EIA development*') because it falls within Schedule 2 of the EIA Regulations and has been subject to a screening opinion that concluded that it is likely to have a significant effect on the environment.

Screening

1.3.4 The applicant submitted a request for a Screening Opinion (document reference 43122-QOO-XX-02-CO-T-0002_S3_R1) to Scottish Ministers on 14th October 2020. Following statutory consultation with EAC, East Renfrewshire Council (ERC) and South Lanarkshire Council (SLC), the Scottish Ministers provided a Screening Opinion to the applicant on 12th February 2021 setting out their position that the Project was an EIA development. The Screening Opinion also noted there was the possibility of the development straddling two different consenting regimes: the *Electricity Act 1989* and the *Town and Country Planning (Scotland) Act 1997* and any subsequent application under the Town and Country Planning Act may have to consider the need for EIA under The *Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017*. As a single

[1] The competent authority's opinion about the need for EIA is set out in the Energy Consents Unit document titled *Screening Opinion of the Scottish Ministers* dated 12th February 2021 (document unnumbered).

Project it has been determined that all elements of the Project should be included within the EIA and this EIA report will be submitted with all applications made under either regime. For an application under the Town and Country planning Act, any references in this report to the EIA regulations should be considered under the *Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017*. A summary of the findings of the Screening Opinion is outlined below and copies of the Screening Request and Screening Opinion are provided within Volume 7 of this EIA Report.

1.3.5 **Table 1.1** provides a summary of the conclusions within Scottish Minister's written statement contained within Screening Opinion:

Table 1.1 Summary of written statement by topic

Topic	Summary from Written Statement
Cumulative Impact/Effect	The ECU provide narrative on the potential for cumulative impact noting that this would be limited. The ECU state (under Characteristics of the Potential Impacts) that the nature of effects arising will be limited in both magnitude and spatial extent and is not expected to be adverse. Yet, this is caveated by its position that significant effects are likely to occur and that the cumulative effect is therefore also likely to be significant.
Natural Resources	The ECU consider that there would be some significant use of natural resources during construction and operation and note site restoration upon decommissioning. The primary natural resource of high use is water and consequently the ECU note the potential impact of the discharge of waste water.
Waste General	The ECU consider that during construction and operation waste is expected to be minimal across all components. It notes however that potentially hazardous waste (citing Li-ion batteries of the BESS) may arise at the end of their economic life.
Fire Control Plans	Further information on Li-ion battery management and on fire control plans will be required to support the Section 36 application, but not within the EIA Report.
Pollution	The ECU consider the risks arising from pollution and nuisances during operation to be low. There is no specific consideration given to noise impact contained within the Screening Opinion.
Accidents and Major Hazards	The ECU consider that risks to human health are low, provided there is a buffer between residential properties and the Project components.
Ecology	It is advised that detailed consideration must be given to peatland restoration and in particular focus should be given to peat integrity and carbon release. The EcIA should consider the impact of PV panels on habitats, including how rainwater dependent wetland habitats are impacted from PV panel shedding as well as the potential impact on bryophytes and other plants which rely on seed dispersal by wind. Further impacts may also include: • Shading (light and temperature). • Rainfall runoff. • Drainage. • Chemical leaching from piling materials. • Chemical impact from cleaning materials. • Fencing in relation to excluded herbivores. • Fencing in relation to deer management.

Topic	Summary from Written Statement
	• Fencing in relation to badger migration across the solar site. • Fencing in relation to bird strike risk. • Animal welfare in relation to grazing by domestic livestock. • Indirect impact on birds of prey through moorland structure change. • Wildfire management. The ECU consider that a Peat Landslide Hazard Risk Assessment (PLHRA) be undertaken.
Peat	As noted above, the Screening Opinion identifies the need for a PLHRA to be undertaken due to the potential for peat landslide within an upland peatland environment.
Hydrology	GWDTEs: The ECU note the proximity of GWDTEs as well as areas with medium to high flood risk within 1km of the Site and specifically 1 instance adjacent to the solar PV farm and green hydrogen production plant. Private Water Supplies: The ECU state that where PWS sources may be within a 2km buffer, that this will require inclusion within the Hydrological Impact Assessment (HIA) of the EIA Report with included recommendations for mitigation.
Landscape and Visual	The Screening Opinion notes limited sensitive receptors with the main adverse effect cited at Cauldstanes. It recommends the production of an LVIA addressing the following: • Residential Visual Amenity Effects. • The impact of commercial forestry operations and felling on screening of landscape and visual effects from receptors. • The potential water vapour plume arising from the green hydrogen production facility. • Lighting requirements for any component but most likely the green hydrogen production facility (including any potential night time effects). • Glint and glare.
Traffic and Transport	The Screening Opinion provides no detail on Traffic and Transport considerations, beyond the limited comments provided by consultees.
Archaeology	WoSAS have provided comment to the ECU on archaeological matters. The view presented within the Screening Opinion is that these can be addressed via planning condition(s).
Glint and Glare	The ECU note that the inclusion of a standalone Glint and Glare Assessment would be supported but no specific requirement is made for glint and glare to be considered within the EIA Report. The ECU advise that the LVIA should include consideration of potential glint and glare effects on nearby roads and properties (citing Cauldstanes), within the EIA Report.

1.3.6 As set out in Schedule 4 of the EIA Regulations, the following information should be included in an EIA Report:

- The location of the development.
- The characteristics and land-use requirements of the Proposed Development, considering construction and operation (including requisite demolition works where relevant).
- Operational processes such as energy, materials and natural resources used.

- Any residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases).
- The reasonable alternatives that the developer has studied with a comparison of their environmental effects.
- The baseline environment.
- A description of the likely significant effects of the Proposed Development on environmental factors - biodiversity, soil, water, landscape and traffic and transport.
- A description of the methods used in the assessment to determine whether significant effects are likely to occur (contained throughout Technical Assessment Chapters 6 – 9).
- A description of measures and monitoring that have been identified to address likely significant effects (contained throughout Technical Assessment Chapters 6 – 9).
- A non-technical summary (Volume 1).
- A list of references (contained throughout Technical Assessment Chapters 6 – 9).

1.3.7 Regulation 4 and Schedule 4 of the EIA Regulations identifies all topics which may be relevant for consideration within an EIA. As it is accepted that not all topics listed in Regulation 4 will be of relevance to every development, a scoping exercise is undertaken to define the scope of the EIA and the topics for consideration. In this case, the scoping was undertaken informally by the applicant through engagement with EAC and the ECU as well as discussions with some statutory consultees. Furthermore, the findings of the EIA Screening Response, issued by the ECU on 12th February 2021 have been taken into account. As a result, the environmental topics listed in column 1 of **Table 1.2** need to be considered when preparing an EIA Report. Column 2 then lists where these topics are included in this EIA Report, with reference to the relevant chapter numbers.

Table 1.2 Environmental topics to be addressed in the EIA Report and chapter references

Topics[2] that need to be assessed under the EIA Regulations	Chapter titles in this EIA Report
Planning and Energy Policy	Planning and Energy Policy, Chapter 5
Biodiversity	Ecology and Ornithology, Chapter 6
Landscape	Landscape and Visual, Chapter 7
Water Environment	Geology, Hydrology and Hydrogeology, Chapter 8
Transport	Traffic and Transport, Chapter 9

1.4 Structure of this Environmental Impact Assessment Report

1.4.1 The EIA Report comprises 7 Volumes:

[2] In this EIA Report, the word 'topic' is used when referring to the environment that could be affected by the Project or its individual components. Other words with the same general meaning are used in the EIA Regulations, notably 'factor' and 'aspect', but these are not used in the same context within this EIA Report.

- **Volume 1** is a Non-Technical Summary (NTS), which is also available as a standalone document.
- **Volume 2** (i.e., this Volume) is sub-divided into the following chapters.
  - **Chapter 2** explains the need for the Project.
  - **Chapter 3** provides a detailed description of the Project and its individual components.
  - **Chapter 4** details the approach that has been adopted in preparing the EIA Report.
  - **Chapter 5** provides an overview of the legislation and policies that are relevant to the EIA Report.
  - **Chapters 6 to 9** set out the Technical Assessments for the environmental topics that need to be considered in the EIA Report, resulting from EIA Screening.
- **Volume 3** contains the technical appendices and figures relevant to the Ecology and Ornithology Technical Assessment, referred to in Volume 2, Chapter 6 of the EIA Report.
- **Volume 4** contains the technical appendices and figures relevant to the Landscape and Visual Technical Assessment, referred to in Volume 2, Chapter 7 of the EIA Report.
- **Volume 5** contains the technical appendices and figures relevant to the Geology, Hydrology and Hydrogeology Technical Assessment, referred to in Volume 2, Chapter 8 of the EIA Report.
- **Volume 6** contains the technical appendices and figures relevant to the Traffic and Transport Technical Assessment, referred to in Volume 2, Chapter 9 of the EIA Report.
- **Volume 7** contains all other general figures and appendices referred to in the aforementioned volumes.

1.5 Other documents

1.5.1 The planning/S36 applications for the Project are informed by the EIA Report, but is also informed by other documents, the contents of at least some of which are of relevance to the findings of the EIA Report. The latter reports, which are listed below, are therefore included within the appendices to the EIA Report contained within Volume 7:

- Glint and Glare Assessment[3] (document reference 43122-WOOD-ZZ-XX-RP-OP-0001_S0_P01.1) (**Volume 7A**).
- EIA Screening Request (document reference 43122-WOOD-XX-02-RP-T-0003_A_R3) (**Volume 7B**).
- EIA Screening Response (ECU, document unreferenced) (**Volume 7B**).

1.6 Supporting figures

1.6.1 As outlined within **Section 1.4** above, Volume 7 of the EIA contains all general supporting information such as it relates to this EIA Report. This includes:

[3] Glint and Glare Assessment specific to solar PV component only (S36)

Table 1.3 Technical appendices and figures supporting the EIA Report

Technical Appendix	Figure	Location (Volume 7)
Glint and Glare Assessment	-	Appendix 7A
Copy of EIA Screening Request, October 2020	-	Appendix 7B
Copy of EIA Screening Response, February 2021	-	Appendix 7B
Supporting Figures	**Figure 1.1**: Green Hydrogen Production Facility Location Plan **Figure 1.2**: Green Hydrogen Production Facility Site Plan **Figure 1.3**: Solar PV, BESS and HV Cable Location Plan **Figure 1.4**: Solar PV, BESS and HV Cable Site Plan **Figure 1.5**: EIA Report Boundary Plan **Figure 1.6**: Solar PV Farm Proposed Layout **Figure 1.7**: Typical Solar Farm Details **Figure 1.8**: BESS Layout and Elevations **Figure 1.9**: Green Hydrogen Production Facility Indicative Layout Plan **Figure 1.10**: Green Hydrogen Production Facility Indicative Elevations	Appendix 7C

1.7 Representations

S36, to ECU

1.7.1 Any representations on the S36 application should be made directly to the Scottish Government Energy Consents Unit via:

Energy Consents Unit
Scottish Government
4th Floor
Atlantic Quay
150 Broomielaw
Glasgow
G2 8LU
Email – representations@gov.scot

Website – www.energyconsents.scot

Full planning permission, to EAC

1.7.2 Any representation on the Full planning application should be made directly to East Ayrshire Council via:

Planning and Economic Development
Opera House
8 John Finnie Street
Kilmarnock
KA1 1DD
Email – submittoplanning@east-ayrshire.gov.uk

Website - https://eplanning.east-ayrshire.gov.uk/online/

1.8 Availability of the EIA Report

Requirement for physical distribution of EIA Report

1.8.1 In accordance with The Electricity Works (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 and the Town and Country Planning (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 (the Coronavirus Regulations), there is presently a suspension on the requirement to make available physical copies of EIA Reports for public inspection at a named place during the "emergency period".

1.8.2 Instead, these interim regulations replace the requirements of Regulations 4(2) and 5(2) of The Electricity (Applications for Consent) (Scotland) Regulations 1990 which require that, in relation to applications under S36 of the Electricity Act 1989, an applicant must in a public notice name a place in the locality where a map of the proposed development may be inspected. Regulations 7 and 10 of these Regulations provide that objections may be made and notices served in physical form.

1.8.3 Regulation 2 of The Electricity Works (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 amends the aforementioned Regulations of The Electricity (Applications for Consent) (Scotland) Regulations 1990, suspending the requirement for a map to be made available by the applicant in physical form in a public place and replacing this with the requirement for a map to be published by the applicant on a website during the emergency period. The amending regulation provides that objections may be made electronically during this period.

1.8.4 Likewise, Regulation 4 of the Town and Country Planning (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 amends Regulation 7(2) and Regulation 7 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 and allows for the same temporary modifications as outlined in paragraph 1.3.3 above (however under the Planning Regulations).

Requirement for notices

1.8.5 Regulations 14 and 20 of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 require that an application for consent under S36 of the Electricity Act 1989 must include publication of a notice stating the times and places at which either an EIA Report or additional information to be included in an EIA Report may be inspected by members of the public.

1.8.6 Regulation 4 of The Electricity Works (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 amends these requirements such that it is not necessary for any applicant to name a place where such information may be inspected during the emergency period.

1.8.7 Regulation 21 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 requires that an application for consent under S32 of the Planning Act 1997 must include publication of a notice stating the times and places at which either an EIA Report or additional information to be included in an EIA Report may be inspected by members of the public.

1.8.8 Regulation 4 of the Town and Country Planning (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 amends these requirements such that it is not necessary for any applicant to name a place where such information may be inspected during the emergency period.

Requirement for submission of hard copies of EIA Report to Scottish Ministers

1.8.9 Regulation 17 of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 requires the developer to submit hard copies of an EIA Report to the Scottish Ministers.

1.8.10 Regulation 4 of The Electricity Works (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 provides that this requirement is suspended during the emergency period, and that a hard copy shall be made available to the Scottish Ministers following the "emergency period".

1.8.11 Regulation 18 of The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 places a requirement upon a developer to make available an EIA Report, on submission of an EIA application, for physical inspection at a named place.

1.8.12 Regulation 4 of The Electricity Works (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 suspends this requirement during the emergency period.

Requirement for submission of hard copies of the EIA Report to the local planning authority

1.8.13 Regulation 21 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 requires that the developer must submit hard copies of an EIA report to the local planning authority so that it may be made physically available at an office of the planning authority where it may be expected.

1.8.14 Regulation 4 of the Town and Country Planning (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020 suspends this requirement during the emergency period.

Alternative arrangements by the applicant

1.8.15 Notwithstanding the above changes arising from The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, the applicant recognises the need to present the findings of the EIA Report as a matter of public record and in the interests of public engagement and transparency has sought to make the EIA Report available in digital format at the following web address:

https://www.scottishpowerrenewables.com/pages/whitelee_solar_hydrogen_bess.aspx

Request for physical copies of EIA Report

1.8.16 Digital copies of complete application submissions are available free of charge on CD. Hard copies of the application may be obtained at a reasonable charge reflecting the cost of making the application(s) available.

To request a copy of the application submissions please contact:

Jamie Gilliland
ScottishPower Renewables UK Limited
320 St Vincent Street
Glasgow
G2 5AD

2. Project Background

2.1 History of the Whitelee site

2.1.1 SPR has developed the Whitelee site in phases across a number of years. The original windfarm project started operations in 2008, with subsequent extensions taking the windfarm to a total of 215 turbines. These are served by two substations, one at Ardochrig on the eastern side (developed for the original wind farm) and one near Rough Hill on the western side (developed for the extended windfarm). The windfarm also incorporates a visitor centre and a series of walking and cycle trails area available for public use in and around the site.

2.2 Site selection

2.2.1 The applicant's site selection process is designed to identify sites which provide the most financially and technically viable option whilst being the least environmentally impactful and thereby standing the best opportunity to gain consent. The applicant has selected the Site principally as it allows for the best opportunity to make a meaningful contribution to Scotland's national targets for renewable energy generation.

2.2.2 The applicant is committed to avoiding development in areas where there would be an unacceptable effect on designated sites and where suitable mitigation cannot be achieved. The applicant is also committed to not considering sites that have an unacceptable effect on landscape character or amenity of National Parks and National Scenic Areas, and special consideration is attributed to internationally and nationally important species and habitats in the wider area.

2.2.3 The following factors have led to the selection of the Site for the Project:

- Acceptable solar resource during peak months.
- Good levels of site accessibility and access from the motorway network.
- The lack of statutory nature conservation designations on the site.
- The close proximity to potential grid connection points.
- The relatively sparse population of the surrounding area.
- A good landscape fit.
- A good opportunity to extend the green energy infrastructure for which the wider Whitelee Windfarm is associated with and the ability to provide connection to the windfarm – increasing operating efficiency.
- Past knowledge of the site gained from the previous windfarm applications, including the ability to use previously gathered baseline data to inform design principles.
- Designated as an area with potential for Wind Energy Development within the East Ayrshire Local Development Plan 2017 (LDP2017) which sets a policy context for renewable/green energy.

2.2.4 The EIA Report site boundary is identified on **Figure 1.5** of Volume 7 and the site plan indicating all of the project components is identified on **Figure 1.4** of Volume 7.

2.3 Consideration of alternatives

Introduction

2.3.1 The EIA Regulations make two references to the consideration of alternatives, as follows.

- In paragraph 5(2)(d) of Part 1 it states that an EIA Report should include "*a description of the reasonable alternatives studied by the developer, which are relevant to the development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*".
- Paragraph 2 of Schedule 4 states that an EIA Report should include "*A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.*"

2.3.2 Although no alternatives have been studied, this EIA Report is compliant with the requirements relating to alternatives under the EIA Regulations, because no alternatives are considered relevant to this Project.

3. Description of the Project

3.1 Introduction

3.1.1 In writing the scheme description, consideration has been given to the requirements of Schedule 4 of the EIA Regulations in which paragraph 1 states that the description should include:

a) *"a description of the location of the development;*

b) *a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;*

c) *a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;*

d) *an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases."*

3.1.2 These requirements are addressed in the sub-sections below.

3.2 Project and development description

Site location

3.2.1 The Site is located immediately adjacent to Whitelee Windfarm and is wholly contained within the local authority area of East Ayrshire. Overall, it encompasses a total area of approximately 1,000+ hectares. Of this area it is anticipated that between 40 and 50 hectares would be considered net developable area for the Project, with an additional c. 8km cable route connecting between the green hydrogen production facility, the BESS, and the existing Rough Hill substation. Of the total cable route, 4.4km comprises new cable and 3.6km is existing cable between wind turbines to which the route will tie in.

3.2.2 The Site is located approximately c. 6.8km (4.25 miles) from the nearest settlements of Eaglesham (East Renfrewshire, to north east), c. 7.4km (4.6 miles) from Fenwick (East Ayrshire, to south west), c. 5.8km (3.6 miles) from Waterside (East Ayrshire, to south west) and c. 8km (5 miles) from Moscow (East Ayrshire, to south).

3.2.3 The Site is located within a highly accessible area adjacent to the B764 which is located to the north of the Site boundary with access to the strategic motorway network from the M77 within c. 800m to the west of the proposed site access.

Project component locations

3.2.4 The main components of the Project considered within the EIA Report are located as shown in **Table 3.1** below.

Table 3.1 Component locations

Component	Consenting Regime	UK Grid Reference (centred location)
Primary site access	S36, to ECU	NS 49870 47450
Solar PV farm (inc. haul/link road)	S36, to ECU	NS 50631 47244
BESS (inc. Cable)	S36, to ECU	NS 54619 44999
Green hydrogen production facility	Full PP, to EAC	NS 51284 47199

Development proposals

Solar PV farm (S36)

3.2.5 It is anticipated that the solar PV farm will comprise c. 62,000 solar panels, each with height less than 3m at the frame's highest point, constructed as a series of arrays. The panels will connect via HV and LV cabling to a proposed substation building located within the green hydrogen production facility development area. From this substation, HV cabling provides further direct connection between the green hydrogen production facility and the BESS.

3.2.6 It is proposed to locate the solar PV farm within a section of the Site contained to north west of the Site boundary and centred on NS 50955 47366. This area of the Site sits south of Kingswell and Tent Knowe and east of Cauldstanes at Collory Bog and extends to approximately 12.5 hectares. This area allows the solar PV arrays to be located in such a way whereby they can be optimally integrated into the landscape with minimal regrading of the land or changes to its natural topography.

3.2.7 The final choice of solar PV panel model would be selected through a competitive procurement process prior to installation on site. At submission stage, it is uncertain which panel model would be used and therefore a degree of flexibility is required regarding the ultimate panel design and dimensions. However, based on the requirement to achieve a solar scheme which would provide a 20MW output, it is anticipated that the installed nominal capacity of each panel will be at least 310W.

3.2.8 The proposed layout has been selected in response to various site constraints, with the specific intention of avoiding, where possible, areas of deep peat (>3m depth) and good condition blanket mire. To achieve this, initial peat probing has been conducted across the identified solar search area and this data has been incorporated into a constraints plan, which has informed the layout.

3.2.9 In addition to the peatland constraints, there are a number of watercourses which cut across the solar PV farm. A standard buffer of 20m has been applied to these watercourses to mitigate against any potential impacts on water quality and groundwater dependent terrestrial ecosystems (GWDTEs). Further detailed information on these watercourses can be found below within the Technical Assessment contained in **Chapter 8** on hydrology, geology and hydrogeology.

3.2.10 The proposed haul/link road which travels east/west between the new access at the B764/Moor Road would support the construction of the solar panel arrays. The solar panel arrays have been designed around the need for this access, but its location may be micro-sited within 100m either side of its location as shown on **Figure 1.4**. This micrositing is requested in order to allow a degree of flexibility to take into account localised ground conditions and other environmental constraints which may be identified during post-consent survey works. The applicant would seek to agree the

use of a planning condition requiring all micrositing to be agreed with the Local Planning Authority in advance of construction works taking place.

Solar PV farm yield

3.2.11 The primary function of the solar PV farm is to provide a direct source of green (i.e., renewable) electricity to feed the green hydrogen production facility and therefore the demand of the green hydrogen production facilities is a key parameter in determining the scale of the solar PV farm. In this instance, the green hydrogen production facility has an electrical demand of c. 20MW.

3.2.12 Given this demand, it was initially predicted that c. 20MW was deliverable from the proposal solar PV farm layout. Following initial optimisation however, the predicted solar yield may be up to 40MW across the same site area. This additional provision allows for greater operational flexibility through storage within the BESS; which also acts as a redundancy measure in the event that there are any planned interruptions or unexpected issues with electricity supply to the green hydrogen production facility from the solar PV farm.

Solar PV farm – access by road and other transportation modes

3.2.13 The Site would eventually be accessed via a proposed new vehicular junction to/from the B764 (NS 49870 47450) which leads to a proposed internal 1.5km haul/link road travelling east/west between the junction and the green hydrogen production facility. This access has been designed to a suitable standard for the use of 17.5m steel beam, 4 doll transporters (tube trailers) which are the largest vehicles which will use the haul/link road and are required for the export of hydrogen. The haul/link road also primarily supports access for smaller maintenance vehicles for the solar PV farm supporting the operation of the solar PV farm. For further information please refer to **Chapter 9**: Traffic and Transport below.

Solar PV farm – waste management

3.2.14 Exact quantities and types of waste are unknown at this stage of the Project. It is expected that they could include:

- Excavated material.
- Forestry residues.
- Welfare facility waste (construction phase).
- Packaging.
- Chemicals, fuels and oils.
- Metals.
- Waste water (dewatering and cleaning activities).
- General construction waste.

3.2.15 A Site Waste Management Plan (SWMP) will detail how waste streams are managed. The Waste Hierarchy[4] of prevention, reuse, recycle, recover and disposal to landfill – as a last resort – will be applied to the methodology of the SWMP. It is anticipated that the SWMP will be submitted for the prior agreement of the local planning authority and implemented prior to the start of construction activities on site.

[4] https://www.gov.scot/publications/guidance-applying-waste-hierarchy/pages/2/

3.2.16 Furthermore, it is not anticipated that the solar PV farm component will give rise to waste in large quantities once operational and therefore it is not considered for waste to be further assessed for this phase of activities within this EIA Report.

Solar PV farm – vulnerability to major accidents and disasters

3.2.17 It has been identified within the ECU Screening Response that the Project's vulnerability of major accidents and disasters is extremely low. Therefore, this element has been scoped out of the EIA Report.

Solar PV farm – ancillary infrastructure & temporary construction laydown area

3.2.18 The solar PV farm will include several centre inverter stations (approximately 10 of), site tracks, HV and LV cabling, perimeter security fencing and CCTV cameras. The final detail of these layouts will be informed by further post-consent survey works, and the applicant would seek to agree the finalised designs and locations of all ancillary infrastructure through planning conditions.

3.2.19 For the purposes of construction, a temporary construction laydown area is required. This area, located at NS 49974 47276, would measure approximately 0.8 hectares and would be formed of a hardstanding with perimeter security fencing, details of which will be agreed prior to construction activities taking place. The temporary construction laydown area is required throughout the duration of construction activities on site and would be removed prior to commencement of the operational phase.

BESS and HV cable (S36)

BESS – proposed site layout and infrastructure

3.2.20 The BESS would have an operating capacity of up to 50MW. It is constructed as a portal frame building of approximate dimensions 70m x 62.5m x 6.8m (to apex) enclosing the following elements:

- 3 No. Battery rooms.
- 2 No. Transformer/inverter compounds.
- HV Switchgear room.
- LV room.
- Store.
- Office and WC.
- Supervisory Control and Data Acquisition (SCADA) equipment.

3.2.21 Outwith the main building is associated plant including:

- 2 No. HVAC condenser plinths.
- LV switchroom.
- Site security kiosk.
- Water tank (fire suppression system).
- 2m high security fencing.

- Up to 6 vehicle parking spaces.

3.2.22 The BESS design is based on that of the Whitelee BESS located adjacent to the Ardochrig electrical substation, which was consented by the ECU (ref. ECU00000729) in June 2019 and which is under construction at the time of writing.

3.2.23 The BESS is centred on grid reference NS 54619 44999 and its location is shown on **Figure 1.4**.

HV cable

3.2.24 The route of the proposed HV cable is shown on **Figure 1.4**. It is requested that the precise location of the cable route may be micro-sited in order to provide flexibility for the construction of this component. It is anticipated that should any changes to the cable route shown be made prior to construction, these details will be submitted for approval in writing.

3.2.25 The HV cable comprises a mix of new cable and tie ins to existing HV cable apparatus at Whitelee Windfarm Extension.

3.2.26 A new section of HV cable measuring approximately 4km will run north/south between the substation contained within the green hydrogen production facility and an existing wind turbine located at the Rough Hill area of the Site, to the west of Craigendunton Reservoir (NS 51959 45164). The route will partially follow existing forestry tracks to minimise environmental impacts within the Habitat Management Plan (HMP) area located south of the solar PV farm and green hydrogen production facility.

3.2.27 At the point of the existing wind turbine identified in the preceding paragraph, the new section of HV cable would tie on to an existing section of HV cable which runs between the 6 turbines of the Rough Hill spur of the Whitelee Windfarm over a length of approximately 3.6km, to the existing Rough Hill substation. By taking advantage of existing HV cable apparatus in this location, construction works and disruption to the windfarm are significantly minimised.

3.2.28 From the southernmost wind turbine of the Rough Hill spur (NS 54913 45179), the cable route branches east and west. To the east the existing HV cable route remains as existing over a distance of 330m, terminating at the existing Rough Hill substation. To the west a new section of cable measuring approximately 385m will terminate at the BESS.

3.2.29 Across its span, the proposed HV cable will be buried beneath ground.

BESS and HV cable – access by road and other transportation modes

BESS

3.2.30 Additional to the new site access outlined above, site access to the BESS is anticipated via the existing Whitelee Windfarm spine (link) road via the B764 (NS 51762 48585). This existing access currently serves as the operational access to the applicant's Control Centre and is a controlled access managed by the applicant. From this link road, direct access can be taken through the Whitelee Windfarm access tracks directly to the substation and BESS at the south of the Site. This road has been built and designed to a standard capable of supporting abnormal loads – due to its use for the Whitelee Windfarm construction and is therefore sufficient as a means of operational access to/from the BESS and also as a means of construction access for the BESS and any abnormal loads (AILs) required.

HV cable

3.2.31 The majority of the HV cable would make use of existing tracks within the Site. New lengths of track would be required for a section to the east of Flow Moss to Dunton Water. These new tracks would be retained following the completion of construction.

BESS and HV cable – waste management

3.2.32 Exact quantities and types of waste are unknown at this stage of the Project. It is expected that they could include:

- Excavated material.
- Forestry residues.
- Welfare facility waste.
- Packaging.
- Chemicals, fuels and oils.
- Metals.
- Waste water (dewatering and cleaning activities).
- General construction waste.

3.2.33 A Site Waste Management Plan (SWMP) will detail how waste streams are managed. The Waste Hierarchy[5] of prevention, reuse, recycle, recover and disposal to landfill – as a last resort – will be applied to the methodology of the SWMP. It is anticipated that the SWMP will be submitted for the prior agreement of the local planning authority and implemented prior to the start of construction activities on site.

3.2.34 Furthermore, it is not anticipated that the BESS and HV cable components will give rise to waste in large quantities once operational and therefore it is not considered for waste from this phase of activities to be further assessed within this EIA Report.

BESS and HV cable - vulnerability to major accidents and disasters

3.2.35 It has been identified within the ECU Screening Response that the Project's vulnerability of major accidents and disasters is extremely low. Therefore this element has been scoped out of the EIA Report.

BESS and HV cable - ancillary infrastructure – temporary construction laydown area

BESS

3.2.36 For the purposes of construction, a temporary construction laydown area is required. This area, located at NS 54678 45042, would measure approximately 0.3 hectares and would be formed of a hardstanding with perimeter security fencing, details of which will be agreed prior to construction activities taking place. The temporary construction laydown area is required throughout the duration of construction activities on site and would be removed prior to operation.

[5] https://www.gov.scot/publications/guidance-applying-waste-hierarchy/pages/2/

Green hydrogen production facility (Full PP)

3.2.37 The green hydrogen production facility is embedded within the solar PV layout and incorporates the substation building required for the solar PV farm. It is proposed that the green hydrogen production facility will ultimately be accessed via a c. 1.5 km haul/link road connecting directly to the B764/Moor Road via a new vehicular junction located at NS 49870 47450.

3.2.38 The extent of the green hydrogen production facility site measures 120m x 120m based on a site platform of 1.44 hectares. This is inclusive of the proposed temporary construction laydown area located along the span of the northern boundary of the Site.

3.2.39 Operationally, the green hydrogen production facility will operate continuously over 24 hours. This is expected to require 8 full time equivalent (FTE) staff including the requirement for 24-hour on-site security. It is not anticipated that all staff will be in attending the site at the same time and therefore a parking provision based on 4 staff parking bays and 2 visitor parking bays is considered sufficient to meet the staffing requirements of the plant.

Green hydrogen production facility – access by road and other transportation modes

3.2.40 Access to/from the green hydrogen production facility is taken via a new access at the B764 leading to a proposed 1.5km haul/link road which would serve the solar PV farm and which links to the north west of the Site. As the haul/link road is necessary to serve the solar PV farm and its ongoing maintenance and management, it has been considered that it is appropriate for it to be proposed within the S36 application.

3.2.41 Through the design evolution of the Project, it has been determined that the least environmentally impactful option is to utilise the haul/link road for the combined purpose both serving the solar PV farm and also to serve the green hydrogen production facility which is located within the wider solar PV farm site.

3.2.42 Operationally in respect of the green hydrogen production facility, it is intended that tube-trailers would enter the site from the north west and be able to directly access four filling bays for their use only. These filling bays are located directly adjacent to the high-pressure green hydrogen storage vessels. General vehicles would use the same access route via the haul/link road and would access the green hydrogen production facility via a separate designed access point located at the south west corner of the site, leading to the site office and associated staff and visitor parking.

Green hydrogen production facility – proposed site layout and infrastructure

3.2.43 Whilst relatively compact in footprint, the green hydrogen production facility will include the following infrastructure as shown in **Table 3.2** below:

Table 3.2 Balance of Plant and Associated Infrastructure

Plant Information	Indicative Proportions (L x W x H)
Hydrogen electrolyser stack house	35m x 30m x 6.5m
Hydrogen purification unit	30m x 15m x 4m
Site office with associated staff and visitor parking	10m x 8m x 5m
Transformer compound	30m x 8m x 3.45m
Water purification unit	15m x 10m x 4m

Plant Information	Indicative Proportions (L x W x H)
Water supply kiosk	2.5m x 2.5m x 3.2m
SPR substation	12m x 12m x 5m
H2, O2 and H2O separation unit	3m x 3m x 12m
O2 capture unit	10m x 12m x 6m
N2 bottles/skid unit	5m x 8m x 3m
Air compressor unit	10m x 8m x 2.5m
Compressor house	15m x 10m x 6m
Lube oil storage and cooler	10m x 10m x 9m
H2 storage vessels/racks	39m x 27m x 5m
Security gatehouse	3m x 3m x 4m
Internal fencing	max height 3m
External security fencing	max height 3m
Pipework gantries	N/A
4 No. filling bay valves on 1 pipework skid (for H2 filling of tube trailers on-site for export off-site)	N/A
Foundations and hardstanding	N/A

Green hydrogen production facility – description of particular features or operations

3.2.44 The green hydrogen production facility operates based on Polymer Electrolyte Membrane Electrolysis (PEM) technology with a predicted capacity for supply up to 10,000kg of green hydrogen per day based on up to a maximum of c. 23MW power demand during the life of the project. The anticipated water demand for the facility is up to c. 480,000 litres per day and is anticipated to be supplied by mains water supply.

3.2.45 The PEM electrolysis technology involves several steps in its process as outlined in **Table 3.3**:

Table 3.3 PEM Electrolysis – Process Summary

Process Step	Description
Water Purification	The feed water enters the Water Purification System to deliver high-purity deionized water required for the electrolysis process.
Water Polishing	To reuse water from the electrolysis system, a Water Polishing System is installed. Incoming water from the prior purification unit and returning water from the electrolysers is further processed to reach the high-water purity.
O_2/H_2O Separation	Oxygen and water are separated in a separation vessel and the oxygen is vented to the atmosphere. Oxygen can also be recovered and utilized for other purposes.

Process Step	Description
Electrolysis Cube Modules	The electrolysis modules split the incoming water into hydrogen and oxygen using PEM electrolysis technology. ITM Power's multi-MW scale electrolysers are built with a modular design philosophy. The stack modules are manufactured onto a skid-frame and built in banks of 3 stacks. Hydrogen is generated at a pressure of 30 bar within the stack while the oxygen is generated at a lower pressure. Each 3-stack module is housed inside a standard ISO container to enable ease of shipping and installation. The modules are completely pre-fitted, to simplify site-installation, and factory acceptance tested before they leave the factory.
H_2/H_2O Separation System	The produced hydrogen stream of the electrolysis system is post-processed to achieve the desired purity. The first step of purification involves a separation of the H2/H2O through a separation vessel.
H_2 Deoxo System	The hydrogen passes to the H2 Deoxo System, which removes excess oxygen from the hydrogen stream.
H_2 Drying System	In the next stage the hydrogen passes a H2 Drying System, which removes any remaining water and achieves the desired hydrogen purity.

3.2.46 This purified hydrogen is contained with the horizontal stacked high-pressure vessels located to the north east of the site. Tube-trailers entering the site from the north west access would arrive and park at one of the four available loading bays and connect to the pipework skid for filling. This process can take approximately 6 hours and once completed, the now full tube-trailer would unhook from the pipework skid and exit the site to via the north east access it arrived by.

3.2.47 The two raw materials for the green hydrogen production facility are electricity and water. Electricity would be substantially served from the associated solar PV farm or, in limited circumstances primarily resulting from seasonal reductions in solar availability, from the BESS and/or excess electricity produced at Whitelee Windfarm and Extension. Water supply would be taken from a direct connection to the network and potable/tap water is sufficient as a means of supply.

3.2.48 The total plant water consumption at the beginning of life is anticipated to be 20 cubic metres per hour, which is equivalent to 480,000 litres per day. However, variance may occur depending on local water quality. The water consumption will increase during the lifespan of the plant as stack efficiency reduces and cooling requirements increase.

3.2.49 Power supply is required by means of HV cable transfer at 33kV. Projected maximum electricity consumption is c. 23MW.

3.2.50 The figures above however assume that the plant would operate at full capacity on day 1 of operation, however plant capacity will be driven by offtaker demand.

Green hydrogen production facility – waste management

3.2.51 Exact quantities and types of waste are unknown at this stage of the Project. It is expected that they could include:

- Excavated material.
- Forestry residues.
- Welfare facility waste (construction).
- Packaging.

- Chemicals, fuels and oils.
- Metals.
- Waste water (dewatering and cleaning activities).
- General construction waste.

3.2.52 A Site Waste Management Plan (SWMP) will detail how waste streams are managed. The Waste Hierarchy[6] of prevention, reuse, recycle, recover and disposal to landfill – as a last resort – will be applied to the methodology of the SWMP. It is anticipated that the SWMP will be submitted for the prior agreement of the local planning authority and implemented prior to the start of construction activities on site.

3.2.53 Furthermore, it is not anticipated that the green hydrogen production facility component will give rise to waste in large quantities once operational and therefore it is not considered for waste from this phase of activities to be further assessed within this EIA Report.

Green hydrogen production facility - vulnerability to major accidents and disasters

3.2.54 It has been identified within the ECU Screening Response that the Project's vulnerability of major accidents and disasters is extremely low. Therefore, this element has been scoped out of the EIA Report.

Green hydrogen production facility – ancillary infrastructure – temporary construction laydown area

3.2.55 Associated with the green hydrogen production facility is a temporary construction laydown area sited immediately north of the fence line. This area measures 120m x 30m spanning the north boundary of the Site and formed of temporary hardstanding. The compound will be enclosed by means of security fencing and details of on-site security during construction will be finalised prior to the commencement of construction activities.

3.2.56 In respect of plant construction, it is anticipated that modules will, where possible, be pre-fitted remotely for delivery to site to keep site installation to a minimum.

Site wide ancillary infrastructure

3.2.57 In addition to the main temporary construction laydown areas, it is proposed that there will be several minor laydown areas located throughout the site, which will be used in a temporary capacity for the duration of construction before being removed and the site restored. The location of these areas would be confirmed post-consenting during pre-construction mobilisation activities. Their finalised locations would be included within the Construction Environmental Management Plan (CEMP) supporting information which the applicant anticipates submitting for the approval of EAC prior to the commencement of construction activities on site.

Health and safety

3.2.58 This Section of the EIA Report identifies and evaluates the Health and Safety effects anticipated to arise as a result of the Project and its components, it considers:

- Direct personnel – associated with construction, operation and decommissioning activities across all components.

[6] https://www.gov.scot/publications/guidance-applying-waste-hierarchy/pages/2/

- Indirect personnel – associated with other site-wide and adjacent operations – forestry activities and windfarm activities.
- The general public, utilising the adjacent windfarm as a site for recreation.
- Other – farming, agriculture and associated activities.

Baseline conditions

3.2.59 Commercial forestry operations are currently active within the Site and the surrounding locale. These activities, undertaken by Forestry and Land Scotland (FLS) (previously Forestry Commission) involve felling operations and the transportation of plant and machinery to/from the site as well as the export of timber offsite via existing forestry and windfarm tracks and routes.

3.2.60 Renewable energy operations in connection with the adjacent Whitelee Windfarm. These activities (undertaken by SPR) involve the ongoing production of renewable (wind) energy and the associated management and maintenance of the windfarm and its infrastructure.

3.2.61 Public recreation also occurs in connection with the windfarm, which is a popular destination for tourism and outdoor pursuits such as walking, running and cycling. The identification of Core Paths within the vicinity of the site is outlined below within **Chapter 7** (Landscape and Visual) and **Chapter 9** (Traffic and Transport).

3.2.62 Farming activities also occur within the vicinity of the Site, including the grazing of livestock within the Site itself.

Embedded mitigation

3.2.63 Health and safety is embedded into the design and layout of the Project and its various components at all levels. Solar PV panels are designed to be safe and are built to withstand extreme weather conditions. Both the BESS and the green hydrogen production facility are proposed in locations which are considered remote to the majority of identified receptors, although it is noted that the BESS is within a location accessible via existing windfarm access tracks. To ensure further protection of both component and receptors, the BESS and green hydrogen production facility will be enclosed by means of security fencing and gated access and will be monitored during their operation via a mixture of CCTV and dedicated on site security personnel.

3.2.64 Health and safety during construction and decommissioning falls within the Construction (Design and Management) Regulations 2015[7] (CDM). While full details of the health and safety strategy are yet to be determined in relation to construction and decommissioning activities, it is anticipated that these will include:

- Production of a pre-construction information pack for contractors.
- The appointment of a Construction Project Manager and nominated personnel responsible for the production of a Construction Phasing Plan in relation to health and safety (Health and Safety Plan) alongside the creation, completion and monitoring of a site Safety File and direct liaison with the applicant.
- Restriction of public access to the Site throughout the period of the construction programme, and during operational phases of the solar PV farm, green hydrogen production facility and BESS (within the fence lines) with existing areas of public access being reinstated post-construction.

[7] https://www.legislation.gov.uk/uksi/2015/51/contents/made

Mitigation and residual effects

3.2.65 The embedded mitigation measures outlined will ensure Health and Safety concerns during the construction of the Development are eliminated or minimised as far as reasonably practicable.

Proposed working hours

3.2.66 There will not be a requirement for a large number of permanent staff at the site as most of the assets can be managed remotely. In respect of staffed working hours information on a component-by-component basis is outlined below.

3.2.67 By far, the most intensive periods of working with the highest relative volumes of staff on site will occur during construction, with an anticipated peak of approximately 200 members of staff on site per day. However, this is not anticipated to occur consistently across the entirety of the 13 month construction programme.

3.2.68 Decommissioning hours are not provided as consent is sought in perpetuity with components replaced on a like-for-like basis when they reach the end of their usable working lifespan.

Construction – all components

3.2.69 Construction activities across all components of the Project will occur on a 7 day per week basis. It is anticipated that permitted core working hours shall be between 07:00 (7am) until19:00 (7pm) Monday – Friday and 08:00 (8am) until 16:00 (4pm) Saturdays and Sundays. The exact figures for construction staff on-site vary across the duration of the construction phase, and it is yet to be established what construction staff figures will be on a component-by-component basis. At peak it is currently predicted that there may be up to 200 members of staff on site per day.

Solar PV farm – operational phase

3.2.70 The solar PV farm will be technically operational on a 24/7 basis however during this time it is not anticipated that there will be operational staff working on site. Operational staff hours will be extremely low and limited to infrequent site work in connection with maintenance and management of the solar PV panels, arrays and infrastructure. It is anticipated that general maintenance and management of the solar PV farm during operation will occur during daylight hours and may occur on any given day per week, albeit infrequently.

BESS and HV cable - operational phase

3.2.71 BESS – the BESS will operate on a 24/7 basis and will require infrequent staffing for maintenance and management only. The anticipated manhours are predicted to be 0.5 members of staff on site per day on a full time equivalent (FTE) basis.

3.2.72 HV Cable – Low level infrequent visits to undertake routine maintenance and management across cable route and period inspections of cable condition. Occasional remedial works may be undertaken on an infrequent basis primarily during daylight hours on any given day per week.

Green hydrogen production facility – operational phase

3.2.73 The green hydrogen production facility will require permanent staffing both from an operational and site security standpoint and this will be on a 24/7 basis. The anticipated manhours are predicted to be 8 members of staff on site per day on a FTE basis. This is consistent with the 24/7 nature of the operation of the green hydrogen production facility.

Construction timescales and programme

3.2.74 It is anticipated that construction activities associated with the entire Project would take approximately 53 weeks/12.25 months with a programme based on a predicted construction commencement date in April 2022 and a construction completion date of April 2023. The breakdown of construction activities as currently anticipated is as shown in **Table 3.4**.

Table 3.4 Summary construction programme

Activity	Projected Timeframe
Mobilisation – Civil Works	8 weeks
Site Access Construction	8 weeks
Haul/Link Road Construction	28 weeks
Solar PV frame installation	11 weeks
Solar PV panel installation	12 weeks
Solar PV cabling	12 weeks
BESS Construction Operations	37 weeks
Grid Connection	16 weeks
Site Restoration and Reinstatement	4 weeks

3.2.75 The above programme is based on assumed construction activities taking place on a five days per week basis. Programme may be subject to change post-planning. It would be the intention of the applicant to keep EAC informed of any alternations to the project programme.

Operational Phase

3.2.76 The applicant's experience through operation of the UK's largest portfolio of windfarms suggests that there is no operational need to limit the lifetime of renewable energy development. Therefore, consent is being sought for the Project and its components in perpetuity. Increasing the operational period allows the costs of renewable energy to be reduced and maximises the contribution that the Project as a whole can make towards climate change and renewable energy targets. Furthermore, there are no current statutory or legislative limits to the duration of consent for renewable energy development proposals.

Decommissioning

3.2.77 Decommissioning of components will take account of the environmental legislation and technology available at the time of decommissioning. While it is noted that consent is sought in perpetuity and therefore decommissioning would only occur when a component, or section of, reaches the end of its operational lifespan it is anticipated that replacement works would occur on a like for like basis. Where necessary, notice will be given to EAC in advance of commencement of decommissioning works, with all necessary licenses or permits being acquired. This will be in line with the decommissioning plan to ensure any works are timed to minimise environmental impact.

Transport movements

Construction Traffic and Access

3.2.78 The Site has good access to the surrounding road network. It is envisaged that all development related vehicles would access the Site from the wider transport network via the M77/A77 corridor. Traffic to and from the north (of the Site) would leave the strategic road network at Junction 6, and traffic to and from the south (of the Site) would leave at Junction 7 and 8 of the M77, route along the A77 to the B764, and then east to the Site.

3.2.79 It is anticipated that the solar PV panels, plant and infrastructure will be primarily fabricated off-site and then transported to the Site via the motorway network, with access taken from the M77, junction 6. Upon arrival at the Site entrance, access will be taken to the northern part of the Site via the proposed new site access and link road for works associated with the solar PV farm and the northern sections of the HV cable route.

3.2.80 For the BESS and the southern sections of the HV cable route, access will be taken through the existing Whitelee Windfarm. This access is proposed via the existing Whitelee Windfarm Control Centre access (spine) road located at the B764/Moor Road (NS 51764 48588) which runs north/south parallel to the Site's eastern boundary and allows for internal access routing to the existing Rough Hill substation and the BESS site via existing access tracks.

3.2.81 It is not anticipated that abnormal loads will be required to support the delivery of site infrastructure and that in most cases standard HGV movements can be predicted. Where abnormal loads may be required in limited circumstances, routing will be directly via the motorway network as above and as outlined within Volume 2, **Chapter 9** of the EIA Report.

3.2.82 It is anticipated that prior to construction works being undertaken that a Construction Traffic Management Plan (CTMP) will be prepared in line with best practice guidance, and the applicant anticipates that such a requirement would form a condition of any consent granted.

3.2.83 Furthermore, it is anticipated that site personnel and construction workers will travel to the Site on a shared transportation basis and that the detail of this and its management would be contained within the CTMP.

Construction Traffic Management

3.2.84 It is proposed that the management of all construction activities on site would be informed through the production of a Construction Environmental Management Plan (CEMP) which would be prepared and adopted prior to the onset of construction activities on site. The CEMP would be produced in line with best practice guidelines and in consultation with EAC and other identified stakeholders. As with the CTMP, it is anticipated that the requirement for a CEMP would form a condition of consent.

3.2.85 Combined, the CTMP and CEMP would form the primary management and reporting tools for all on-site construction activities.

3.3 Evolution of the proposed scheme

Solar PV farm

Development design

3.3.1 The solar PV farm as presented in this EIA Report has been the subject of a number of iterations and refinements which seek to mitigate by design predicted adverse effects as far as reasonably practicable. The resultant proposal balances the environmental and technical constraints, whilst producing an economically viable Project overall. Design changes made as a consequence of the key constraints are considered to be mitigation which is 'embedded' in the design.

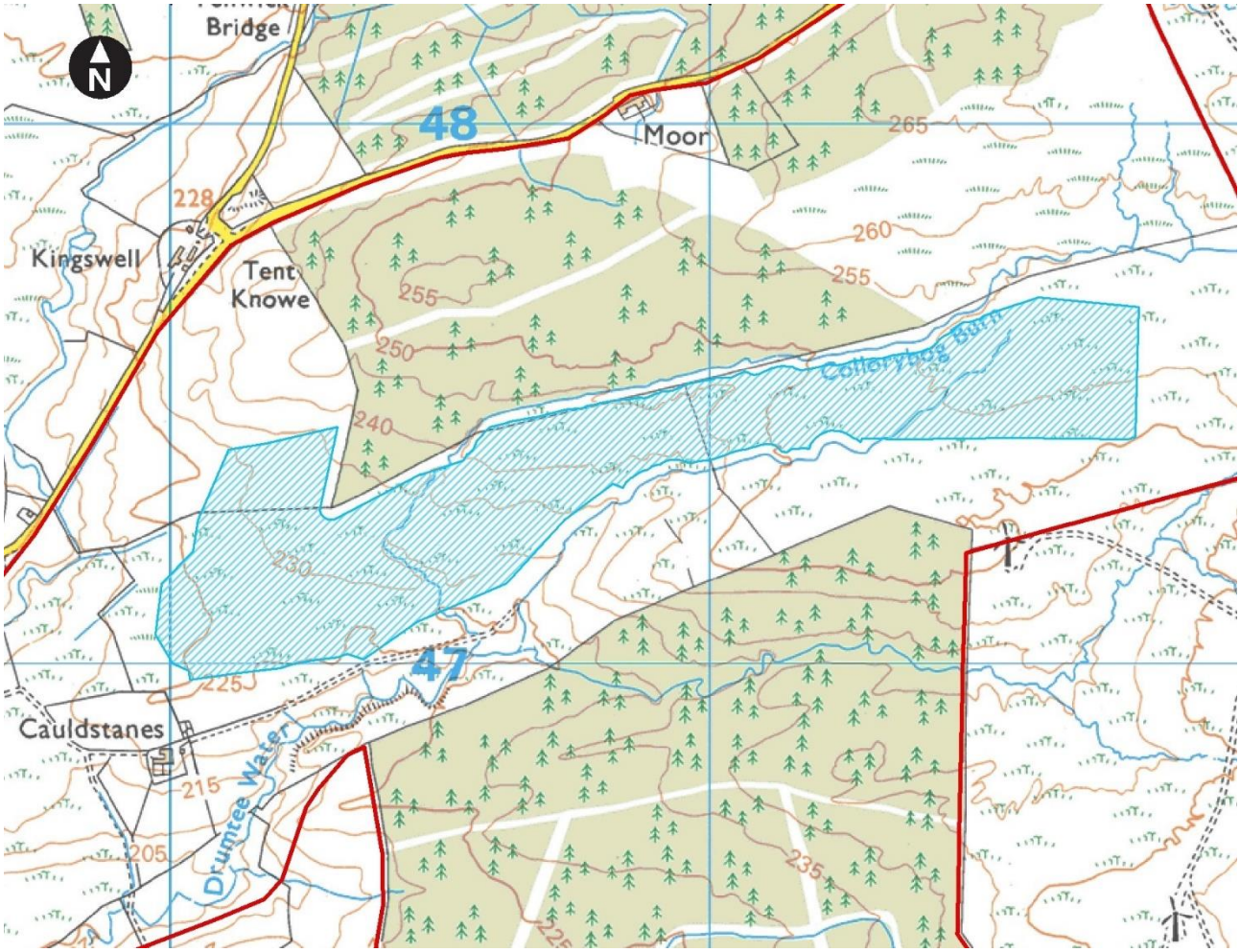
3.3.2 The solar PV farm will consist primarily of a series of solar PV arrays made up of individual solar PV panels up to a maximum of 3m in height supported by steel framework. In addition, LV cabling will be mounted directly to the panel arrays. The LV cabling will then meet a series of inverters/transformers where the voltage is stepped up and transmitted through buried HV cabling. The HV cables will connect to the proposed substation contained within the green hydrogen production facility site.

Layout & location

3.3.3 The exact layout within the Whitelee site selected for the solar PV farm was chosen through an iterative design process which sought to carefully balance the factors listed above. The scale of the solar PV farm has been driven since inception by the energy requirements of the Project overall, which in turn has been driven by a projected offtaker demand for green hydrogen of 10,000kg per day. The green hydrogen production facility associated with this Project requires 20MW of 100% renewable electricity in order to reach this level of output. This is a fixed parameter from the perspective of the Project as less electrical output would result in a reduction in the hydrogen production and in turn limit the viability of the Project as a whole.

3.3.4 Originally, the philosophy had been to over-engineer the solar PV farm by providing c. 150,000 solar PV panels generating c. 35MW of energy. This would produce more solar energy than as required by the green hydrogen production facility during peak solar production, which could then be stored in the BESS for use later or exported to the Grid.

3.3.5 Initially, the first stage of the design process was to identify the solar search area. This is an area of the site identified from the applicant's preliminary feasibility data as having the potential to support a solar scheme of c. 35MW. The solar search area, located within the north of the Site, is shown below and illustrated as a blue hatched area.



Landscape considerations

3.3.6 The impact upon the local landscape character has been given careful consideration in developing the scheme for the solar PV farm. While a solar PV farm of this size will inevitably have some effect on landscape character it has been designed and located so to minimise these effects as far as possible. The area where the solar PV farm is proposed would allow the solar PV arrays to be located in such a way whereby, they can be optimally integrated into the landscape with minimal regrading of the land or changes to its natural topography.

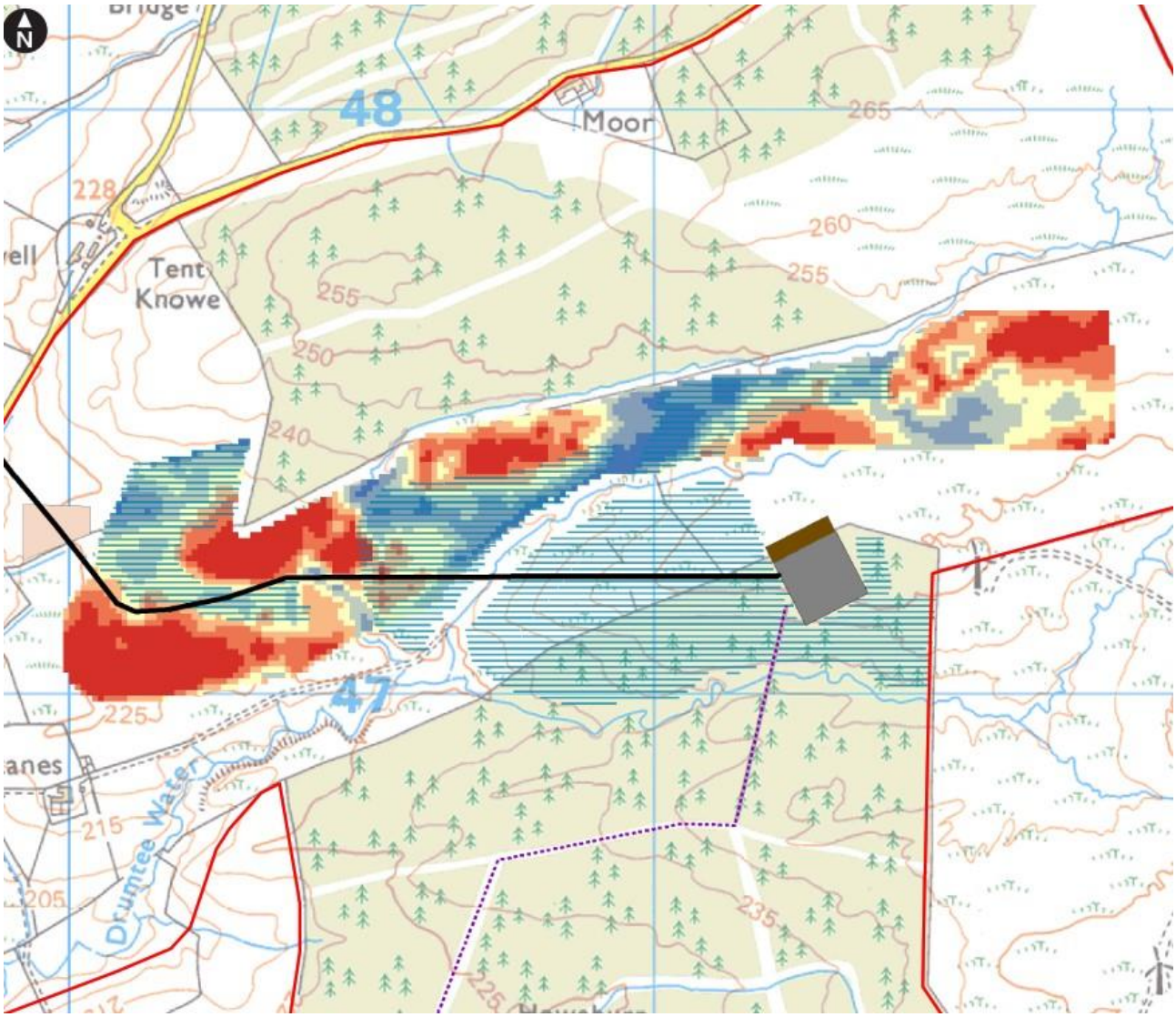
3.3.7 In support of this application, a Landscape and Visual Impact Assessment (LVIA) has been undertaken which considers the landscape and visual effects of the solar PV farm. For further information please refer to **Chapter 7** below.

Size & scale

3.3.8 During the iterative design process, and in response to addressing the complexities of constructing solar PV arrays on peat bog, as well as responding to physical and ecological site constraints, the design of the solar PV layout has been scaled back.

3.3.9 To achieve a suitable energy yield, a minimum requirement of 62,000 solar PV panels was determined to be required. This is the minimum level of development necessary to ensure that the site performs effectively with regards to its purpose of generating enough low carbon renewable energy to provide a suitable supply of green (renewably sourced) electricity for the green hydrogen production facility (20MW).

3.3.10 Following in-depth consideration of site constraints as well as consultation with the consenting authorities, statutory consultees and other interested third parties additional data was gathered in respect of the ground conditions within the wider northern section of Eaglesham Moor. To facilitate this, peat probing was undertaken which provided a constraints parameter both in terms of the siting of the proposed solar PV farm, but also, consequently that location of the green hydrogen production facility. The graphic below illustrates peat probing data undertaken. A detailed version of this figure indicating the colour coding is provided as **Figure 6.2** and contained within **Volume 3, Appendix 3F**.



3.3.11 As greater knowledge of the underlying peatland was gained, the overall possible locations for the siting of the solar PV arrays narrowed as localised areas of deeper peat were identified. This, coupled with the requirement to identify watercourse buffers, provided significant limitation to the location of the solar PV arrays; resulting in a layout which is split over multiple banks of arrays, rather than one singular layout.

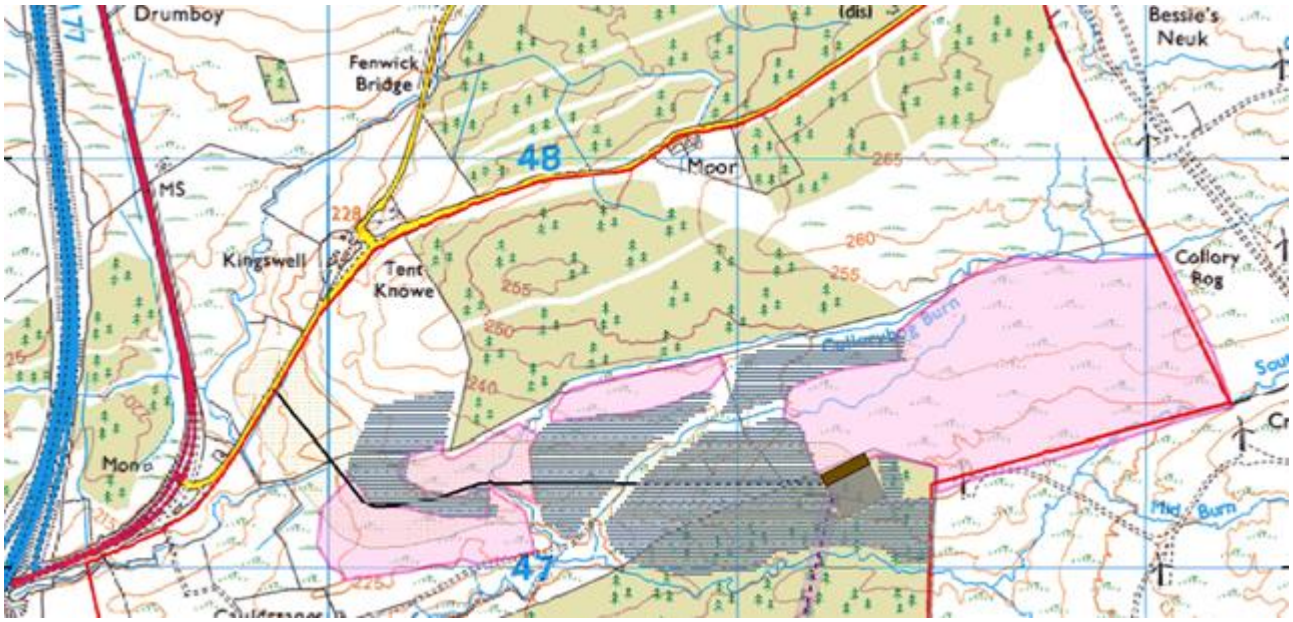
3.3.12 The solar PV panels will be laid out in rows across the site and will be spaced to avoid any shadowing effect from one panel to another with topography and maximisation of solar resource availability dictating exact row spacing and geometry.

3.3.13 All of the plant on the solar PV farm will be at or below single storey level (at or below 4m in height). Even when viewed from nearby public vantage points, the scale of development will not be

overbearing due to its limited height and relatively benign appearance (e.g. lack of movement and external illumination).

3.3.14 Each array of solar PV panels within the site will be mounted on a simple metal framework which must be capable of withstanding appropriate environmental stresses for the location, such as wind or snow loading. The framework will be driven into the soil between 1 and 2 metres deep, removing the need for deep foundations. Such supporting systems are designed to avoid the use of concrete foundations and are reversible. The challenge of building such a development on a peat bog has also informed the layout of the solar PV farm, as areas of deep peat were avoided. Peat probing of the site has identified peat depth across the site which, in turn, has informed the finalised layout.

3.3.15 The image below illustrates the layout of the solar PV arrays relative to its Site context and the green hydrogen production facility. Further detailed information provided as **Figure 1.5** and contained within **Volume 3, Appendix 7C**.



BESS & HV cable

Development design

3.3.16 The BESS design and layout is primarily derived from its function. The scale of the BESS is comparable to Whitelee BESS, located within the Whitelee Windfarm at Ardochrig, which was consented in 2020 and is under construction at the time of writing. The design philosophy of the BESS is to site as much of the infrastructure within the envelope of a single profiled steel-clad building akin to commonly visible rural and agricultural buildings.

Layout & location

3.3.17 The site of the BESS has been selected due to its advantageous proximity to the existing Rough Hill substation, thereby minimising cable runs and reducing the amount of excavation of undisturbed land. Additionally, the site itself is substantially disturbed land which was previously a laydown area for the wind farm construction works, and which has since been used by Forestry and Land Scotland for its operational activities at Whitelee.

3.3.18 The BESS site selected offers the opportunity to take access via existing access routes established by Whitelee Windfarm with minimal disruption to environmental receptors.

Landscape considerations

3.3.19 The BESS component located to the south has been scoped out of this assessment on landscape and visual effects as a result of the corresponding ZTV identifying no receptors which would be affected by its construction.

3.3.20 Furthermore, the proposed HV cable connecting the solar PV farm in the north to the BESS in the south will be buried and will have no effect on landscape character once installed.

Size & scale

3.3.21 The BESS will include a Portal Frame building of approximate dimensions 70m x 62.5m x 6.8m (to apex) enclosing the following elements; Battery storage room, switchgear room, inverters, supervisory control and data acquisition (SCADA) equipment, welfare facilities and fire suppression room. Outwith the main building, will be an external transformer compound, a compound for temporary reserve diesel generators, vehicle parking spaces and up to 3m high security fencing.

3.3.22 The size and scale of the BESS is slightly larger than that consented and currently under construction at the Ardochrig area of Whitelee Windfarm with its overall design and appearance generally comparable to a modern agricultural building.

Green hydrogen production facility

Development design

3.3.23 The green hydrogen production facility as presented in this EIA Report has also been the subject of a number of iterations and refinements which seek to mitigate by design predicted adverse effects, as far as reasonably practicable. The resultant proposal balances the environmental and technical constraints, whilst producing an economically viable Project overall. Design changes made as a consequence of the key constraints are considered to be mitigation which is 'embedded' in the design.

Layout & location

3.3.24 The ultimate site selected for the green hydrogen production facility was chosen through an iterative design process which sought to carefully balance the factors listed above. Initially, the site for the green hydrogen production facility had been considered to the west of the currently proposed green hydrogen production facility site boundary within the envelope of the solar search area at approximate grid reference NS 50229 47353.

3.3.25 Logically, consideration was given to this initial location due to its close proximity to the B764 and the ease of access and transportation. Ultimately however this location was discounted as it was unsatisfactory due to the proximity to the nearby residential properties of Kingswell and Best Friends as well as the visually prominent location relative to the B764 and M77 and due to the large areas of deep peat and watercourses within the immediate vicinity.

3.3.26 Following the discounting of the initial site, further data was gathered in respect of the ground conditions within the wider northern section of Eaglesham Moor. To facilitate this, peat probing was undertaken which provided a constraints parameter both in terms of the siting of the proposed solar PV farm, but also, consequently that location of the green hydrogen production facility.

3.3.27 As greater knowledge of the underlying peatland was gained, the overall possible locations for the green hydrogen production facility (as well as the solar PV farm) narrowed as localised areas of deeper peat were identified. This, coupled with the requirement to identify watercourse buffers, proved a significant limitation to the location of the green hydrogen production facility.

3.3.28 A second site was then selected, which addressed a number of constraints but was ultimately deemed to be sub-optimal from the perspective of the underlying ground conditions as well as its potential to impact on biodiversity. This location was also within the envelope of the solar search area but located further east of the original location at NS 51151 47479.

3.3.29 Following the discounting of the second site, consideration was given to an area of land to the south which benefitted from shallower peat and presented less impact on peatland habitat. The primary constraint affecting this site has been its partial inclusion within the existing Whitelee Windfarm Habitat Management Area (HMA). This effect of this has meant that the ecological impact assessment (EcIA) conducted in support of this application (please refer to **Chapter 6** below) has had to account for the partial loss of existing HMA within its recommendations for mitigation.

3.3.30 Ultimately, however this was deemed to be the most appropriate location for the green hydrogen production facility as it addressed a number of physical site constraints, positioned the green hydrogen production facility away from residential receptors and allowed for the solar PV farm layout to be built around the facility as a way of providing embedded mitigation; minimising environmental impacts but also mitigating, to a degree, its limited visual impacts.

Landscape considerations

3.3.31 The impact upon the local landscape character has been given careful consideration during the site selection process for the green hydrogen production facility. While a development of this size will inevitably have some effect on landscape character, its location has been selected so to minimise this effect as far as possible.

3.3.32 A Landscape and Visual Impact Assessment (LVIA) has been undertaken which considers the landscape and visual effects of the green hydrogen production facility. This LVIA can is contained within **Chapter 7** below.

3.3.33 It is considered that the landform and vegetation including a large bank of mature forestry to the north boundary of the Site helps in the mitigation of the potential effects resulting from the installation of the development.

3.3.34 While it is recognised that the forestry to the north of the Site is commercial in nature and therefore its use as a screening device cannot be guaranteed in perpetuity, a balance between location and visual impact has had to be achieved. In order to deliver a financially viable scheme and in order to minimise other environmental impacts through embedded mitigation it has been necessary to site the green hydrogen production facility as close to the proposed solar PV farm as possible.

3.3.35 Once established that the proposed green hydrogen production facility required to be situated as close to the solar PV farm as possible, it has been necessary to therefore determine the most appropriate location for the site, taking account of all environmental constraints. In undertaking this exercise a number of factors were considered:

- The relative landscape character of the northern section of Eaglesham Moor and potential for significant environmental effects resulting from loss of landscape character.
- The topography of the landscape.

- The proximity of sensitive receptors, including surrounding residential properties.
- The ground conditions and the engineering considerations of construction of the green hydrogen production facility on wet modified bog.
- The impact on carbon rich soils.
- Other biodiversity considerations arising from known constraints identified during pre-application survey work.
- Hydrological considerations and potential impacts on watercourses, private water supplies and ground water dependent terrestrial ecosystems.

Size & scale

3.3.36 The green hydrogen production facility has been designed based on the plant requirements for the electrolyser technology being adopted. In this case, the form and scale of the green hydrogen production facility is fully informed by its requirements. As far as possible, the site area proposed for the green hydrogen production facility has been reduced so as to only accommodate the infrastructure required and has been sited so as to minimise its impact on areas of deep peat and associated ecological constraints. Full details of the infrastructure required for the green hydrogen production facility are included within **Chapter 3** of the accompanying Planning Statement (Full PP).

3.3.37 The green hydrogen production facility is of a low scale with the maximum height of its structures not exceeding 15m. Of the structures proposed, the tallest are the vent stacks, with the majority of the buildings and infrastructure at a level of 8m or lower.

3.3.38 Due to its intrinsic link to the proposed solar PV farm which would be located westerly adjacent to the green hydrogen production facility, and in order to minimise the amount of cable run, and cut and fill associated with the burying of HV cable apparatus, the green hydrogen production facility has been sited as far as possible within the envelope of the solar PV farm whilst balancing the need to avoid deeper areas of peat. The intention is to integrate the green hydrogen production facility within the surrounding infrastructure, taking further advantage of the screening opportunities which would be created by the solar PV panel arrays.

3.3.39 Furthermore, contextually the impact of the introduction of the green hydrogen production facility within the landscape is greatly minimised due to the high modification of the surrounding landscape character as a result of the turbines and infrastructure which form Whitelee Windfarm located immediately east of the green hydrogen production facility site.

4. Approach to preparing the EIA Report

4.1 The Environmental Impact Assessment process

4.1.1 The preparation of the EIA Report is one of the key stages in the EIA process, as it brings together information about any significant environmental effects, which both the ECU and EAC will use to inform their decisions about whether the relevant Proposed Developments (taken together comprising the Project) should be allowed to proceed.

4.2 EIA terminology

Impacts and effects

4.2.1 In some EIA Reports, the terms 'impacts' and 'effects' are used interchangeably, whilst in others the terms are given different meanings. Some use 'impact' to mean the cause of an 'effect', whilst others use the converse meaning. This variety of definitions has led to a great deal of confusion over the terms, both among the authors and the readers of EIA Reports.

4.2.2 The convention used in this EIA Report is to use 'impacts' only within the context of the term EIA, which describes the process from scoping through EIA Report preparation to subsequent monitoring and other work. Otherwise, this document uses the word 'effects' when describing the environmental consequences of the Project and its components. For example, such effects may come about as a result of the following:

- Physical activities that would take place if the development were to proceed (e.g., vehicle movements during construction operations).
- Environmental changes that are predicted to occur as a result of these activities (e.g., loss of vegetation prior to the start of construction work or an increase in noise levels). In some cases, one change causes another change, which in turn results in an environmental effect.

4.2.3 The predicted environmental effects are the consequences of the environmental changes for specific environmental receptors. For example, with respect to bats, the loss of roosting sites or foraging areas could affect the bats' population size; with regard to people, an increase in noise levels could affect people's amenity.

4.2.4 This EIA Report is concerned with assessing the significance of the environmental effects of the Project, rather than the activities or changes that cause them. However, this requires these activities to be understood and the resultant changes identified and quantified, often based on predictive assessment work.

Spatial and temporal scope

4.2.5 Spatial scope is the area over which changes to the environment are predicted to occur as a consequence of a Proposed Development. In practice, an EIA should focus on those areas where these effects are likely to be significant.

4.2.6 In this EIA Report, the spatial scope varies between environmental topics and is therefore described in each of the topic chapters. For example, the spatial effects of a development on landscape and visual amenity will probably cover a much greater area to that affected by noise.

4.2.7 The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur, and are typically defined as either being temporary or permanent.

4.3 Consultation

4.3.1 Consultation has been undertaken with both the Energy Consents Unit (ECU) and the local planning authority EAC.

4.3.2 **Table 4.1** lists the dates of all consultation between Wood, the applicant, the ECU, NatureScot (previously Scottish Natural Heritage) ('NS') and EAC undertaken to date.

Table 4.1 Summary of Pre-application Engagement with Determining Authorities and Consultees

Date	Consultee	Attendees	Summary
18.08.2020	ECU	Ruth Findlay (ECU) James McKenzie (ECU) Dan Ferrier (SPR) Jamie Gilliland (SPR) Lewis Monaghan (SPR) Chris Pepper (Wood) Fergus Tickell (Wood)	Initial pre-application discussion and introduction to the Project by the applicant and Wood.
10.09.2020	ECU & EAC	Alan Brogan (ECU) James McKenzie (ECU) David Wilson (EAC) Dan Ferrier (SPR) Jamie Gilliland (SPR) Lewis Monaghan (SPR) Chris Pepper (Wood) Fergus Tickell (Wood)	Project introduction to EAC, high level discussion on principles of development within the Site and detailed discussion submission and appropriate determination routes.
18.11.2020	ECU & EAC	James McKenzie (ECU) David Wilson (EAC) Dan Ferrier (SPR) Jamie Gilliland (SPR) Lewis Monaghan (SPR) Chris Pepper (Wood) Alastair Evans (Wood) Fergus Tickell (Wood)	Post-EIA Screening Request meeting to discuss Screening Request submission, content and findings. Discussion with all parties on scope and nature of public engagement requirements.
10.12.2020	NS & ECU	Lyndsey Kinnes (NS) Andrew Coupar (NS) Amee Hood (NS) Kenny Taylor (NS) Danielle Thomson (NS) Dave Lang (NS) James McKenzie (ECU) Dan Ferrier (SPR) Jamie Gilliland (SPR) Lewis Monaghan (SPR) Coni Caskie (SPR) Pete Robson (SPR) Chris Pepper (Wood) Alastair Evans (Wood) Alastair Miller (Wood)	Pre-Application meeting to discuss implications of construction and operation of solar PV infrastructure on peatland and peatland habitats, including introduction of NS to Project.

Date	Consultee	Attendees	Summary
11.01.2021	EAC	David Wilson (EAC) Dan Ferrier (SPR) Jamie Gilliland (SPR) Lewis Monaghan (SPR) Chris Pepper (Wood) Alastair Evans (Wood)	Pre-Application meeting with EAC planning officer to discuss evolution of the Project. Discussion centred around requirement to show an access where it was agreed that an access was not necessary to support the application on the basis that it is being applied for under the corresponding S36 application being made to the ECU and that sufficient detail is made within the Planning Statement of the Full Planning Application to address this matter.

4.4 Overview of assessment methodology

Introduction

4.4.1 All the topic assessments presented in the EIA Report have been undertaken on the basis of a common understanding of the nature of the project, as described in Chapter 3.

4.4.2 For each topic, the assessment of likely significant effects has been undertaken by competent experts with relevant specialist skills, drawing on their experience of working on other development projects, good practice in EIA and on relevant published information. For some topics, use has been made of modelling or other methodologies, as appropriate.

4.4.3 With a few exceptions, each topic chapter follows a common format, as outlined below:

- Introduction.
- Limitations of this assessment.
- Legislative and policy context.
- Data gathering methodology.
- Overall baseline (where appropriate), with the detailed baseline being set out under the assessment of effects sub-section identified below.
- Scope of the assessment.
- Environmental measures embedded into the scheme.
- Assessment methodology.
- Assessment of effects - this sub-section excludes cumulative effects and deals separately with each receptor or category of receptors that could be significantly affected. The assessment is made against the predicted future baseline (see **Section 4.6** below).
- Assessment of cumulative effects.
- Additional mitigation.
- Conclusions of significance evaluation.

- References.

4.5 Identification of baseline conditions

4.5.1 As the various elements of Project would be built over a period of 1 year, starting in 1 year time (April 2022) and then operated indefinitely, it cannot be assumed that the baseline conditions in the absence of the project, would be the same as the current baseline.

4.5.2 To determine the baseline conditions that should be used for the assessment of the likely significant effects of the Project, it is necessary to define the current baseline conditions and then to decide whether these conditions are likely to change by the 'assessment years' that are selected for the construction and operation of the various Project components. If this future baseline is more likely to occur than the current baseline, the future baseline is used for the assessment of likely significant effects. However, in many cases it will be concluded that the current baseline is just as likely, or even more likely, to occur in the assessment years than would be the case with any future baseline conditions. In this case, the current baseline is used for the assessment.

4.5.3 The current baseline is determined for the *'Study Area'* for each environmental topic by a combination of desk-based research, including consultation with the relevant statutory and non-statutory authorities, together with field survey work (where required).

4.5.4 In its simplest form, the Study Area is likely to comprise the entirety of the Project Site. However, for many developments, the Study Area is also likely to include land outside the site, especially where the effects of the Project are likely to extend beyond such geographical limits to reflect *'zones of influence'* (ZoIs), where the Project or its individual components could affect off-site areas.

4.5.5 Details of the relevant ZoIs are discussed in the baseline section of each environmental topic chapter. These chapters also explain the basis for defining the future baseline conditions, where this is appropriate. This is based on the following:

- Information gathered about the existing environmental conditions.
- Changes that can be predicted based on reasonable assumptions and modelling calculations, e.g., the application of traffic growth factors based on relevant guidance.
- Information relating to other likely and predictable changes, e.g., climate change, which could affect current prevailing environmental conditions.
- Information about other relevant developments, including the nature of the development proposals, their likely timing and their location relative to the Project and its components.

4.6 Overview to approach to significance evaluation methodology

Introduction

4.6.1 One of the requirements of an EIA Report is to set out the conclusions that have been reached about the likely significant environmental effects that it is predicted will result from the Project. Reaching a conclusion about which effects, if any, are likely to be significant is the culmination of an iterative process that involves the following stages:

- Identifying those effects that could be likely to be significant (see **Section 4.3** on Scoping).
- Assessing the effects of the Project against the baseline (current or future, as appropriate).
- Concluding whether these resultant effects are likely to be significant.

4.6.2 Chapters 6 to 9 describe the approaches that have been used, in relation to the stages outlined in the bullet points above, for each of the environmental topics that are considered in this EIA Report.

Identification of likely significant effects

4.6.3 To inform the identification of likely significant effects, all of those involved in the preparation of the EIA Report were supplied, at an early stage of the assessment process, with information about the proposals for constructing and operating the various Project components.

4.6.4 As the proposals evolved, more detail became available about construction and operational activities. This enabled a progressively more refined understanding to be developed about the environmental changes that could be caused by the project, including information about their spatial extent and other characteristics (e.g., their magnitude, frequency etc.).

4.6.5 The identification of receptors that need to be considered draws on available information about environmental changes, which in some cases can be translated into ZoIs outside of which the environmental changes are predicted to be sufficiently small that receptors are not likely to be significantly affected. In addition, for some environmental topics (e.g., biodiversity and historic environment), a valuation is undertaken to define those receptors that are of sufficient importance or value that they could be significantly affected. Only those receptors that are of sufficient importance or value and that are located within the defined ZoIs where effects could be significant, are taken forward for further assessment.

4.6.6 The Technical Assessments, undertaken in Chapters 6 to 9 of this EIA Report, describe how environmental changes and resulting effects for different environmental topics are assessed, together with the topic specific approaches that have been used to identify the receptors that could be significantly affected by the Project.

Types of effects

4.6.7 Paragraph 5 of Schedule 4 of the EIA Regulations states that *"The description of the likely significant effects on the factors specified in regulation 4(3) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development."* Where appropriate, this EIA Report considers all these types of effects where they are relevant to different environmental topic chapters, with the exception of cumulative effects, which are dealt with separately in **Section 4.8**.

Direct effects

4.6.8 Direct effects are those that result directly from a Proposed Development (in this case the Project or its individual components). For example, where a machine disturbs an area of habitat; the associated physical activity could result in a change to the receptor.

Indirect and secondary effects

4.6.9 Indirect and secondary effects are those that result from consequential change caused by the development. As such they would normally occur later in time or at locations farther away than direct effects. An example would be where water or gas pipes are damaged as a result of the development, and the consequences of that damage is fire or flood risk to other receptors.

Transboundary effects

4.6.10 Transboundary effects are those that would affect the environment in another state within the European Economic Area (EEA).

Temporal effects

4.6.11 As discussed in **Section 4.2**, temporal effects are typically defined as being permanent or temporary as follows:

- Permanent - these are effects that will remain even when the Project (or its individual components) is/are complete, although these effects may be caused by environmental changes that are permanent or temporary. For example, an excavator that is temporarily driven over an area of valuable habitat could cause so much damage that the effect on this vegetation would be permanent.
- Temporary – these are effects that are related to environmental changes associated with a particular activity and that will cease when that activity finishes.

Significance evaluation

Overview

4.6.12 The receptors that could be significantly affected are identified within each topic chapter. The approach that is adopted to determine whether the effects on these receptors are significant is to apply a combination of professional judgement and a topic-specific significance evaluation methodology that draws on the results of the assessment work that has been carried out.

4.6.13 In applying this approach to significance evaluation, it is necessary to ensure that there is consistency between each environmental topic in the level at which effects are considered to be significant. Therefore, it is inappropriate for the assessment of one topic to conclude that minor effects are significant, when, for another topic, only comparatively major effects are significant.

4.6.14 In order to achieve the desired level of consistency, each environmental topic lead has been guided in their decision-making about likely significance by the *'significance test'* that informed the preparation of the scoping report (see **Section 4.3** above), as well as the relevant topic-specific significance evaluation methodology.

4.6.15 The conclusion about significance is arrived at using professional judgement, with reference to the project description, and available information about the magnitude and other characteristics of the potential changes that are expected to be caused by the Project, receptors' sensitivity to these changes and the effects of these changes on relevant receptors.

4.6.16 In some cases, use of the 'significance test' alone will enable a conclusion to be reached in the 'Scope of the assessment' section of the topic chapter, without the need for more detailed assessment, that a potential effect is not likely to be significant. However, in other cases, effects identified in the 'Scope of the assessment' section are taken forward for further assessment in the subsequent section(s) of each topic chapter.

4.6.17 For some of these effects, relatively little assessment work may be required to reach a conclusion that an effect is not significant. But, in other cases, more extensive assessment work is required. Sometimes the application of the 'significance test' is sufficient to support this conclusion but, in other cases, the relevant topic-specific significance evaluation methodology is used to inform the evaluation of significance (to determine whether an effect is or is not significant).

4.6.18 Having applied the relevant topic-specific significance evaluation methodology, the topic specialists check the conclusions against the significance test. If this test results in a different conclusion to that reached using the significance evaluation methodology, a detailed justification is provided as to why this different conclusion is valid.

4.6.19 For some of the topics that are assessed in the EIA Report, there is published guidance available about significance evaluation. Where such guidance exists, even if in draft, it has been used to inform the development of the significance evaluation methodologies that are used in this EIA Report. For other topics, it has been necessary to develop methodologies without the benefit of guidance. This has involved technical specialists drawing on their previous experience of significance evaluation in EIA.

Evaluation matrices

4.6.20 Significance evaluation involves combining information about the sensitivity, importance or value of a receptor, and the magnitude and other characteristics of the changes that affect the receptor. The approach to using this information for significance evaluation is outlined below.

Receptor sensitivity, importance, or value

4.6.21 The sensitivity or value of a receptor is largely a product of the importance of an asset, as informed by legislation and policy, and as qualified by professional judgement. For example, receptors for landscape, biodiversity or the historic environment may be defined as being of international or national importance. Lower value resources may be defined as being sensitive or important at a county or district level. For each environmental topic, it is necessary to provide a detailed rationale that explains how the categories of sensitivity/importance/value have been used.

4.6.22 The use of a location or physical element that may be representative of receptors, e.g., human beings, would also play a part in its classification in terms of sensitivity, importance, or value. For example, when considering effects on the amenity of a human population, a location used for recreational purposes may be valued more than a place of work.

Magnitude of change

4.6.23 The magnitude of change affecting a receptor that would be affected by the Project would be identified on a scale from very low to very high. As with receptor sensitivity and value, a rationale is provided in each topic chapter that explains how the categories of environmental change are defined. For certain topics, the magnitude of change would be related to guidance on what levels of change are acceptable (e.g., for air quality or noise), and be based on numerical parameters. For other changes, it will be a matter of professional judgement to determine the magnitude of change, using descriptive terms.

Determination of significance

4.6.24 The significance of effects is determined with reference to information about the nature of the development, the receptors that could be significantly affected and their sensitivity, importance or value, together with the magnitudes of environmental change that are likely to occur.

4.6.25 Other than for environmental topics for which significance evaluation does not involve the use of matrices, sensitivity/value and the characteristics of environmental changes can be combined using a matrix (see **Table 4.2**). In addition, professional judgement is applied because, for certain environmental topics, the lines between the sensitivities or magnitudes of change may not be clearly defined and the resulting assessment conclusions may need clarifying.

4.6.26 Variations to this approach, which may be applicable to specific environmental topics, will be detailed in the relevant 'Significance evaluation methodology' sub-section contained in each environmental topic chapter.

4.6.27 Definitions of how the categories that are used in the matrix are derived for each topic are also set out in each environmental topic chapter, along with the relevant explanation and descriptions of

receptor sensitivity, magnitude of change and levels of effect that are considered significant under the EIA Regulations.

4.6.28 Within the matrix that is used in most significance evaluation exercises, reference is made to:

- Major effects, which will always be determined as being significant in EIA terms.
- Moderate effects are likely to be significant, although there may be circumstances where such effects are considered not significant on the basis of professional judgement.
- Minor or negligible effects, which will always be determined as not significant.

Table 4.2 Significance evaluation matrix

		Magnitude of change				
		Very high	**High**	**Medium**	**Low**	**Very low**
Sensitivity/importance/value	**Very high**	Major (Significant)	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)
	High	Major (Significant)	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
	Medium	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
	Low	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
	Very Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

Note: Significant effects are those identified as 'Major'. 'Moderate' effects would normally be deemed to be significant. However, there may be some exceptions, depending on the environmental topic and the application of professional judgment.

5. Legislative and policy overview

5.1 Introduction

5.1.1 This Section of the EIA Report sets out the energy and planning policy framework for the Project.

5.1.2 This Section presents the existing and emerging international and national energy policy as well as the national and local planning policy context applicable to the Project and relates these policies to the individual sections set out within the Technical Assessment chapters of the EIA Report. The reference to specific planning policies and guidance within these other chapters is provided to ensure full knowledge and understanding of planning related issues within the EIA Report.

5.1.3 This Chapter does not provide an assessment of whether the proposal complies with extant energy and planning policy. The corresponding Supporting Statement (Section 36 application) and Planning Statement (Full Planning Permission), which accompanies the EIA Report provides a detailed assessment of the Project against the policies identified within this Section.

5.1.4 In the case of an application submitted to the Scottish Ministers under Section 36 of the Electricity Act 1989 (the Electricity Act), the Local Development Plan (LDP), in this case the East Ayrshire Council LDP 2017 (LDP2017), does not have primacy in the decision-making process, instead being used to inform the Council's consultation response.

5.1.5 In the case of an application submitted to the Council as the local planning authority (in this case East Ayrshire Council, EAC) under the Town and Country Planning (Scotland) Act 1997, as amended, (the Planning Act), the LDP2017 does have primacy in the decision-making process.

5.1.6 The energy and planning policy frameworks outlined in this Section are provided for the purpose of informing the other Technical Assessment chapters of the EIA Report. Further consideration of the merits of the Project, and more specifically, to how different components relate to different consenting regimes is provided within the corresponding Planning and Supporting Statements.

5.2 Policy context

International policy context

5.2.1 The Scottish and UK legislative and policy framework on climate change is shaped by international climate change legislation and are considered in **Table 5.1** below. These incorporate binding targets in the reduction of greenhouse gas emissions and in the generation of energy from renewable sources.

Table 5.1 International policy documents

International Document	Overview
Kyoto Protocol 1997	An international treaty under the United Nations Framework Convention on Climate Change (UNFCCC) that commits state parties to reduce greenhouse gas emissions. The Protocol's first commitment period started in 2008 and ended in 2012. A second commitment period was agreed on in 2012, running to 2020, in which 37 countries have binding targets, including the EU and its Member States.

International Document	Overview
The COP21 UN Paris Agreement 2015	The central aim of the Paris Agreement is to strengthen the global response to the threat of climate change by keeping the increase in global temperature to well below 2oC above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5oC. The first global "stocktake" to assess collective progress is to take place in 2023 and will follow every five years thereafter. In 2018 the Intergovernmental Panel on Climate Change (IPCC) published a special report on the impacts of global warming of 1.50 above pre-industrial levels and related greenhouse gas emissions pathways, in the context of strengthening the global response to the threat of climate change. The report states that pathways limiting global warming to 1.5°C with no or limited overshoot would require rapid and far-reaching transitions in energy, with renewables being projected to supply 70–85% of electricity in 2050. The UK Government responded to the report by asking the UK Committee on Climate Change to update the advice it gives to Government on setting targets for carbon emissions and whether the UK needs to reduce carbon emissions at a faster rate or to a greater extent than originally planned. This continued focus on the decarbonisation of the energy generation sector will result in a reliance on mature renewable energy technologies such as solar PV.
The COP26 UN Climate Change Conference UK 2020	The Prime Minister appointed Alok Sharma as the COP26 President on 13 February 2020. On the 29th May 2020, it was determined to move the COP26 UN climate conference date to take place between the 1st and 12th November 2021. Member states of the conference are expected to continue their efforts to take climate action.

UK energy policy

5.2.2 **Table 5.2** contains the UK policy and guidance which governs energy generating developments. The UK policy contains many renewable energy and climate reduction targets, which highlights the importance the UK government places upon renewable energy generating developments.

Table 5.2 UK energy policy documents

International Document	Overview
Climate Change Act 2008	The Climate Change Act is the basis for the UK's approach to tackling and responding to climate change. This Act committed the UK to reducing greenhouse gas emissions by at least 80% of 1990 levels by 2050. It also requires the Government to set legally-binding 'carbon budgets' to act as 'stepping stones' towards the 2050 target. A Committee on Climate Change was set up to ensure emissions targets are set based on expert independent assessment of the evidence and to monitor the UK's progress towards meeting the targets. Carbon budgets cover a five-year period and currently run to 2032. The UK is currently in the third carbon budget period (2018 to 2022). The Committee on Climate Change has confirmed that the first carbon budget was met and the UK is currently on track to outperform on the second and third, however, it is not on track to meet the fourth (2023 to 2027), and to meet future carbon budgets and the 80% target for 2050, the UK will need to reduce emissions by at least 3% a year, from now on, requiring more challenging measures to be applied by Government. The UK Government has confirmed its intention to set the Fifth Carbon Budget to reduce UK greenhouse gas emissions relative to 1990 levels by 57% by 2028-32, in line with the advice of the Committee on Climate Change.
Climate Change Act 2008 (2050 Target Amendment) Order 2019	Article 2 of this Order amends Section 1 of the Climate Change Act 2008 (see above). Section 1(1) imposes a duty on the Secretary of State to ensure that the UK will reduce greenhouse gas emissions by 100% of 1990 levels by 2050. Previously this was 80%.

International Document	Overview
UK Renewable Energy Strategy 2009	This Strategy sets out the path for the UK to meet the legally binding target of 15% of all energy consumed in the UK to come from renewable sources by 2020. It includes action to deliver the 'lead scenario' of 30% of electricity, 12% of heat and 10% of transport energy to be generated from renewables by 2020. The Strategy will help us tackle climate change, reducing the UK's emissions of carbon dioxide by over 750 million tonnes between 2009 and 2030. The Strategy reaffirms the requirement to be the target of an 80% reduction in greenhouse gas emissions by 2050 identified in the Climate Change Act 2008. Regarding delivering renewable transport, the Strategy has the following vision: *"Looking at the transport system between 2020 and 2050, the fuels we use will be cleaner, the technology greener and we will have seen a shift to renewable sources of transport energy such as sustainable biofuels, electricity and hydrogen."*
UK Renewable Energy Roadmap 2011 and updates in 2012 and 2013	The 2011 roadmap analysed how the deployment of renewable energy might evolve by 2020, focussing on 8 technologies that have either the greatest potential to help the UK meet the 2020 target in a cost effective and sustainable way, or offer great potential for the decades that follow. This included solar PV. The 2012 update highlighted the urgent need for new large-scale renewable energy projects to ensure the 2020 targets are met. The 2013 update noted that the share of renewable energy generation had increased from 9.7% in 2012 to 15.5% in 2013, and that Scotland accounted for 33% of the total UK renewables output during this period. The importance and benefits of solar PV are particularly noted in paragraph 179: *"…it is versatile and scalable, with deployment possible in a wide range of locations including domestic and commercial buildings and where appropriate on the ground; solar projects can be developed and installed very quickly; and the fuel, solar radiation is free."*
UK Solar PV Strategy Part 1: Roadmap to a Brighter Future (2013) and Part 2 (2014)	The Solar PV Strategy sets out the UK's continued support and demand for solar PV developments and wishes to encourage more solar PV developments built across the UK. Solar PV forms an integral part of the UK's ability to meet its continuingly ambitious renewable energy and decarbonisation targets. This strategy document establishes the following guiding principles for solar PV developments (paragraph 28): • *"Support for solar PV should allow cost-effective projects to proceed and to make a cost-effective contribution to UK carbon emission objectives in the context of overall energy goals.* • *Support for solar PV should deliver genuine carbon reductions that help meet the UK's target of 15 per cent renewable energy from final consumption by 2020 and in supporting the decarbonisation of our economy in the longer term.* • *Support for solar PV should ensure proposals are appropriately sited, give proper weight to environmental considerations such as landscape and visual impact, heritage, and local amenity, and provide opportunities for local communities to influence decisions that affect them.* • *Support for solar PV should assess and respond to the impacts of deployment on: grid systems balancing; grid connectivity; and financial incentives."* Energy storage technologies and developments are noted as being important to maximising the benefits of renewable energy developments, especially wind and solar PV developments.

International Document	Overview
UK Clean Growth Strategy 2017	The UK Government published the Clean Growth Strategy 'Leading the Way to a Low Carbon Future' in October 2017. It makes reference to the 2015 Paris Agreement and states: *"The actions and investments that will be needed to meet the Paris commitments will ensure the shift to clean growth will be at the forefront of policy and economic decisions made by Government and businesses in coming decades"*. The strategy recognises that meeting the fourth and fifth carbon budget raises challenges, stating: *"In order to meet the fourth and fifth carbon budgets (covering the periods 2023 – 2027 and 2028-2032) we will need to drive a significant acceleration in the pace of decarbonisation and in this strategy we have set out stretching domestic policies that keep us on track to meet our carbon budgets"*. The strategy sets out two guiding objectives for the UK's approach to reducing emissions: • To meet our domestic commitments at the lowest possible net cost to UK taxpayers, consumers and businesses. • To maximise the social and economic benefits for the UK from this transition. The Strategy identifies that, to meet these objectives, the UK will need to nurture low carbon technologies, processes and systems that are as cheap as possible.
UK Industrial Strategy 2017	The Industrial Strategy White Paper entitled 'Building a Britain fit for the Future' was published by the UK Government in November 2017. The Industrial Strategy sets a path to improved productivity and identifies four Grand Challenges – developments in technology that are set to transform industries and societies around the world, and in which the UK has the opportunity to play a leading global role. One of these Grand Challenges is 'clean growth'. The Industrial Strategy sees the move to cleaner economic growth through low carbon technologies and the efficient use of resources as *"one of the greatest industrial opportunities of our time"* (page 42). The Strategy sets out the aim to maximise the advantages for UK industry through leading the world in the development, manufacture and use of low carbon technologies, systems and services which cost less than high carbon alternatives (page 42).
Energy White Paper 2020	The Energy White Paper: Powering our Net Zero Future was published in December 2020. It provides further clarity on the Prime Minister's Ten Point Plan for a Green Industrial Revolution and puts in place a strategy for the wider energy system that transforms energy, supports a green recovery and creates a fair deal for consumers. The role of solar technology in supporting the transition to a low carbon energy mix is identified with the statement that a low-cost, net zero consistent system is likely to be composed predominantly of wind and solar and that onshore wind and solar will be key building blocks of the future generation mix, along with offshore wind. The flexibility provided by battery storage is also recognised as a way of complementing wind and solar when such technologies cannot generate electricity. The White Paper identifies that part of the Ten Point Plan includes working with industry the UK is aiming for 5GW of low carbon hydrogen production capacity by 2030.

Scottish Government energy policy

5.2.3 Energy policy is a matter reserved to the UK Parliament. The UK Government therefore retains control of the overall direction of energy policy including renewable energy targets. However, the devolved administrations, including the Scottish Government can, and have, prepared distinct climate change and related renewable policy for their devolved areas as well as implementing UK wide policies. **Table 5.3** contains the considered Scottish energy policy for the Project.

Table 5.3 Scottish Government energy policy documents

International Document	Overview
The Climate Change (Scotland) Act (2009)	The 2009 Act is the key legislation in Scotland dealing with climate change and carbon targets. The Act included an interim greenhouse gas emissions reduction target of at least 42% for 2020 and an 80% reduction target for 2050 against 1990 levels. The Act requires Scottish Ministers to set annual targets for Scottish emissions from 2010 to 2050, consistent with meeting both the interim and 2050 targets. The Act has been amended in 2019 requiring 100% lower than the 1990s baseline level. Details of this are set out below. The Act requires that, as soon as reasonably practicable after setting the annual targets, Ministers publish a report setting out policies and proposals for meeting those targets. This is delivered through the publication of Climate Change Plans. The Scottish Government published its third Climate Change Plan in February 2018, setting out proposals and policies to reduce emissions by 66% by 2032 against 1990 levels.
2020 Routemap for Renewable Energy in Scotland 2011 (updated 2013 & 2015)	The Scottish Government published the 2020 Routemap in July 2011. It established a target for the equivalent of 100% of Scotland's electricity demand to be supplied from renewable sources by 2020, roughly equating to the equivalent of around 16GW of installed capacity. The Scottish Government recognised at that time that "Meeting the equivalent of 100% of Scottish demand for electricity from renewables within the next 9 years will be a huge challenge" (page 19) and to meet the target will "demand a significant and sustained improvement over the deployment levels seen historically" (page 26). This target remains unmet (see further below) and the challenge of further sustained deployment remains. The Routemap also provided an increase in the Scottish Government's overall renewable energy target to 30% by 2020 and a new target of 500 MW of community and locally owned renewable energy by 2020. The Routemap was updated in December 2013. It continues to recognise the role that renewable energy has in delivering secure, low carbon and cost-effective energy supplies and the investment and job opportunities it presents. A further Routemap update published in September 2015 provided statistics on deployment of renewables at that time and sectoral updates. The Routemap states the importance of solar PV provides to ensure a healthy energy mix. It also notes that despite the Scottish climate, solar is still a valuable type of development that is needed to meet Scotland's renewable energy targets. Solar PV developments are noted to have had their associated costs fall the most out of all the different types of renewable energy technologies, showcasing the competitiveness of solar PV schemes in the long term. At every stage of the Routemap, the importance for energy storage developments was stressed as such developments aid in the storage of energy from renewable energy developments for use later. This means such schemes improve the amount of renewable energy available for the grid and ensures less renewable energy is potentially wasted.
Electricity Generation Policy Statement 2013	The Electricity Generation Policy Statement was published in June 2013. It examines the way Scotland generates electricity and considers the changes necessary to meet the various targets in the sector set by Government, including in the Climate Change (Scotland) Act 2009. It reiterates the Government's commitment to securing the transition to a low carbon economy and that Scotland has the potential to make a major contribution to the EU's overall renewables target. The Policy Statement is built around the 2020 target of the equivalent of 100% of Scotland's electricity demand to be supplied from renewable sources by 2020. It acknowledges that the target, which it estimates would require around 14 -16GW of installed capacity, is a challenge. But it embodies the Government's belief that *"Scotland can and must exploit its huge renewables potential to the fullest possible extent – to help meet demand here and across Europe"* (paragraph 14). The Policy Statement highlights that the renewable targets underpin the Government's vision of a stable and desirable future generation mix for Scotland, built around the following key principles:

International Document	Overview
	• A secure source of electricity supply. • At an affordable cost to consumers. • Which can be largely de-carbonised by 2030. • Which achieves the greatest possible economic benefit and competitive advantage for Scotland including opportunities for community ownership and community benefits.
The Chief Planner Letter to All Heads of Planning (November 2015)	A letter from the Scottish Government Planning and Architecture Division to all Heads of Planning entitled 'Energy Targets and Scottish Planning Policy' was published in November 2015. The letter was issued following an announcement by the Secretary of State for Energy and Climate Change that the UK Government would be bringing to an early closure the Renewable Obligation subsidy scheme. The letter confirmed that the Scottish Government's policy remains unchanged and that it supports new onshore renewable energy developments. The letter adds that this policy support continues in the situation where renewable energy targets have been reached and confirms that there is no cap on the support for renewable energy development. In short, the need for renewable energy including solar PV developments is unconstrained.
The Scottish Energy Strategy (December 2017)	The Scottish Energy Strategy, which was published in December 2017, sets out the Scottish Government's 2050 vision for the future energy system in Scotland: *"A flourishing, competitive local and national energy sector, delivering secure, affordable, clean energy for Scotland's households, communities and businesses"* (page 6). The Strategy reiterates the role that Scotland can play in delivering international and national commitments on reducing greenhouse gas emissions and notes that renewable energy and its associated infrastructure is now a major industrial sector in its own right, helping to sustain economic growth and employment. The 2050 vision is built around six priorities. Of particular relevance to the Project is the priority of 'renewable and low carbon solutions'. The Scottish Government states that it will: *"Continue to champion and explore the potential of Scotland's huge renewable energy resource, and its ability to meet our local and national heat, transport and electricity needs – helping to achieve our ambitious emissions reductions targets."* (page 8). Two new targets for the Scottish energy system by 2030 are set out on page 7: • The equivalent of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources. • An increase by 30% in the productivity of energy use across the Scottish economy. The Strategy identifies that renewable electricity could rise to over 140% of Scottish electricity consumption, ensuring its contribution to the wider renewable energy target for 2030. The Strategy continues that this assumes a considerably higher market penetration of renewable electricity than today, requiring in the region of 17GW of installed capacity in 2030 (compared to 9.5GW of installed capacity as of June 2017. The role of renewable energy in achieving the longer-term vision is further emphasised on page 34 where it states: *"Scotland's long-term climate change targets will require the near complete decarbonisation of our energy system by 2050, with renewable energy meeting a significant share of our needs".* The Strategies vision for 2050 includes Scotland using low carbon electricity and hydrogen to meet Scottish demands for electricity. Hydrogen producing developments are therefore also seen with growing importance for the long-term sustainability of Scotland's energy market and generation.

International Document	Overview
	The vital role of solar PV developments, to achieve climate change targets is recognised by the Strategy: *"Solar will play an important role in a low carbon energy system, helping meet Scotland's renewable generation ambitions. Combining storage with wind and solar assets presents a valuable solution for the energy system as a whole, offering the potential for demand to be managed locally. This kind of flexibility and control will be important as electric vehicles become an integral part of the transport system."*
Climate Change Plan 2018	This Climate Change Plan is the Scottish Government's third report on proposals and policies for meeting its climate change targets. It sets out how Scotland can deliver its target of 66% emissions reductions, relative to the baseline, for the period 2018–2032. The Climate Change Plan comprises three parts. Part One sets out the context for the Scottish Government's climate change proposals and policies. It shows the emissions reductions pathway to 2032 and the crucial roles that will be played by local authorities and the wider public sector (and the planning system) and communities. The Scottish Government's statutory duties are covered in Part Two, alongside the annual emissions targets to 2032 and the monitoring framework and indicators that will be used to measure progress against the policies set out in the Plan. Part Three provides detailed information on the emissions envelopes and emissions reduction trajectories for each sector. The Climate Change Plan reiterates the Scottish Government's support for community and locally owned energy. It also restates the importance that the Scottish Government place on the need for a route to market for lowest cost renewable technologies, which solar PV currently is as the Strategy states (page 78): . *"Between 2010 and 2017, the cost of generating electricity from solar PV fell by over 70%..."* The Climate Change Plan also notes the potential for hydrogen producing developments in achieving Scotland's transition to a decarbonisation.
Climate Change (Emissions Reductions Targets) (Scotland) Act 2019	The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 received Royal Assent on 31 October 2019. The Act requires that the net Scottish emissions account for the net-zero emissions target year is at least 100% lower than the baseline (the target is known as the "net-zero emissions target"). The "net-zero emissions target year" is 2045. The Act sets interim targets as follows: • 2020 is at least 56% lower than the baseline. • 2030 is at least 75% lower than the baseline. • 2040 is at least 90% lower than the baseline. In introducing the net zero target, the Climate Change Secretary stated *"There is a global climate emergency. The evidence is irrefutable. The science is clear. And people have been clear: they expect action. The Intergovernmental Panel on Climate Change issued a stark warning last year: the world must act now. By 2030 it will be too late to limit warming to 1.5 degrees."*
Update to the Climate Change Plan 2020	An update to the Climate Change Plan was published in December 2020. It sets out the Scottish Government's pathway to achieving the targets set by the Climate Change (Emissions Reductions Targets) (Scotland) Act 2019 for net zero emissions by 2045. It identifies that wind and solar are now the lowest cost forms of new generation. The update states that actions to develop the role of hydrogen in Scotland's energy system will be taken forward, including building on the outputs of the Hydrogen Assessment project. It states that a Hydrogen Policy statement will be published in December 2020 and a Hydrogen Action Plan will be published in 2021.
Hydrogen Policy Statement 2020	This was published in December 2020. It identifies that role that hydrogen can play a major role globally in the transition to net zero, and that Scotland can be a major player in this emerging global hydrogen market. The statement sets out the Scottish Government's vision for Scotland to become a leading hydrogen nation in the production of reliable, competitive, sustainable hydrogen, and restates the target of 5GW of low-carbon hydrogen by 2030.

5.3 National planning policy and guidance

5.3.1 National planning policy is set out within the National Planning Framework (NPF) and Scottish Planning Policy (SPP). Both were published in 2014 and are nearing the end of their 5-year life. The Planning (Scotland) Act 2019 proposes to review national policy with the preparation of NPF4. This review will incorporate Scottish Planning Policy and will become part of the Development Plan. The Scottish Government has now revised the timetable for the preparation of NPF4, with a Position Statement published in November 2020 and a draft in Autumn 2021.

5.3.2 The current 2014 documents therefore provide the current national policy framework, with the Scottish Energy Strategy and Onshore Wind Policy Framework providing up to date advice on the Scottish Minister's position and targets for the supply of energy from renewable sources.

The National Planning Policy Framework (NPF3)

5.3.3 Scotland's Third National Planning Framework (NPF3 – Scottish Government, 2014) provides the statutory national framework around which to orientate Scotland's long-term spatial development. NPF3 represents the spatial expression of the Scottish Government's Economic Strategy (2011) and it highlights the spatial planning implications of multiple national policy documents and commitments, including the binding decarbonisation targets enshrined within the Climate Change (Scotland) Act 2009.

5.3.4 Overall, NPF3 emphasises the Scottish Government's commitment to increasing sustainable economic growth across all areas of Scotland and therefore orientates the efforts of Scotland's planning system towards this purpose. The introduction to the NPF3 notes the importance of maintaining economically active and vibrant rural areas whilst "safeguarding our natural and cultural a*ssets and making innovative and sustainable use of our resources*".

5.3.5 NPF3 sets out a national spatial strategy structured around four key themes. These are set below;

- A successful, sustainable place: this theme is underpinned by the objective of achieving *"a growing low carbon economy*" alongside creating "*high quality, vibrant and sustainable places…*".The Framework calls for a renewed focus on exploiting Scotland's energy resources, and in paragraph 2.7 the NPF3 identifies a need for development which "*facilitates adaptation to climate change, reduces resource consumption and lowers greenhouse gas emissions*".
- A low carbon place: this theme relates to the legally binding target of reducing Scotland's greenhouse gas emissions by 80% by 2050 compared with 1990 levels, as set out in the Climate Change (Scotland) Act 2009. It states that *"Our built environment is more energy efficient and produces less waste and we have largely decarbonised our travel"*.
- A natural, resilient place: this theme is concerned with environmental protection and it is noted that Scotland's principal asset is the land, which must be managed sustainably as both an economic and dynamic resource and an environmental asset. It is noted in paragraph 4.22 of the SPP that "*rural areas have a particular role to play in building Scotland's long-term resilience to climate change and reducing our national greenhouse gas emissions*".
- A connected place: this theme is orientated around maximising physical and digital connectivity around Scotland and between Scotland and the rest of the world.

The National Planning Framework 4 – Position Statement

5.3.6 The NPF4 Position Statement provides guidance on what direction the Scottish Government wishes to take planning and developments within Scotland in the future. The Position Statement is clear that difficult and considerable changes are needed within the Scottish planning system in order to

rebalance it with climate change as a guiding principle. This shift is required in order to ensure Scotland can achieve its target of net-zero emissions by 2045.

5.3.7 The NPF4 Position Statement is in support of renewable energy developments and on the creation of hydrogen networks. Green hydrogen production facilities are especially noted for their ability to create a clean fuel that can be used by vehicles to further the Net Zero agenda toward a carbon neutral Scotland by 2045. The Position Statement appreciates that hydrogen is a newer technology and highlights how the final version of the NPF4 is likely to have new policies that are in support of such developments.

Scottish Planning Policy (SPP)

5.3.8 The Scottish Government has identified 16 national outcomes which explain how the purpose of sustainable economic growth is to be achieved. Both the NPF3 and the SPP are underpinned by a common vision, which is articulated in paragraph 11 of the SPP:

"*We live in a Scotland with a growing, low-carbon economy with progressively narrowing disparities in well-being and opportunity. It is growth that can be achieved whilst reducing emissions and which respects the quality of environment, place and life which makes our country so special. It is growth which increases solidarity – reducing inequalities between our regions. We live in sustainable, well-designed places and homes which meet our needs. We enjoy excellent transport and digital connections, internally and with the rest of the world*".

5.3.9 The relevant policy in the SPP is a material consideration that carries significant weight. It sets out the Scottish Government's expectations regarding the treatment of specific planning issues within development planning and development management. The SPP includes policies relating to sustainable development and renewable energy which are directly applicable to the Project, as detailed below.

5.3.10 To implement this Vision statement the SPP identifies four planning outcomes based on the themes of the NPF3, which are:

- "*Outcome 1: A successful, sustainable place – supporting sustainable economic growth and regeneration, and the creation of well-designed, sustainable places.*"
- "*Outcome 2: A low carbon place – reducing our carbon emissions and adapting to climate change*". This outcome relates to the legally binding target of reducing Scotland's greenhouse gas emissions by 80% by 2050 compared with 1990 levels, as set out in the Climate Change (Scotland) Act 2009. The outcome further sets out Scotland's commitment to generating at least 30% of overall energy demand, and the equivalent of at least 100% of gross electricity consumption, from renewables by 2020. The need to facilitate this transition by supporting diversification in the energy sector and the importance of onshore wind are recognised within NPF3.
- *"Outcome 3: A natural, resilient place – helping to protect and enhance our natural and cultural assets, and facilitating their sustainable use*." As noted in the NPF3, Scotland's principal asset is the land, which must be managed sustainably as both an economic and dynamic resource and an environmental asset. The role of rural areas in the transition towards a low carbon economy is recognised.
- *Outcome 4: A more connected place – supporting better transport and digital connectivity".*

The most relevant paragraphs of the SPP are identified in **Table 5.4** below.

Table 5.4 Relevant subject specific policies within the SPP

Subject Policy	SPP Reference	Overview
Principle Policy on Sustainability	Paragraphs 24 - 35	Includes a presumption in favour of sustainable development. This relates to the identification of the need for, and the acceptability of, the development. Thirteen principles (found at paragraph 29 of SPP) which should guide planning policies and decisions have been identified. The principles of relevance to the Project include: • *"Giving due weight to net economic benefit.* • *responding to economic issues, challenges and opportunities, as outlined in local economic strategies.* • *Supporting good design and the six qualities of successful places.* • *Supporting delivery of infrastructure.* • *Supporting climate change mitigation and adaptation.* • *Having regard to the principles for sustainable land use set out in the Land Use Strategy.* • *Protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment.* • *Avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality."*
Supporting Business and Employment	Paragraphs 92 - 108	This Section highlights the need to "*give due weight to net economic benefit of proposed development*" (paragraph 93). The SPP identifies energy as one of several key growth sectors which should be appropriately supported through Development Plans.
Valuing the Historic Environment	Paragraphs 135 - 151	The SPP states that planning should promote the care and protection of the designated and non-designated historic environment and should take account of all aspects of the historic environment.
A Low Carbon Place	Paragraphs 152 - 174	It is noted that taken together, the NPF3 and the SPP should *"facilitate the development of generation technologies that will help to reduce greenhouse gas emissions from the energy sector…efficient supply of low carbon and low cost heat and generation of heat and electricity from renewable energy sources are vital to reducing greenhouse gas emissions and can create significant opportunities for communities"* (paragraph 152-153). The SPP identifies four planning principles (paragraph 154) related to the delivery of electricity and heat infrastructure, three of which are of relevance to the Project: • *"Support the transformational change to a low carbon economy.* • *Support the development of a diverse range of electricity generation from renewable energy technologies.* • *Guide development to appropriate locations and advise on the issues that will be taken into account when specific proposals are being assessed… ".* SPP paragraphs 167 and 168 state that Development Plans should identify areas capable of accommodating renewable electricity projects in addition to wind generation, including hydro-electricity generation related to river or tidal flows or energy storage projects of a range of scales. Paragraph 169 identifies several considerations which are likely to be relevant when determining proposed energy infrastructure developments. These include economic impacts and benefits,

Subject Policy	SPP Reference	Overview
		renewable energy targets, effects on greenhouse gas emissions, cumulative impacts and environmental impacts including residential amenity considerations such as noise; landscape and visual impacts; public access, tourism and recreation, hydrology; geology; natural and built heritage; impacts on the transport network, aviation interests and telecommunications; and requirements for decommissioning and restoration.
Valuing the Natural Environment	Paragraphs 193 - 233	The SPP identifies several planning principles related to natural heritage protection and ecological resilience. Principles (paragraph 194) of relevance to the Project include that planning should: • *"Facilitate positive change while maintaining and enhancing distinctive landscape character.* • *Conserve and enhance protected sites and species.* • *Promote protection and improvement of the water environment...in a sustainable and co-ordinated way.* • *Seek to protect soils from damage.* • *Protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value.* • *Seek benefits for biodiversity from new development where possible..."*
Maximising the Benefits of Green Infrastructure	Paragraphs 219 - 233	The SPP identifies several planning principles related to the protection, enhancement and promotion of green infrastructure including core paths and other important routes.
Managing Flood Risk & Drainage	Paragraphs 254-268	A precautionary approach to flood risk from all sources is promoted and where relevant, flood risk assessments and the deployment of SUDs are required.
Promoting Sustainable Transport and Active Travel	Paragraphs 269-291	Notes the requirement to consider traffic impacts including cumulative.

Planning Advice Notes (PANs) and Circulars

5.3.11 National planning policy is supported by Planning Circulars, Planning Advice Notes (PANs), Advice Sheets and Ministerial/Chief Planner Letters to Planning Authorities. Planning Circulars contain guidance on policy implementation through legislative or procedural change, while PANs expand on national policy and incorporate best practice advice.

5.3.12 The following Scottish Government/NatureScot Planning Circulars and Advice documents are of relevance to the Project and are contained within **Table 5.5** below.

Table 5.5 Relevant PANs and Circulars

PAN or Circular	Overview
Online Planning Advice regarding Flood Risk (published 18th June 2015)	This advice document provides brief guidance on all aspects of flood risk. It was produced to support the SPP and its goals for ensuring flood risk is properly considered, managed and mitigated in potential developments. This document also ensures that information regarding flooding is made available and kept up to date by SEPA and that Local Authority's LDP (LDP2017) and development management procedures consider flooding to be a considerably important aspect new developments must consider and address.

PAN or Circular	Overview
Draft Advice on Net Economic Benefit and Planning (2016)	This draft advice note seeks to educate developers and Local Authorities on how to consider net economic benefits that can exist in some, but not all, developments. Where the decision to grant planning permission is finely balanced or difficult to ascertain due to LDP requirements and/or other material considerations, the net economic benefit of a proposed development should be considered. The document is clear that any proposed net economic benefit needs to be proportionate, supported by evidence and transparent to ensure any predictions are as accurate as possible.
Draft Peatland and Energy Policy Statement (2016)	In June 2016, the Scottish Government published its draft Peatland and Energy Policy Statement, which provides the basis from which the Scottish Government and its agencies will act in development and implementing policies in relation to peatland and energy. This policy is a material consideration for new energy developments and the impact they may have on peatland habitats. The Policy Statement notes that; *"analysis by the James Hutton Institute suggests Scotland's peatlands store approximately 2,000 Mt carbon (or over 7,000 million tons CO2 equivalent). For Scotland to meet its greenhouse gas emissions reduction targets, this vast carbon store must be maintained and where possible enhanced."*
Historic Environment Policy for Scotland (2019)	The Historic Environment Policy for Scotland (HEPS) sets out how to approach decisions in the planning system affecting the historic environment. It is non statutory but should be considered whenever a decision will affect the historic environment. It includes six policies for managing the historic environment, including: • HEP1 – Decisions affecting any part of the historic environment should be informed by an inclusive understanding of its breadth and cultural significance. • HEP2 – Decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations. • HEP4 – Changes to specific assets and their context should be managed in a way that protects the historic environment. Opportunities for enhancement should be identified where appropriate. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place.
PAN 2/2011 Planning and Archaeology (July 2011)	This PAN provides advice on how important archaeology is and how the planning system is important to its continued protection, maintenance and even enhancement. The PAN clearly states that new developments could potentially damage archaeological assets and their setting. Local Authorities and developers should consider the importance of the archaeological sites that are being affected and this importance is determined by many factors, some of which the PAN outlines.
PAN 1/2011 Planning and Noise (March 2011)	This PAN outlines the importance of developers and Local Authorities working to ensure new developments do not pollute their surrounding with undue noise. Developments that produce a considerable amount of noise and/or constant noise can have considerable effects on their neighbours unless such noises are in keeping with their surroundings.
PAN 3/2010 Community Engagement (August 2010)	This PAN seeks to advise developers on how to conduct effective engagement for National and Local bodies and stakeholders. Developers should use methods that are appropriate to ensure any attempts to carry out community engagement are accessible for as many people as possible. Community engagement can provide important local knowledge and local people should have a say in how development is shaped in their surroundings.
PAN 60 Planning for Natural Heritage (2000, revised January 2008)	This PAN provides guidance on the importance of natural heritage and the duty of Local Authorities and developers to ensure Scotland's important natural heritage is maintained and/or enhanced. Scottish Natural Heritage (SNH) is an important consultee and can provide both developers and Local Authorities with important advice on how to approach developments.
PAN 51 Planning, Environmental Protection and Regulation (Revised October 2006)	This PAN outlines the importance of Local Authorities and SEPA's role in protecting the environment. Developments should not unduly compromise the environment and it is important for developers to consult with SEPA and other bodies to ensure the full extent of a development affects are understood and mitigated.
PAN 79 Water and Drainage (September 2006)	This PAN outlines the importance of Scotland's water resources and infrastructure including drainage. It also outlines how developments need to consider flooding and how they must not increase the risk of flooding in their surroundings.

PAN or Circular	Overview
PAN 75 Planning for Transport (August 2005)	This PAN seeks to inform developers and Local Authorities on the importance of good quality infrastructure and developments that are well integrated into their surroundings. The benefits of good quality infrastructure are many and early planning for infrastructure is often key to ensure it is effective.
PAN 68 Design Statements (August 2003)	This PAN seeks to encourage the submission of design statements alongside applications for new developments. High quality design is key to the SPP's aim of sustainable development, which is an aspect of development that is often important in most policies. A design statement should lay out in simple terms the design of a development and communicate how the development would look.

5.4 Legislative framework

The Electricity Act 1989

5.4.1 The solar PV farm, substation compound, BESS, HV cable, link road to/from the B764, temporary construction laydown areas and associated infrastructure will be determined through an application under Section 36 of the Electricity Act 1989 due to their classification as electricity generating stations and the installed capacity being more than 50 MW. This application will be made to the Scottish Ministers. A request is also being made that a direction be issued under Section 57 (2) of the Town and Country Planning (Scotland) Act 1997 that planning permission be deemed to be granted.

5.4.2 The applicant is a licenced generator and has obligations under Schedule 9 of the Electricity Act 1989 which requires it to have regard to certain environmental matters when formulating development proposals. It is obliged to have regard to the desirability of preserving natural beauty, conserving listed natural heritage interests and to protecting sites, buildings, and objects of architectural and historical interest. It must also do what it reasonably can to mitigate any effects of development and it must not impact fisheries or fish stocks in any waters.

The Town and Country Planning (Scotland) Act 1997, as amended

5.4.3 The green hydrogen production facility including accesses, a temporary construction laydown area and associated infrastructure will be determined through an application for Full Planning Permission submitted under Section 32 of the TCPA 1997. This application will be made to EAC.

5.5 Material Considerations

The Local Development Plan

5.5.1 The relevant Development Plan relating to the Project is the LDP2017. Section 25 of the TCPA 1997 requires that planning decisions be made in accordance with the Development Plan (in this case the LDP2017) unless material considerations indicate otherwise. As set out above, in the case of the application submitted to EAC under the TCPA 1997, the LDP2017 has primacy in the decision-making process, but it does not have this status for the application submitted to the Scottish Ministers under Section 36 of the Electricity Act.

Relevant Policies

5.5.2 The relevant LDP2017 policies are contained within **Table 5.6** below.

Table 5.6 East Ayrshire Local Development Plan policies

Policy/Guidance	Overview and Objectives	EIA Report Chapter
Overarching Policy OP1	This policy provides a list of criteria all development proposals must satisfy to be deemed acceptable. Where a development proposal demonstrates their contribution towards sustainable development, should these contributions outweigh their lack of consistency with parts of this policies criteria then their contributions towards sustainable development can soften the criteria. As this policy is overarching the policy is concerned with ensuring developments conform with all policies of the LDP, have no unacceptable impacts on the environment, are well designed and of an appropriate size and scale to their surroundings, creates no unacceptable impacts on the landscape character and protect important natural and built heritage assets	As this is an overarching policy, it applies across all the EIA Report Technical Assessment Chapters (6 – 9).
Policy IND3: Business and Industrial Development in the Rural Area	Policy IND3 allow for the creation of renewable energy related developments within rural areas where the development proposal has demonstrated it has been considered critically against relevant policy and satisfies those policies. The policy is therefore wide ranging in terms of renewable energy developments as it enforces the importance of the other policies within the LDP and for developments to be considered critically against their various requirements.	-
Policy RES11: Residential Amenity	Policy RES11 requires development proposals to not compromise the amenity and characteristics of residential areas, protecting said areas from potentially damaging developments. Established residential properties will have come to expect a certain level of residential amenity that new developments should not compromise.	-
Policy RE1: Renewable Energy Developments	Policy RE1 is an overarching policy for renewable energy developments. The policy establishes the criteria in Schedule 1: Renewable Energy Assessment Criteria, which is a set of criteria all renewable energy development proposals must comply with. It also stresses the importance for renewable energy development proposals are appropriate to their surroundings.	As this is the overarching renewable energy policy, it applies across all the EIA Report Technical Assessment Chapters (6 – 9).
Schedule 1: Renewable Energy Assessment Criteria	Schedule 1 provides the detailed criteria established by policy RE1 that renewable energy development proposals must consider and the full list of the criteria is shown below: • *"Landscape and visual impacts.* • *Cumulative impacts – likely cumulative impacts arising from all of the considerations below, recognising that in some area the cumulative impact of existing and consented energy development may limit the capacity for further development.* • *Impacts on carbon rich soils, deep peat, and peatland habitats, using the carbon calculator.* • *Effects on the natural heritage, including birds. Renewable energy proposals will only be approved where the Council has ascertained that they would not have an adverse effect on the integrity of a Natura 2000 site.* • *Impacts on wild land.* • *Impacts on all aspects of the historic environment.* • *Effects on hydrology, the water environment, flood risk and groundwater dependent terrestrial ecosystems.*	This applies across all the EIA Report Technical Assessment Chapters (6 – 9).

Policy/Guidance	Overview and Objectives	EIA Report Chapter
	• *Re-use of excavated peat, forest removal and forest waste.* • *Impacts on forestry and woodlands with reference to the Ayrshire and Arran Forestry and Woodland Strategy (2013).* • *Effect on greenhouse gas emissions.* • *Impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker.* • *Impacts on tourism and recreation;* • *Public access, including impact on long distance walking and cycling routes and scenic routes identified in National Planning Framework 3.* • *Net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities.* • *Impacts on aviation and defence interests and seismological recording.* • *Impacts on road traffic including during construction and decommissioning.* • *Impacts on adjacent trunk roads.* • *Impacts on telecommunications and broadcasting installations, particularly ensuring that transmission links are not compromised.* • *…The need for conditions relating to the decommissioning of development, including ancillary infrastructure, and site restoration.* • *The need for a robust planning obligation to ensure that operators achieve site restoration;* • *The scale of contribution to renewable energy generation targets.* • *Opportunities for energy storage."*	
Policy RE5: Financial Guarantees	This policy seeks to ensure financial guarantees from developers where the Council expects the development in question to have restoration, aftercare, decommissioning and/or mitigation costs. Such financial contributions are required to be agreed before work commences on the development should it be deemed acceptable.	-
Policy T1: Transportation Requirements for New Development	Policy T1 requires development proposals to satisfy the requirements of the Ayrshire Roads Alliance and align with any Regional and Local Transport Strategies. Development proposals are required to demonstrate that their development would be accessible, preferably by sustainable and active means.	Chapter 5 – Traffic and Transport
Policy WM1: Sustainable Waste Management	Policy WM1 requires development proposals to meet the aims of the Scottish Governments Zero Waste Plan and follow the principles of the Waste Hierarchy. Development proposals are therefore required to ensure they minimise any waste produced and recycle as much waste as possible. The policy encourages developments that manage to use recycled material.	-
Policy WM3: Sustainable Waste Management and New Developments	Policy WM3 requires development proposals to have waste separation on site during construction to ensure as much waste as possible has the potential to be recycled and not lost to landfill. Major and significant local developments could also be required to produce a Site Waste Management Plan to demonstrate in detail how waste generation will be minimised during the site's construction and operation.	-

Policy/Guidance	Overview and Objectives	EIA Report Chapter
Policy ENV1: Listed Buildings	Policy ENV1 provides protection to both the character and setting of listed buildings within East Ayrshire. The demolition or loss of listed buildings would rarely be supported.	-
Policy ENV2: Scheduled Monuments and Archaeological Resources	Policy ENV2 provides protection to the character and setting of scheduled monuments, only permitting support for development proposals where any adverse effects on scheduled monuments has exceptional overriding circumstances. This policy also affords protection to the archaeological resources located within East Ayrshire. Archaeological assets discovered should remain in situ where possible and developers are required to provide for the archaeological excavation of the asset where this is not possible.	-
Policy ENV6: Nature Conservation	This policy affords protection to the important natural resources, assets and biodiversity found within East Ayrshire. Development proposals that adversely affects Natura 2000 or SSSI sites would only be permitted where they would not have adverse effects on the integrity of these sites. Potential effects on sites of local importance due to the composition of natural assets within them, are also protected. Development proposals are required to minimise and mitigate their potential effects on these sites and on protected species that might operate in and around the development site. The policy also seeks to ensure that development proposals are designed in such a manner that opportunities to incorporate or extend existing habitat networks are considered.	Chapter 2 – Ecology and Ornithology
Policy ENV8: Protection and Enhancing the Landscape	This policy affords protection to the landscapes of East Ayrshire and even seeks to see the enhancement of East Ayrshire's landscapes over the lifetime of the LDP. The policy requires development proposals to be well designed and of a size, scale and layout that is in accordance with the landscape character the site is located within. The policy notes that the finishing's, colours and materials used in developments is also of considerable importance and such aspects of development should be carefully considered to ensure development proposals mitigate and reduce their potential effects on landscapes and their characteristics as much as possible. The policy highlights the following important landscape features that should be conserved and considered in development proposals: • *"Settings of settlements and buildings within the landscape.* • *Skylines, distinctive landforms features, landmark hills and prominent views.* • *Woodlands, hedgerows and trees.* • *Field patterns and means of enclosure, including dry stone dykes.* • *Rights of way and footpaths."*	Chapter 3 – Landscape and Visual
Policy ENV9: Trees, Woodland and Forestry	This policy affords protection to the trees, woodlands and forests located within East Ayrshire. Development proposals must justify the loss of such natural assets and must achieve clear and considerable public benefit from their development. Compensatory planting and similar schemes could be used by development proposals to help justify the loss of trees.	Chapter 2 – Ecology and Ornithology

Policy/Guidance	Overview and Objectives	EIA Report Chapter
Policy ENV10: Carbon Rich Soils	This policy affords protection to the important peatland soils within East Ayrshire. The policy seeks to minimise any potential effects or loss of peatland soils as these are an important source of carbon storage. The policy does make special exceptions for renewable energy developments, which may be built on carbon rich soils where their economic and public benefit outweighs the potential loss of said soils.	Chapter 2 – Ecology and Ornithology
Policy ENV11: Flood Prevention	This policy seeks to ensure new developments within East Ayrshire at not as risk of flooding and do not increase the risk of flooding in their surroundings. Development proposals are required to mitigate their susceptibility to flooding, ensuring their resulting development would be as flood resilient as possible.	Chapter 4 – Geology, Hydrology and Hydrogeology.
Policy ENV12: Water, Air and Light and Noise Pollution	This policy works to ensure development proposals within East Ayrshire do not create unreasonable levels of water, air, light and noise pollution. Preferably, development proposals would produce as little pollution and types of pollution as possible. Development proposals are required to mitigate any effects from pollution as much as possible.	Chapter 4 – Geology, Hydrology and Hydrogeology; and Chapter 5 – Traffic and Transport.
Policy ENV14: Low and Zero Carbon Buildings	Policy ENV14 seeks to ensure that new developments within East Ayrshire incorporate low and zero carbon technologies and reduce their creation of greenhouse gases as much as possible.	-

5.6 Other considerations

Emerging Local Development Plan

5.6.1 EAC is currently in the process of preparing the Local Development Plan 2 (LDP2), a successor to the current LDP2017. EAC has progressed to the stage of issuing a Main Issues Report (MIR) which contains the main issues the Council seeks to address in LDP2 and helps to identify how the Council will consider development proposals in the future. At the time of submission, LDP2 is not at a stage where it would be considered as a fundamental material consideration in the assessment of the project.

East Ayrshire Economic Development Strategy 2014 – 2025

5.6.2 This document provides the economic aspirations of the East Ayrshire region. Key to this application is EAC desire to ensure the East Ayrshire region increases its sustainability and places it as key to ensuring long term economic growth. The document also highlights renewables as being a priority growth sector.

5.7 Summary

5.7.1 This Chapter has identified the relevant energy, and national and local planning policy frameworks relevant to the Project. A separate Supporting Statement (Section 36)/Planning Statement (Full Planning Permission), not included as part of the EIA Report, discusses the policy considerations in greater detail and provides a planning balance assessment and conclusions on the acceptability of the Project in planning terms.

6. Ecology and ornithology

6.1 Introduction

6.1.1 This Ecological Impact Assessment (EcIA) assesses the likely significant effects[8] of the Project with respect to terrestrial and freshwater ecology and ornithology. The report should be read in conjunction with the development description provided in the Planning Statement and with respect to relevant parts of other assessments, including **Chapter 8**: Geology, Hydrology and Hydrogeology of this EIA Report, where common receptors have been considered and where there is an overlap or relationship between the assessment of effects. In this EcIA, receptors are referred to as ecological features, to accord with the Chartered Institute of Ecology and Environmental Management (CIEEM 2019) "*Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* Version 1.1 – updated September 2019". The term ecological feature is defined in the guidance as pertaining to habitats, species and ecosystems.

6.1.2 This EcIA was informed by the following Technical Appendices and Figures presented in **Table 6.1** below.

Table 6.1 Technical appendices and figures supporting the EcIA

Technical Appendix	Figure	Location (Volume 3)
Ecological Desk Study	**Figure 3A6.1**: Study Areas **Figure 3A6.2**: Statutory and Non-Statutory Designated Sites **Figure 3A6.3a**: Protected species data (2011/12) - Whitelee Extension Phase 3 **[Confidential]** **Figure 3A6.3b**: Breeding bird survey records (2009) - Whitelee Extension Phase 3 **Figure 3A6.3c**: Black grouse and nesting/roosting owls (2009 and 2012) - Whitelee Windfarm Extension Phase 3 **[Confidential]** **Figures 3A6.4a-i**: Whitelee Habitat Management Area - Bird monitoring data Raptor records (HMA Monitoring 2017, 2018, 2020) **[Confidential]** Breeding waders and red grouse breeding records (HMA Monitoring 2017, 2018, 2020) Red-listed passerine records (HMA Monitoring 2017, 2018, 2020) Black grouse records (HMA Monitoring 2017, 2018, 2020) **[Confidential]**	Appendix 3A
Phase 1 Habitats and NVC Survey	**Figure 3B6.1**: Phase 1 Habitats **Figure 3B6.2**: National Vegetation Classification **Figure 3B6.3**: Potential Groundwater Dependent Terrestrial Ecosystems	Appendix 3B
Protected Species Survey	**Figure 3C6.1**: Study area and watercourses **Figure 3C6.2**: Otter field signs	Appendix 3C
Scoping of Assessment Survey	-	Appendix 3D
Habitat Loss Calculations	-	Appendix 3E

[8] The term "potentially significant effects" is used in the sections prior to the "scope of the assessment" being determined, as it accords with CIEEM guidance. The term "likely significant effects" is used once the scope of the assessment has been determined. The use of this term is not to be confused with Likely Significant Effects (LSEs) as used in the context of a Habitats Regulations Appraisal (HRA).

Technical Appendix	Figure	Location (Volume 3)
General Supporting Figure	**Figure 6.1**: Proposed Development Overview **Figure 6.2**: Peat Depth **Figure 6.3**: Proposed Management Areas **Figure 6.4**: Proposed Management Unit A **Figure 6.5**: Proposed Management Unit B	Appendix 3F

6.1.3 The following terms are used throughout this Chapter and associated Technical Appendices, provided within Volume 3 of the EIA Report, as illustrated in **Figure 6.1:**

- Site: refers to all land within the red line boundary (i.e. the scheme layout and Site access route).
- Project: Land Adjacent to Whitelee Windfarm - Solar PV, Green Hydrogen Production and Battery Storage Facilities, as described in the Supporting Statement (S36) and Planning Statement (Full PP).
- Proposed Habitat Management Area (HMA): refers to proposed habitat management units within the northern area of the Site.
- Whitelee HMA: refers to the existing habitat management area for the existing Whitelee Wind Farm, some of which lies within the Site.

6.2 The Project

6.2.1 A detailed description of the Project is provided above within **Chapter 3** as well as within the accompanying Supporting Statement (S36) and Planning Statement (Full PP).

6.2.2 Due to the nature of the Project and the location of the various elements within the site (i.e., the solar PV and green hydrogen energy facility to the north and the BESS to the south), there are varying characteristics between these two areas.

- Northern area: The immediate surroundings of the northern area of the site comprise coniferous forestry plantation to the immediate north of the site boundary between the site at the B764, plateau moorland and felled coniferous plantation to the south and west which comprises the area of land identified for the site and the Eaglesham Moor area of the existing Whitelee Windfarm immediately to the east nearby the Lochgoin circuit, Lochgoin reservoir, Lochgoin farmhouse and monument. Within the northern area of the site, peat bog underlies a significant proportion of the site at varying depths. The site layout of the solar PV farm and the location of green hydrogen production facility have been selected to avoid areas of deeper peat and concentrate development to areas where peat bog has been identified as being 1m or less in depth.
- Southern area: The immediate surroundings of the southern area of the site at the BESS comprise sections of commercial forestry to the north, west and south interspersed with areas of moorland combined with existing access tracks between the existing wind turbines of the Whitelee Windfarm Extension. To the east is situated the existing Rough Hill substation (c. 800m). Distant to the northwest of the BESS site is Craigendunton Reservoir (2km).

6.3 Scope and limitations of this assessment

6.3.1 The baseline context of the Study Area has been determined based on the following:

- A desk study was based on extensive ecological and ornithological surveys conducted in 2009/2010/2011 and 2012 as part of the Whitelee Phase 3 Wind Farm Extension 2010 and 2012 applications. Limitations are acknowledged in relation to the age of data used to inform elements of the assessment (some of which is up to 10 years old). Where necessary professional judgement has been used to provide clear rationale where there is reliance on such surveys and their representativeness in the absence of a more current baseline.
- Desk study data comprising extensive ongoing ecological monitoring (2006 - 2020) for the surrounding Whitelee Wind Farm Habitat Management Plan were reviewed for the Site and adjacent areas in respect to the potential presence of notable ecological features.
- Field surveys were undertaken between September – November 2020. Field surveys followed the survey guidance that is widely recognised, including by NatureScot. Full details are provided in the accompanying survey reports, which also note where deviations occurred due to issues including adverse weather, health and safety concerns and land access.
- NVC surveys were undertaken across the northern area (the solar search area), whilst Phase 1 habitat coverage was undertaken across the southern area comprising former and existing forestry plantation.
- The plantation woodland areas adjacent to the Study Area were not surveyed for badger in detail but given the nature of the boggy terrain and the damp soils, they are considered unlikely to support badger setts.

6.3.2 It is considered that the limitations of the survey programme do not affect the robustness of the assessment of the likely significant effects of the Project.

6.4 Relevant legislation, planning policy, technical guidance

Legislative context

6.4.1 The following legislation has been considered in the assessment of the effects on ecological features:

- Electricity Act 1989 Schedule 9 sub para 3 and 4.
- Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora) as transposed into Scots Law by:
  - The Conservation (Natural Habitats &c.) Regulations 1994 (as amended in Scotland) (the "Habitats Regulations").
  - The Conservation of Habitats and Species Regulations 2017 which apply in Scotland in relation to certain specific activities (reserved matters), including consents granted under Section 36 of the Electricity Act 1989.
- Wildlife and Countryside Act 1981 (as amended in Scotland).
- The Wildlife and Natural Environment (Scotland) Act 2011 (as amended) (WANE Act).
- Nature Conservation (Scotland) Act 2004 (as amended).
- The Protection of Badgers Act 1992 (as amended).
- Water Environment and Water Services (Scotland) Act 2003 (WEWS Act).
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

Planning policy context

National policies

6.4.2 A summary of the relevant national planning policies is given in **Table 6.2** below.

Table 6.2 Planning policy issues relevant to ecology

Policy Reference	Policy Issue
Scottish Planning Policy (2014)	
Valuing the Environment Subject Policy (paragraphs 193-218)	The 'Valuing the Natural Environment' subject policy within the Scottish Planning Policy (SPP) (2014) sets out detailed policy provisions relating to the protection and enhancement of different types of natural resources and natural heritage assets, as detailed below: • Natural Heritage Planning Principles (paragraph 194). • Protecting Designated Sites (paragraph 196). • Development Management Decisions (paragraphs 202-206). • Non-Native Species (paragraph 206). • Protected Species (paragraph 214); and Woodland (paragraphs 216-218).
Protecting Designated Sites (paragraph 196)	The SPP requires designated areas and sites to be identified and appropriately protected through development plans, without the use of buffer zones (paragraph 196). Within the same paragraph the SPP states that "*the level of protection given to local designations should not be as high as that given to international or national designations*".
Development Management Decisions (paragraphs 202-206)	The SPP states that planning decisions "*should take account of potential effects on landscapes and the natural and water environment, including cumulative effects*". The SPP further states that "*planning permission should be refused where the nature or scale of proposed development would have an unacceptable impact on the natural environment*". It is noted in the same paragraph that whilst effects on statutorily protected sites will be an important consideration, this "*does not impose an automatic prohibition on development*".
Non-Native Species (paragraph 206)	The SPP states that "*where non-native species are present on site, or where planting is planned as part of a development, developers should take into account the provisions of the Wildlife and Countryside Act 1981 relating to non-native species*".
Protected Species (paragraph 214)	The SPP notes that "*the presence (or potential presence) of a legally protected species is an important consideration in decisions on planning applications. If there is evidence to suggest that a protected species is present on site or may be affected by a proposed development, steps must be taken to establish their presence. The level of protection afforded by legislation must be factored into the planning and design of the development and any impacts must be fully considered prior to the determination of the application*".
Woodland (paragraph 218)	The SPP notes that the Scottish Government's Control of Woodland Removal Policy "*includes a presumption in favour of protecting woodland. Removal should only be permitted where it would achieve significant and clearly defined additional public benefits*". The SPP also confirms that where woodland is removed in association with a proposed development, compensatory planting will generally be expected.
Local Planning Policy	
East Ayrshire Local Development Plan (LDP) (2017)	The adopted East Ayrshire LDP policies of relevance to this report include: • Policy ENV6: Nature Conservation. • Policy ENV9: Trees, Woodland and Forestry. • Policy ENV10: Carbon Rich Soils.

Policy Reference	Policy Issue
UK Biodiversity Action Plan (UKBAP) / UK Post-2010 Biodiversity Framework (UKBAP)	The UKBAP, produced in 1994 by the UK Government, was a national strategy for the conservation of biodiversity. The UKBAP was updated in July 2012 with a plan which covers the period 2011-2020. This framework is implemented individually by each of the four UK devolved areas. Within Scotland, the UKBAP is coordinated through the Biodiversity Action Reporting System (BARS), which is an online tool which contains a list of Scottish priority habitats and species (The Scottish Biodiversity List [SBL]). All UKBAP species and habitats are listed in the SBL.
Scottish Biodiversity List (SBL)	The SBL is a list of flora, fauna and habitats considered by the Scottish Ministers to be of principal importance for biodiversity conservation and its publication was a requirement of Section 2(4) of The Nature Conservation (Scotland) Act 2004.
Ayrshire Local Biodiversity Action Plan (ALBAP)	The Ayrshire Local Biodiversity Action Plan (ALBAP) was written to deliver national (UKBAP) objectives at local level and it prioritises habitats for action, as well as identifying key habitats and species. Since the current ALBAP was written in 2007 a number of very important Scottish biodiversity plans have been written including the SBL, as well as the updated UKBAP, which should be used to update the current ALBAP which ended in 2010.

Technical guidance

6.4.3 Publications that provide guidance that is relevant to the assessment of potentially significant effects on ecology are listed below:

- Chartered Institute of Ecology and Environmental Management (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Version 1.1 – updated September 2019.* Chartered Institute of Ecology and Environmental Management, Winchester.
- Scottish Government (2013). The Scottish Biodiversity List (SBL).
- SNH (2010) Floating Roads on Peat.
- SNH (2013) Constructed tracks in the Scottish Uplands. Updated September 2015.
- SNH (2016b) Dealing with construction and birds.
- SNH (2017) Natural heritage considerations for solar photovoltaic installations.
- SEPA (2008) Engineering in the water environment good practice guide: construction of river crossings.
- Scottish Environment Protection Agency (2017). LUPS-GU31 Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Version 3.
- Natural England (2017) Evidence review of the impact of solar farms on birds, bats and general ecology (NEER012).
- Natural Research (2007). A review of disturbance distances in selected bird species.
- Forestry Commission (2003) Forests and Water Guidelines fourth edition.
- Anderson, R. (2010) Restoring afforested peat bogs: results of current research. Forestry Commission Research Note[9].
- CIRIA C648 (2006), Control of water pollution from linear construction projects.

[9] http://www.forestry.gov.uk/pdf/fcrn006.pdf/$FILE/fcrn006.pdf

- Scottish Renewables, SNH, SEPA, Forestry Commission Scotland, Historic Environment Scotland and Marine Scotland Science (2019). Good Practice during Wind Farm Construction (4th Edition).
- BRE (2013) Planning guidance for the development of large-scale ground mounted solar PV systems.
- BRE (2014). Biodiversity guidance for solar developments.

6.4.4 Technical guidance used to define the survey methods and inform this assessment are referenced in Volume 3B of Volume 3: Phase 1 Habitat and NVC Survey 2020, EIA Report Volume 3C: Protected Species Survey 2020.

6.5 Data gathering methodology

Study area

6.5.1 The "Study Area" encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this Chapter. Due to the presence of multiple ecological features and many potential effects, the level and type of data collection varies across the study area. The Study Area comprises:

- The Site boundary (as defined in the Planning Statement).
- The Development footprint (working area).
- The Desk study area for Statutory and Non-statutory sites.
- The Desk study area for legally protected and notable ecological features.
- The field survey areas comprise the Project footprint plus a surrounding area defined below:
  - Phase 1 habitat survey: 100m.
  - NVC survey: 100m or 250m around the Project footprint to account for potential groundwater dependent terrestrial ecosystem (GWDTE)[10] presence).
  - Protected species:
    - All watercourses plus 200m beyond the Site boundary (otters).
    - All watercourses plus 50m beyond the Site boundary (water voles).
    - Suitable habitats within the Site plus 50m beyond the Site boundary (badgers).

6.5.2 The extent of the desk study area(s) and field survey area (see **Table 6.3**) were determined based on best practice guidance together with a high-level overview of the types of ecological features present, and the potential effects that could occur (see **Figure 3A6.1** Study Area in Volume 3A of Volume 3. The Study Area was defined on a precautionary basis to ensure that, as a minimum, the Zone of Influence (ZoI)[11] relevant to all ecological features (see **Table 6.8** and **Section 6.7**) was covered during baseline data collection activities.

6.5.3 As the design of the Project has evolved iteratively, the Study Area, and its constituent parts, has been regularly reviewed to ensure that its extent was adequate to enable the assessment of all

[10] Determined by proposed depth of excavations - 100m radius of all excavations less than 1m in depth; and 250m around all excavations deeper than 1m (SEPA, 2017).

[11] The Zone of Influence (ZoI) in this context is the area over which an individual ecological feature may be subject to a potentially significant effect resulting from changes in the baseline environment due to the Project.

potentially significant effects of the ecological features identified. Changes to the initial developable area, or the precise nature of the development, have been reviewed in light of the ecological features present (this being informed by the data gathering exercise) and the potential effects that could occur. At each stage of design evolution, the extent of the Study Area, including all of its components, was tested using the methodology described in **Section 6.7** to ensure adequate information was available on which to base an assessment.

Desk study

6.5.4 A desk-based data-gathering exercise was undertaken to obtain existing information relating to relevant ecological features, these being: statutory and non-statutory biodiversity sites; habitats and species of principal importance[12]; legally protected and controlled species; and other conservation notable species that have been recorded within the Study Area.

6.5.5 **Table 6.3** lists the data compiled within the desk Study Area (which is the Site and the additional areas of search beyond and is shown in Volume 3A of the Volume 3).

Table 6.3 Information relevant to the desk study

Ecological Feature	Example/Description	Study Area[13]
Statutory sites designated under International conventions or European legislation	Wetlands of International Importance (also known as Ramsar sites), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)	The Site and within 5 km of it.
Statutory sites designated under national legislation	Sites of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) and Local Nature Reserves (LNRs)	The Site and within 2 km of it.
Locally designated sites	Often termed as Local Wildlife Sites (LWS), County Wildlife Sites (CWS), Sites of Interest for Nature Conservation (SINC)	The Site and within 2 km of it.
Scottish Biodiversity List; Red listed species[14]; and Legally protected species.	Flora, fauna and habitats of principal importance for the conservation of biodiversity in Scotland. Species recorded on The IUCN Red List of Threatened Species and/or local Red Lists for the UK or relevant sub-units (e.g., regions or counties) and legally protected habitats and species including those listed on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended in Scotland) and those included on Schedules 2 and 5 of the Habitats Regulations. Badgers are protected under the Protection of Badgers Act 1992.	The Site and within 2 km of it.
Legally controlled species	Legally controlled species include those listed on Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended in Scotland).	The Site and within 2 km of it.

[12] Scottish Biodiversity List features.

[13] Justification for the extent of the desk study areas is provided in **Volume 3A** of Volume 3.

[14] Red listed species for the purposes of this assessment refer to those noted using IUCN criteria as being "Near Threatened", "Vulnerable", "Endangered" and "Critically Endangered", and those on present on local Red Lists in the categories "Nationally Scarce" and "Nationally Rare".

6.5.6 **Table 6.4** lists the organisations and other sources that have supplied data, together with the nature of the information provided.

Table 6.4 Sources of desk study data

Source	Nature of Information Provided
NatureScot's interactive map facility[15]	Access to data and information on key protected areas across Scotland.
Scottish Environment Protection Agency (SEPA) website[16]	Information on the classification of the ecological status of waterbodies under the Water Framework Directive (WFD) and Freshwater Fish Directive (FFD).
National Biodiversity Network (NBN) gateway's information service[17]	Commercially available records of protected and/or notable species from within the last ten years.
Forestry Commission online map[18]	Extents of woodland and forests (including ancient woodland inventory areas) and FCS approved areas for plantation.
East Kingswell Windfarm (Whitelee Extension) Environmental Statement (ES) 2010	All supporting baseline ecology and ornithology data for the two Environmental Statements.
Whitelee Windfarm Extension Phase 3 ES 2012	
Whitelee Habitat Management Plan – Annual monitoring data	Access to all available ecological/ornithological monitoring data compiled to support the Whitelee Habitat Management Plan area which lies adjacent to and within the Site.
Scottish Raptor Study Group	Annual publications detailing population and productivity estimates based on monitored populations for raptor species at the national and regional level.

Where appropriate, data were drawn from existing ecological records and site information obtained through field surveys conducted in 2009/10/11/12 as part of the Whitelee Extension applications. Field data collected during this period considered pertinent to this assessment included Phase 1 Habitat and National Vegetation Classification (NVC) Surveys, otter and water vole surveys, badger surveys, red squirrel surveys, breeding bird and non-breeding bird surveys, and fish habitat survey.

Contemporary field data from a long-term ongoing programme of ornithological monitoring surveys within the existing Whitelee Wind Farm Habitat Management Area (HMA) were also interrogated.

Survey work

Habitat surveys

6.5.7 A Phase 1 habitat survey[19] of the site and buffer zone was undertaken on 21 August; and 25 - 26 November. Distinct habitats were identified, and any features of interest recorded and included on a Phase 1 habitat map as a target note (TN) (see Volume 3B of Volume 3: Phase 1 Habitat and NVC Report 2020).

[15] https://sitelink.nature.scot/home
[16] http://sepa.org.uk
[17] http://data.nbn.org.uk
[18] http://map.environment.scotland.gov.uk/landinformationsearch/lis_map.html
[19] JNCC (2010). Handbook for Phase 1 habitat survey – a technique for environmental audit.

6.5.8 NVC surveys of the site and buffer zone were undertaken on 24-25 September 2020 following Rodwell (ed.), (1991b) and (1992) Volumes 2[20] and 3[21] respectively). The NVC methodology provides a detailed classification and survey of a wide range of natural plant communities (and some man-made plant communities, e.g., pastureland) that occur within Great Britain. Plant species were identified and recorded as per the Extended Phase 1 habitat survey, described above.

Protected species surveys

6.5.9 Badger, otter and water vole surveys were undertaken following standard methods within the Study Area on 24-25 September 2020 and 25-26 November 2020.

6.5.10 The survey comprised a walkover assessment of the proposed working areas and associated 200m buffer (100m buffer for proposed access tracks) (See Volume 3C of Volume 3: Protected Species Report 2020).

6.6 Overall baseline

6.6.1 The description of the ecological features below provides a summary of the ecology baseline as determined through desk study and field survey. Further details of the desk study and field survey programme are provided in **Sections 6.10 – 6.17**, and detailed descriptions of the desk study and field survey results are provided in Volumes 3A, 3B and 3C of Volume 3.

Current baseline

Site context and surrounding habitats

6.6.2 The site occupies a flat-gently undulating moorland plateau at a mid-altitude range between 230-350m above sea level. The majority of the site is dominated by peat deposits over 1m deep, with small, localised areas of mineral soil.

6.6.3 The immediate surroundings of the site comprise commercial forestry to the immediate north of the site boundary between the site at the B764, plateau moorland to the south and west which comprises the area of land identified for the site and the Eaglesham Moor area of the existing Whitelee wind farm immediately to the east nearby the Lochgoin circuit, Lochgoin reservoir, Lochgoin farmhouse and monument.

Statutory and non-statutory nature conservation sites

6.6.4 **Figure 3A6.2** (Volume 3A) illustrates the locations of statutory and non-statutory nature conservation sites. The nearest statutory site, Brother Loch and Little Loch Site of Special Scientific Interest (SSSI) is located approximately 3.8km to the north of the Site, which is notified for open water basin-fens with a high diversity of wetland communities and small populations of wintering bird species.

6.6.5 Three non-statutory designated sites are located within 1km of the Site:

- Lochgoin Reservoir and Dunwan Dam Site of Importance for Nature Conservation (SINC), is located approximately 2km from the Site boundary.

[20] Rodwell (ed.) (1991b). Volume 2 – Mires and Heath. Cambridge University Press.

[21] Rodwell (ed.) (1992). Volume 3 – Grassland and Montane Communities. Cambridge University Press.

- Fenwick Moor (Greenfield Burn) Provisional Wildlife Site (PWS) is located within the eastern extent of the Site boundary.
- Craigendunton Reservoir PWS is located approximately 200m from the Site boundary.
- Crins Hill PWS is located approximately 700m from the Site boundary.

Habitats

6.6.6 A detailed summary of the habitats/vegetation communities present across the Site is presented in Volume 3B of Volume 3.

- A Phase 1 Habitat map is illustrated in **Figure 3B6.1**.
- An NVC map is illustrated in **Figure 3B6.2**.
- A GWDTE map is illustrated in **Figure 3B6.3**.

6.6.7 **Table 6.5** summarises the status and classification of the vegetation communities recorded within the survey area and identifies whether these have the potential to be groundwater dependant terrestrial ecosystems (GWDTE) as defined in SEPA guidance (SEPA 2017).

Table 6.5 Vegetation Communities Recorded on Site

Phase 1 Habitat Classification (JNCC, 2010)	NVC Community Code	Potential Groundwater Dependant Terrestrial Ecosystem (SEPA 2017)
E1.7 - Wet Modified Bog	M19a *Calluna vulgaris-Eriophorum vaginatum* blanket mire Erica tetralix sub-community	No
E1.7 - Wet Modified Bog	M20a *Eriophorum vaginatum blanket* mire species poor sub-community	No
E1.7 - Wet Modified Bog	M25a *Molinia caerulea – Potentilla erecta* mire Erica tetralix sub-community	**Yes**
E2.1 – Flush and spring - acid flush	M6di *Carex echinata-Sphagnum fallax* mire *Juncus acutiflorus* sub-community *Sphagnum fallax* variant	**Yes**
B5 - Marsh/ marshy grassland	M23b *Juncus effusus/acutiflorus-Galium palustre* mire *Juncus effusus* sub-community	**Yes**
B5 - Marsh/ marshy grassland	M25a *Molinia caerulea – Potentilla erecta* mire *Erica tetralix* sub-community	**Yes**
B1.2 – Acid grassland - semi improved	U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland *Holcus lanatus-Trifolium repens* sub-community	No
B2.2 – Neutral grassland – semi-improved	MG10a *Holcus lanatus-Juncus effusus* rush pasture typical sub-community	**Yes**
A1.2.2 - Coniferous woodland plantation	-	No
A4.2 - Recently felled woodland - coniferous	-	No

Groundwater Dependent Terrestrial Ecosystems

6.6.8 The NVC survey identified the presence of a number of potential GWDTEs within the Site. Some were also inferred through the Phase 1 habitat survey within the southern section of the Site.

6.6.9 A summary of NVC communities within the Study Area that may indicate the presence of GWDTE is provided within the Phase 1 Habitats and NVC Survey (**Volume 3B** of Volume 3). Each potentially groundwater dependent area was allocated a unique number identifier and four separate NVC plant communities were assessed for actual groundwater dependence. A full description of this assessment and the GWDTE Risk Assessment is provided in **Section 8**: Geology, Hydrology and Hydrogeology.

Species

6.6.10 Details on the methods and findings of the protected species field surveys are detailed in the technical baseline report (**Volume 3C** of Volume 3).

Otter

6.6.11 The otter survey identified evidence of otter activity along several watercourses within the otter Study Area. The locations of all recorded field signs are presented in **Figure 3C6.1** (**Volume 3C**); and further details including grid references and a detailed description are provided in **Table C-A.1** (**Volume 3C** of Volume 3).

6.6.12 Evidence of otter activity was recorded along a number of watercourses within the study area, including Drumtee Water, Collorybog Burn,Dunton Water and Rough Hill Burn (**Figure 3C6.1**, **Volume 3C**). Field signs observed comprised spraints, the greatest density of which were recorded along the Drumtee Water and Dunton Water.

6.6.13 Two potential resting sites were recorded, one on the Dunton Water, and the other along Rough Hill Burn. Further details are presented in **Volume 3C** of Volume 3 (**Annex A (Table C-A.1**)) and locations are presented on **Figure 3C6.2** (**Volume 3C** of Volume 3).

Water Vole

- Sections of five of the watercourses (upstream parts of Drumtee Water and Collorybog Burn, tributary of Drumtee Water, Soutors Burn and Greenfield Burn) contained suitable water vole habitat, with very low disturbance levels, abundant reed, sedge, herb and rush species, suitable bank substrates and shallow slow-flowing sections of water.
- However, no evidence of water vole was recorded within the water vole Study Area during the survey.

Badger

6.6.14 No evidence of badger was recorded within the badger Study Area during the survey.

6.6.15 The soils present within the study area are generally poorly drained and are inherently of sub-optimal suitability for setting due to the likelihood of them becoming waterlogged. The plantation woodland areas adjacent to the Study Area was not surveyed in detail but given the nature of the terrain and the soils, they are considered unlikely to support badger setts.

Future baseline

6.6.16 Determining a future baseline draws upon information about the likely future use and management of the site in the absence of development, known population trends (for species), climate change

and any other proposed developments (consented or otherwise) that may act cumulatively with the Project components to affect ecological features.

6.6.17 In the absence of the Project, it is likely that rough grazing will continue across the northern area of the site and forestry operations will still occur within the forestry plantation areas. Within the HMA in the area to be developed, habitats on shallow peat would tend towards heathland and woodland. Across the wider Whitelee HMA, habitat restoration will continue to improve these areas in terms of the existing bog resource as well as improving wetland habitats for biodiversity interest, (including breeding waders).

6.7 Consultation

6.7.1 **Table 6.6** provides a summary of consultee comments about the Project and how these have been considered in this assessment.

Table 6.6 Summary of consultee comments regarding ecology

Consultee	Comments	Response and How Considered in this Report	Section Ref
East Ayrshire Council	*'... impacts on soils and biodiversity would appear to be minimal largely due to the likely design although there is some uncertainty on this given the level of information currently provided.'*	A scoping assessment has been undertaken for all species and habitats of conservation concern. Important ecological features (IEFs) have been scoped in for further assessment where they occur within a ZoI of the Project.	**Appendix 3D, Volume 3**
	'The weight placed on claims by the applicant that impact on areas of less degraded habitat will be minimised by design and that deeper peat and good condition blanket mire will be avoided wherever possible has to be made within the context that the actual impact on such matters, even with that approach, are unknown. As such the extent to which siting and design can achieve these objectives cannot be completely ascertained at this time although as an approach in principle this is welcome.'	Environmental Measures embedded into the Development Proposals would reduce negative effects and mitigate against predicted habitat and ecological loss.	**Table 6.9**
		Additional mitigation, restoration and compensation proposals are proposed to address effects on sensitive bog habitats.	**Section 6.16**

6.8 Scope of the assessment

6.8.1 The method for determining the scope of the assessment within the ecology Chapter differs from that used in other Technical Assessment Chapters within this EcIA in order to correspond with topic specific guidance (i.e., CIEEM 2019). However, the relevant receptors (i.e., ecological features), the spatial and the temporal scope are all defined in this section. The methodology followed has multiple stages, enabling the scope of the assessment to be progressively refined.

Ecological features

Scoping - determining importance

6.8.2 For this ecological assessment the first stage in determining the scope of the assessment is to identify which ecological features identified through the desk study and field surveys (see **Section 6.5**) are 'important'[22] in the context of the Project. Following CIEEM (2019) guidance, the importance of ecological features is first determined with reference to UK legislation and policy and then with regard to the extent of habitat or size of population that may be affected by the Project.

6.8.3 As the importance of ecological features is determined with regard to the extent of habitat or size of population that may be affected by the Project, the level of importance can differ from that which would be conferred by legislative protection or identification as a conservation notable species and from one development to another. For example, water vole is important at a national level because it is a SBL species and has experienced a population decline of more than 25% in the last 25 years. However, a small population that could be affected by a development would be assessed as being of less than national importance if there is alternative well-connected and suitable habitat nearby that has the capacity to support individuals that may be displaced.

6.8.4 Wherever possible, information regarding the extent and population size, population trends and distribution of the ecological features has been used to inform the categorisation described in **Table 6.7** to determine importance for the purposes of this assessment. Where detailed criteria or contextual data are not available, professional judgement was used to determine the level of importance.

6.8.5 An explanation of all determinations of importance are provided in this Section, **Table 6.7** (for scoped in ecological features) and **Volume 3D** (**Tables D.1 and D.2**) (for all ecological features both those scoped in and out) to ensure transparency.

Table 6.7 Importance of the project for ecological features

Geographic Context of Importance	Example/Description
International or European	1. European sites including SPAs, SACs, candidate SACs and Sites of Community Importance (SCI), potential SPAs (pSPA) and possible SACs (pSACs) should also be considered in the same manner in accordance with National Planning Policy. 2. Areas of habitat or populations of species[23] which meet the published selection criteria based on discussions with NatureScot and field data collected to inform the EcIA for designation as a European site or Ramsar site, but which are not themselves currently designated at this level.
National	1. A nationally designated site including SSSIs and National Nature Reserves (NNRs). 2. Areas (and the populations of species which inhabit them) which meet the published selection criteria guidelines for selection of biological SSSIs but which are not themselves designated based on field data collected, and in agreement with NatureScot. 3. Scottish Biodiversity List (SBL) habitats and species, Red listed and legally protected species that are not addressed directly in Part 2 of the "Guidelines for Selection of Biological SSSIs" but can be determined to be of national importance using the principles described in Part 1 of the guidance. 4. Areas of Ancient Woodland e.g., woodland listed within the Ancient Woodland Inventory.

[22] Importance relates to the quality and extent of designated sites and habitats, habitat/species rarity and its rate of decline. Ecological features that are not considered to be important are those that are sufficiently widespread, unthreatened and resilient and with populations that will remain viable and sustainable irrespective of the Project.

[23] This includes habitats and species listed under Annex I and Annex II of the Habitats Directive.

Geographic Context of Importance	Example/Description
Regional	1. Regionally occurring populations of SBL species will be considered to be of regional importance in the context of published information on population size and distribution.
County	1. Local Nature Reserves and Non-statutory designated sites. 2. Areas which based on field data collected to inform the EcIA meet the published selection criteria for those sites listed above (for habitats or species, including those listed in relevant Local Biodiversity Action Plans) but which are not themselves designated.
Local	1. SBL habitats and species, Red listed and legally protected species that based on their extent, population size, quality etc are determined to be at a lesser level of importance than the geographic contexts above. 2. Common and widespread semi-natural habitats occurring in proportions greater than may be expected in the local context. 3. Common and widespread native species occurring in numbers greater than may be expected in the local context.
Negligible	1. Common and widespread semi-natural habitats and species that do not occur in levels elevated above those of the surrounding area. 2. Areas of heavily modified or managed land uses (e.g., hard standing used for car parking, as roads etc.)

6.8.6 Where protected species are present and there is the potential for a breach of the legislation, those species should always be considered as 'important' features. With the exception of such species receiving specific legal protection, or those subject to legal control (e.g. invasive species), all ecological features that were determined to be of negligible importance have been scoped out of the assessment at this stage. Furthermore, ecological features of local importance were also scoped out at this stage where there was a specific technical justification to do so. This is because effects on them would not influence the decision-making about whether or not consent should be granted for the Project (in other words a significant effect in EIA terms could not occur). This approach is consistent with that described in CIEEM 2019. Specific justification for exclusion of each of these ecological features is provided in **Volume 3D (Tables D.1 and D.2)**.

6.8.7 All legally protected species and ecological features that are of sufficient importance were then taken through to the next stage of the scoping assessment.

Spatial Scope

6.8.8 The construction and operation phases of the Project may result in the following direct and indirect environmental changes that could significantly affect ecological features:

- Direct habitat loss: permanent and temporary habitat loss during construction and operational phases due to landtake by as a result of the Project; and land management may change as a result of the Development (including mitigation/enhancement measures).
- Indirect habitat loss: disturbance/displacement to protected or notable species from habitat they would otherwise use for nesting, foraging, commuting, sheltering or roosting because of works activities during construction or by the presence of solar panels and associated maintenance activities during operation.
- Habitat modification as a result of changes to the surface hydrology during construction and operation.

- Pollution associated with accidental spillage of fuels, oils, run-off and dust emission i.e. via direct contact, air or water.
- Criminal offences: Potential disturbance or harm to nationally or European protected species (EPS), damage or harm to nesting birds and disturbance to specially protected bird species listed on Schedule 1 of the Wildlife and Countryside Act, even when significant adverse ecological effects are unlikely, which could potentially lead to commission of criminal offence(s).

6.8.9 Decommissioning phase effects are considered to result in no greater scope and magnitude of effects upon ecological features than would occur during the construction phase, albeit occurring over a shorter timescale. As such, decommissioning phase effects of the Project upon ecological features are not considered explicitly within this assessment.

6.8.10 Key to establishing which environmental changes may result in likely significant effects, is the determination of a ZoI for each important ecological feature (IEF) identified. ZoIs differ depending on the type of environmental change (i.e., the change from the existing baseline) as a result of the Project and the ecological feature being considered.

6.8.11 The most straightforward ZoI to define is the area affected by land-take and direct land-cover changes associated with the Project. This ZoI is the same for all affected ecological features.

6.8.12 By contrast, for each environmental change that can extend beyond the area affected by land-take and land-cover change (e.g., increased noise associated with construction activities within the land-take area), the ZoI may vary between ecological features, dependent upon their sensitivity to the change and the precise nature of the change. For example, a water vole might only be disturbed by noise generated close to its burrow, while nesting hen harrier might be disturbed by noise generated at a much greater distance, and other species (e.g., many invertebrates) may be unaffected by changes in noise. In view of these complexities, the definition of the ZoI that extends beyond the land-take area was based upon professional judgement informed (as far as possible) by a review of published evidence (e.g., disturbance criteria for various species) and discussions with the technical specialists who are working on other related assessments.

6.8.13 It should be noted that the avoidance of potentially significant effects through the design process is implicitly taken into account through the consideration of each ZoI, as are standard construction practices that are commonplace. When scoping in or out ecological features from further assessment, environmental measures (see **Section 6.8**) associated with general good practice that are described within the Code of Practice for planning and development (BSI, 2013) and Good Practice during Wind Farm Construction (Scottish Renewables *et al*., 2015) have been taken into account (e.g., dust suppression, appropriately scheduled vegetation removal etc.) and referenced in **Volume 3D** of Volume 3.

6.8.14 Ecological features that are scoped into the assessment (i.e., those of sufficient importance occurring within a relevant ZoI) are summarised in **Table 6.8**, along with a summary of the explanation behind their inclusion. For each ecological feature presented in **Table 6.8**, the potential environmental changes and potential significant effects resulting from the Project are provided. Ecological features that are scoped out of the assessment are identified in **Table D.2** (**Volume 3D** of Volume 3).

Table 6.8 Likely effects, zoIs and justification for scoped in 'Important Ecological Features'

Ecological Feature	Importance – Legislation and Policy	Importance – Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
Wet modified bog communities (M19a, M20a, M25a)	European	Local/ County	Direct loss and temporary damage to terrestrial habitats	Within the construction/ maintenance areas	Blanket bog communities are a restricted and declining habitat in the UK and Europe. Blanket bog is a SBL Priority habitat and includes habitats / vegetation communities listed on Annex I to the EC Habitats Directive. A great extent of the Study Area comprises wet modified bog (E1.7), formed of stands consisting of M19a, M20a and M25a located on deep peat (i.e. >0.5m deep) (**Volume 3B** of Volume 3). Wet modified bog is a heavily modified habitat through anthropogenic means including extensive draining and sheep grazing, colonisation by self-seeded trees (conifers and broadleaf) and signs of erosion. As such, a large proportion of the Site is assessed as being in poor/modified condition with low cover values of typical species and unlikely to be actively peat-forming. Considering its heavily modified form, the extent of this habitat and its widespread coverage this feature is considered to be of Local value. The wet modified bog resource recorded within the eastern section of the HMA comprises part of the Fenwick Moor PWS (primarily M19a) and is in places closer to good condition blanket bog communities with greater potential for recovery to SBL and ALBAP quality bog habitat. The eastern extent of this area is considered to be of County value. Land take and land use during construction is likely to lead to the loss/disturbance of this habitat or within a 10m ZoI of the construction zone and has been considered for further assessment.
			Indirect disturbance and changes to composition of plant communities resulting from hydrological change	10m beyond construction/ maintenance areas	
Otter	European	Local	Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of disturbance (such as increased noise, lighting, and	Non-breeding resting sites: 30m from the proposed construction/ maintenance area (based on NatureScot's protected species advice)	Otter resting sites and signs were recorded within the Study Area, along the majority of watercourses. Two potential resting sites were recorded within the Study Area **Volume 3C** of Volume 3, one of which was identified within a potential disturbance threshold (within 30m of proposed works areas).

Ecological Feature	Importance – Legislation and Policy	Importance – Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
			human presence) during construction/operation and related works.		A European Protected Species (EPS) Licence is likely to be required should proposed works occur within a threshold of disturbance within 30m of a resting site.
				Breeding resting sites: 200m from the proposed construction/ maintenance/ area (based on NatureScot's protected species advice)	No identified breeding resting sites were recorded within the Study Area and no evidence of breeding was recorded; nonetheless, pre-construction surveys have the potential to identify a breeding site, which would require appropriate measures and potentially an EPS licence to avoid contravention of legislation.
			Temporary severance of otter habitat and commuting routes	Within the construction/ maintenance area	Evidence of otter activity was recorded along a number of watercourses and waterbodies within the Study Area, in the form of spraints, paths and potential resting sites. The Project could therefore lead to temporary habitat severance and fragmentation of territories during construction phase, particularly during the construction of water crossings.
Black grouse	National	Local	Disturbance/displacement effects for nesting and/or lekking habitat	Within 750 m of Project footprint (based on disturbance distances as described by Ruddock & Whitfield 2007).	Contemporary surveys within Whitelee HMA indicate that black grouse numbers have declined to a single displaying male in 2017. However, as precaution given that historical and contemporary baseline surveys indicate (**Volume 3A** of Volume 3) that the area surrounding the site has previously supported a small number of black grouse and therefore land take and land use during construction could potentially contribute to the loss/disturbance to historical lekking sites within a 750m ZoI of the construction zone.
			Operational displacement leading to barrier effects.	Within 500 m of the Project footprint.	Historical and contemporary baseline surveys indicate that the area surrounding the site has previously supported a small number of black grouse and therefore land take during operation could potentially contribute to the loss/disturbance of foraging habitat within 500m of the Project footprint.
			Potential disturbance and displacement to birds due to vehicle movements and associated human activities	Within 750 m of the Project footprint.	

Ecological Feature	Importance – Legislation and Policy	Importance – Site	Environmental changes and likely significant effects	Zone of Influence	Relevant assessment criteria and scoped in justification
			during operation and for maintenance purposes.		
Curlew	National	Local	Construction activity resulting in temporary disturbance or displacement. Operational displacement leading to barrier effects. Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes.	500m beyond construction/ maintenance areas Within 500 m of the Project footprint. Within 500 m of the Project footprint.	Based on historical and contemporary data (**Volume 3A** of Volume 3) for the Site and wider area, two historical breeding territories fall within the ZoI of the Project footprint. This represents 0.09% of the Natural Heritage Zone (NHZ) population therefore it is not considered that associated impacts would not result in significant effects on the NHZ population; nevertheless, this species is taken through for further assessment.
Lapwing	National	Local	Construction activity resulting in disturbance or displacement of breeding birds Operational displacement leading to barrier effects. Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes	500m beyond construction/ maintenance areas Within 500 m of the Project footprint. Within 500 m of the Project footprint.	Based on historical and contemporary data (**Volume 3A** of Volume 3) for the Site and wider area, three historical breeding territories fall within the ZOI of the Project footprint, whilst the NHZ population is unknown, given the low numbers of breeding birds within the ZOI significant effects on the NHZ population are unlikely.

Temporal scope

6.8.15 The temporal scope of the ecological assessment is consistent with the period over which the Project would be carried out and therefore covers a.) construction; b.) operation; and c.) decommissioning periods.

a. Construction of the Project would be completed over a period of 12 – 18 months;

b. Operation of the Project is anticipated to run for 40 years; and

c. The environmental changes identified in **Section 6.8.8** could occur during the construction phase and operational phase of the Project. The effects of the environmental changes are considered with respect to their duration, frequency, timing and reversibility for each of the scoped in ecological features in **Table 6.8** above.

6.9 Environmental Measures Embedded into the Project Proposals

6.9.1 An iterative design process has been carried out and range of environmental measures have been embedded into the Project, including:

- Avoidance of areas of deeper peat (>1m) wherever possible (See **Figure 6.2**, **Volume 3F**).
- Avoidance of Fenwick Moor PWS (which comprises modified M19 tending to better condition blanket bog in places) (See **Figure 3A6.1**, **Volume 3A**).
- Avoidance of localised areas of bog pools and areas with high-water table with presence of broad-branched *Sphagnum* species (*Sphagnum magellanicum* and *Sphagnum papillosum*) (see **Volume 3B**).
- Areas of lower value grassland habitats on shallow peat and more heavily modified or degraded bog (including poor M25 and M20 communities) were considered more preferential for siting infrastructure than areas of better condition (but still modified) M19 (**Volume 3B**).
- Habitats (both wet modified bog and marshy grassland within the HMA on shallow peat were considered more preferential than modified bog on deeper peat outside the HMA (Compensation for loss of HMA is discussed in **Section 6.17.1**).
- The number of watercourse crossings (two culverted and five trenched) was kept to a minimum to reduce the risk of pollution to watercourses (**Chapter 8: Hydrology, Geology and Hydrogeology**).
- Site infrastructure has been located a minimum 20m from watercourses (**Chapter 8: Hydrology, Geology and Hydrogeology**).
- All construction works areas have been located a minimum 50m from known otter resting sites with the exception of a single potential resting site (See **Figure 3C6.2, Volume 3C**).
- Avoidance of historical black grouse lekking sites (See **Figure 3A6.4i, Volume 3A**).

6.9.2 **Table 6.9** outlines how these embedded measures would influence the ecological assessment.

Table 6.9 Summary of embedded environmental measures and how these influence the ecological assessment

Important Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
Construction Phase:		
Blanket bog communities	Direct habitat loss and temporary disturbance during construction	Design measures for minimising effects to sensitive habitats include: • The layout of the solar array has been designed to ensure that good condition blanket bog and mire communities on deeper peat >1m is avoided as much as possible, with preference for development on lower sensitivity habitat including more degraded modified bog and areas of shallower peat. • Access track and cable route layout was designed as far as reasonably practicable to use the minimum land take; and cabling infrastructure will be installed where possible alongside existing forestry track thus limiting temporary disturbance of habitat. • The green hydrogen production facility, BESS Compound, and temporary storage/laydown areas have been sited to avoid sensitive vegetation communities where possible, utilising areas such as existing disturbed ground, grassland or clear-felled areas. • Tight construction footprints would be adhered to in order to minimise damage to sensitive habitats. All access tracks on peat depths exceeding 1m would be of floating design, to minimise effects on peat. The following measures would be incorporated in order to minimise construction effects to sensitive blanket bog habitats: • Full details of proposed construction measures will be provided within an overarching Construction Environmental Management Plan (CEMP), including a Peat Management Plan (PMP), which would be submitted pursuant to a condition of the deemed planning permission in consultation with East Ayrshire Council (EAC), NatureScot and SEPA, in advance of construction works commencing. • Site supervision would be provided by a suitably experienced Environmental Clerk of Works (ECoW), who would be responsible for ensuring the successful implementation of embedded measures, including micro-siting of cable routing along non-cable route sections; pollution prevention (see below), monitoring of buffers around construction areas and reference to areas of greater ecological sensitivity, and adherence to current construction good practice. • A Habitat Management Plan (HMP) would also be implemented with the aim of ensuring successful restoration and reinstatement of affected blanket bog within the Site. The HMP would be submitted pursuant to a condition of the deemed planning permission to be agreed with EAC following consultation with Whitelee HMP Steering Group, NatureScot and SEPA.
Watercourses, otters and freshwater fish	Silt/sediment and pollutant release, damaging fish habitats (inc. spawning habitat), potentially harming fish and associated adverse effects on fish and otter populations	The following measures have been incorporated in order to minimise the risk of pollution and to ensure that impacts on watercourses are either avoided or reduced: • To comply with the Controlled Activities Regulations (CAR) it is anticipated that a Construction Site Licence (CSL) is likely to be required. The application for a CSL would be supported by a Pollution Prevention Plan (PPP) and Pollution Incident Response Plan (PIRP) which would be subject to consultation with SEPA in advance of any construction activities. This would set out site management and working practices and draw heavily upon SEPA's Guidance for Pollution Prevention (GPPs). • All watercourse crossings would be designed in accordance with the SEPA Good Practice Guide for the Construction of River Crossings (2010). Where culverts are required, these will be designed in accordance with the CIRIA Culvert Design and Operation Guide (2010).

Important Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
		• A construction area stand-off of at least 20m has been applied to all watercourses (except for watercourse crossing). The layout has been designed to minimise the number of crossings.
Breeding and roosting bird species	Construction and decommissioning disturbance	The following measures would be incorporated into the Project in order to minimise construction effects to breeding or roosting bird species: • As part of an overarching CEMP, a Bird Protection Plan (BPP) would be developed in consultation with the relevant consultees in advance of construction works commencing. Construction Method Statements (CMSs) would be developed to detail the mitigation approach for all bird receptors. These would cover the site and receptor (species) specific requirements of the embedded mitigation as outlined in the remainder of this table. • Site supervision would be provided by a suitably experienced ECoW, who would be responsible for ensuring the successful implementation of embedded measures, including pollution prevention, monitoring of buffers around construction areas and reference to areas of high ecological sensitivity, and adherence to current construction best practice. • Pre-construction verification check surveys would be undertaken for birds in particular where potential significant effects or legal breaches could occur. If a nest is discovered, construction activities (including vehicle movements) within an appropriate species-specific distance (Whitfield *et al.* 2008) of the nest would be halted immediately.
Freshwater fish	Obstruction of migration and associated adverse effects on fish spawning and recruitment. Risk of harm to fish during works at watercourse crossings	Watercourse crossing designs/construction would be informed by SEPA Good Practice Guide for the Construction of River Crossings (SEPA 2010b) and CIRIA Culvert Design and Operation Guide (CIRIA 2010). Bridged watercourse crossings would be used where feasible/practicable. Any damming/over-pumping during work on watercourse crossings would be accompanied by a fish rescue scheme under the supervision of an ECoW. Culverts would be subject to a programme of inspection throughout the construction and operation of the Project components.
	Loss/ severance of, or damage to, watercourse habitat at watercourse crossings, including associated adverse effects on fish spawning and recruitment	Watercourse crossing would be micro-sited to avoid unconsolidated gravel and pebble substrates and riffle habitats. Culverts would be a single pipe structure i.e. not comprising multiple pipes. Culvert construction would be supervised by the ECoW, with culverts transferred to watercourse crossings intact, avoiding mixing concrete near to watercourse crossings. Culverts would be sunk in and angled so as not to prohibit fish passage. With the exception of work at watercourse crossings a buffer/exclusion zone (20m radius) around watercourses would be implemented.
	Silt/sediment and pollutant release, damaging fish habitats (inc. spawning habitat), potentially harming fish and associated adverse effects on fish populations	With the exception of work at watercourse crossings, a buffer/exclusion zone (20m radius) around the watercourse network would be implemented. Additional measures to minimise the risk of pollution sediment release to watercourses are set out in detail in **Chapter 8: Hydrology, Geology and Hydrogeology** below. These include for example: avoiding construction activity and temporary or permanent infrastructure in flood zones and steeper gradients. Drainage designs would avoid silt-laden run-off entering watercourses, directing drainage away from watercourses. Dewatering designs would allow collection and settlement of suspended sediment (silt traps, fences, straw bales or where necessary swales and settlement lagoons). Pollution prevention measures will be detailed within the CEMP and would be implemented as part of the CAR licensing requirements (expected to be a CSL). The ECoW would inspect all dewatering regularly and get any identified defects fixed within a day.

Important Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
	Noise and vibration and associated harm to fish	With the exception of watercourse crossings (construction and operation), a buffer/exclusion zone (20m radius) around the watercourse network would be implemented, which would minimise noise/vibration effects on fish. Construction of watercourse crossings would be completed over a period of short duration and taking care to minimise noise/vibration, such as avoiding impacts between plant and riverbed/bank substrate and carefully lowering culverts into place.
Otter, water vole and badger	Disturbance, Kill /injure /destroy habitat, affect distribution	The CEMP would include details of pre-construction surveys for otter, badger and water vole, which would be prepared to ensure compliance with legislation to check on the presence of protected species and the following suite of embedded measures that would be implemented across the Site to avoid causing harm to, or disturbance to these species: • During normal working hours throughout the construction period the ECoW would be onsite to ensure that all environmental measures relevant to otter, water vole and badger are delivered and ensure compliance with legislation. • Avoid working or artificial lighting within 50m of watercourses/ waterbodies during the hours of darkness, taken to be 30 minutes before sunset to 30 minutes after sunrise. • All works in proximity to waterbodies / watercourses would follow measures outlined in the CEMP to ensure their complete protection against pollution, silting and erosion. • Strict speed limits would be followed on access tracks during all phases of development. • Trenches, holes and pits would be kept covered at night or provide a means of escape for otters (and other fauna) that may become entrapped. Gates to compound areas would be designed sensitively to prevent mammals from gaining access and would be closed at night. Any temporarily exposed pipes would be capped when contractors are off site to prevent otter from gaining access. • Any lighting used to accommodate such works must be positioned to minimise light spill onto watercourses/ waterbodies. • An emergency procedure would be implemented by site workers if otter are encountered. All works within 30m would cease as soon as it is safe to do so, and the ECoW would inspect the site and define appropriate measures (if required). • Should construction activities take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity. This includes any works taking place within 50m of the watercourse.
Operational Phase:		
Watercourses, otters and freshwater fish	Pollution	The majority of the specific measures applied during ongoing and operational activities relate to the application of good practice in terms of managing and controlling activities to minimise the risk of pollution upon receptors and hydrological features. The potential risks to surface water during operation are likely to be limited and localised based on the planned solar array servicing/maintenance works and the nature and volume of potentially polluting substances required.
Otter	Disturbance, Kill /injure /destroy habitat, affect distribution	All operational and maintenance work requirements would be undertaken within working areas clearly defined in advance of works and the storage of materials would be restricted to areas of hardstanding e.g., permanent tracks or Hydrogen Storage, BESS compound and associated infrastructure. Speed limits would be enforced by all site vehicles along access tracks during operation and site maintenance.

Important Ecological Feature	Changes and Effects	Embedded Measures and Influence on Assessment
Birds	Collision risk	All electrical cabling within the proposed solar area is above ground attached to modules, and between this area and the site substation would be underground alongside the access tracks and therefore will not pose a risk to birds.

6.10 Assessment Methodology

Introduction

6.10.1 The approach that has been used in this ecological assessment aligns to the standard industry guidance provided by CIEEM (2019).

6.10.2 The assessment has been based upon not only the results of the desk study and field surveys, but also relevant published information (for example on the status, distribution, sensitivity to environmental changes and ecology of the features scoped into the assessment, where this information is available), and professional knowledge of ecological processes and functions.

6.10.3 For each scoped-in 'Important Ecological Feature' (IEF) (see **Table 6.8**), potential effects were assessed against the current baseline conditions for that feature during construction and operation.

6.10.4 Throughout the assessment process, the initial results of the assessment regarding potentially significant effects have been used to inform whether additional baseline data collection is required, together with the identification of environmental measures that should be embedded into the Project to avoid or reduce adverse effects or to deliver enhancements (see **Section 6.9**). The results of the assessment as set out in **Section 6.11 to 6.17**, therefore reflect the final scheme design (i.e., incorporating the environmental measures described in **Section 6.9** and **Table 6.9**).

6.10.5 The spatial extent of the assessment (see **Table 6.8**) reflects the area occupied by the ecological feature that is being assessed and, as a minimum, the ZoI of the changes that may affect it.

6.10.6 Where part of a designated site is located within the ecological ZoI relating to a particular biophysical change as a result of the Project, an assessment has been made of the effects on the designated site as a whole. A similar approach has been taken for areas of notable habitat.

6.10.7 For species that occur within the ZoI, the assessment has considered the total area that is used by the affected individuals or the local population of the species (e.g., for foraging or as breeding territories) rather than the footprint of the Site.

Significance evaluation methodology

Overview

6.10.8 CIEEM (2019) defines a significant effect as one "*that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general*".

6.10.9 When considering potentially significant effects on ecological features, whether these be adverse or beneficial, the following characteristics of environmental change are taken into account[24]:

- Extent – the spatial or geographical area over which the environmental change may occur.

[24] The definitions of the characteristics of environmental change are based on the descriptions provided in CIEEM 2019. Other Chapters in this EIA Report may use some of the same terms albeit with a different definition.

- Magnitude – the size, amount, intensity or volume of the environmental change.
- Duration – the length of time over which the environmental change may occur.
- Frequency – the number of times the environmental change may occur.
- Timing – the periods of the day/year etc. during which an environmental change may occur.
- Reversibility – whether the environmental change can be reversed through restoration actions.

Magnitude of change

6.10.10 A scale for the magnitude of the environmental change as a result of the Project has been described in **Table 6.10** to provide an understanding of the relative change from the baseline position, be that an adverse or beneficial change.

Table 6.10 Guidelines for the assessment of the scale of magnitude

Scale of Change	Criteria and Resultant Effect
High	The change permanently (or over the long-term) affects the conservation status of a habitat/species, reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area e.g., Natural Heritage Zone (NHZ)[25] and relative to the wider habitat resource/species population, a large area of habitat or large proportion of the wider species population is affected. For designated sites, integrity is compromised. There may be a change in the level of importance of the receptor in the context of the project ZoI.
Medium	The change permanently (or over the long term) affects the conservation status of a habitat/species reducing or increasing the ability to sustain the habitat or the population level of the species within a given geographic area and relative to the wider habitat resource/species population, a small-medium area of habitat or small-medium proportion of the wider species population is affected. There may be a change in the level of importance of this receptor in the context of the project ZoI.
Low	The quality or extent of designated sites or habitats or the sizes of species' populations, experience some small-scale reduction or increase. These changes are likely to be within the range of natural variability and they are not expected to result in any permanent change in the conservation status of the species/habitat or integrity of the designated site. The change is unlikely to modify the evaluation of the receptor in terms of its importance in the context of the project ZoI.
Very Low	Although there may be some effects on individuals or parts of a habitat area or designated site, the quality or extent of sites and habitats, or the size of species populations, means that they would experience little or no change. Any changes are also likely to be within the range of natural variability and there would be no short-term or long-term change to conservation status of habitats/species receptors or the integrity of designated sites.
Neutral	A change, the level of which is so low, that it is not discernible on designated sites or habitats or the size of species' populations.

Determining significance - adverse and beneficial effects

6.10.11 Adverse effects are assessed as being significant if the favourable conservation status of an ecological feature would be lost as a result of the Project. Beneficial effects are assessed as those where a resulting change from baseline improves the quality of the environment (e.g., increases species diversity, increases the extent of a particular habitat etc., or halts or slows down an existing decline). For a beneficial effect to be considered significant, the conservation status would need to positively increase in line with a magnitude of change of "high" as described in **Table 6.10**.

6.10.12 Conservation status is defined as follows (as per CIEEM, 2019):

[25] Natural Heritage Zones are an established biogeographical regional classification used by NatureScot (SNH, 2002).

- "*For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and typical species within a given geographical area.*
- *For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area*".

6.10.13 SNH (2018a) detail that a species' conservation status is favourable when:

- Population dynamics indicate that the species is maintaining itself on a long-term basis and is therefore likely to persist in the habitat it occupies.
- The natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future.
- There is (and will probably continue to be) a sufficiently large habitat to maintain its populations on a long-term basis.

6.10.14 SNH (2018a) recommends that the concept of maintaining a favourable conservation status of a species should be applied at the level of its Scottish population, to determine whether an impact is sufficiently significant to be of concern. This is a test which makes good ecological sense and maintains compatibility with the aims of European legislation and Government policy.

6.10.15 Nonetheless, developments should be assessed, alone or in combination, at a regional (or analogous scale) for their impacts on a species population size, trend and range. An adverse impact on a species at a regional scale (within Scotland) may adversely affect its national conservation status (for example where a specific region holds the majority of the national population). For wind farms which do not have an impact on designated sites, SNH (2018a) highlights the relevance of the NHZ as the basis for the geographical range selection, the boundaries of which have been drawn to reflect biogeographical differences between different zones, with a high level of environmental coherence within each zone.

6.10.16 The Site is within NHZ 17 (West Central Belt).

6.10.17 NHZ-level population estimates for a number of breeding bird populations and a number of estimates for key wintering waterfowl populations are available (*Wilson et al., 2015*).

6.10.18 The decision as to whether the conservation status of an ecological feature would alter has been made using professional judgement, drawing upon the information produced through the desk study, field survey and assessment of how each feature is likely to be affected by the Project.

6.10.19 A similar procedure is used where designated sites may be affected by the Project, except that the focus is on the effects on the integrity of each site; defined as:

- "*The coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

6.10.20 The assessment of effects on integrity draws upon the assessment of effects on the conservation status of the features for which the site has been designated. Where these features are not clearly defined, which is often the case for non-statutory biodiversity sites, it is necessary to use professional judgement to identify the interest features or obtain additional information about the interest features from NatureScot, Scottish Wildlife Trust or the local planning authority responsible for identifying these sites, so that sufficient information on which to base an assessment is available.

6.11 Assessment of effects: wet modified bog communities

Current baseline

Desk study

6.11.1 Blanket bog communities are a restricted and declining habitat in the UK and Europe. Blanket bog is a SBL Priority habitat and includes habitats / vegetation communities listed on Annex I to the EC Habitats Directive.

6.11.2 MacArthur Green undertook surveys in 2012 to determine the blanket mire condition within the site, based on peat depth and key plant groups present. The results of the survey indicated that the blanket mire resource within the site had been adversely impacted by the effects of commercial forestry plantation, grazing pressures and drainage (MacArthur Green, 2012).

Field Surveys

6.11.3 A great extent of the Study Area comprises wet modified bog, formed of stands consisting of the following mire communities: M19a, M20a and M25a (**Figure 3B6.2**, **Volume 3B**), all of which are located on deep peat (i.e., >0.5m deep). Wet modified bog is a heavily modified habitat through anthropogenic means including extensive draining and sheep grazing, colonisation by self-seeded trees (conifers and broadleaf) and signs of erosion. As such, a large proportion of the Site is assessed as being in poor/modified condition with low cover values of typical species and unlikely to be actively peat-forming.

6.11.4 To the west of the northern section, the wet modified bog vegetation type was largely M25 *Molinia caerulea-Potentilla erecta* mire. Drainage channels were clearly evident on aerial photographs of the site. Grass species were prominent and dwarf shrub species were generally rare or absent, although cross-leaved heath was occasionally locally frequent. Rush dominated vegetation was present along drainage channels, although these weren't always delineated on the ground, and the vegetation in general was tussocky in habitat.

6.11.5 The blanket bog vegetation towards the east of the northern section had a high heather content with large amounts of *Sphagnum spp*., hare's-tail cottongrass and glittering wood-moss. Much of the vegetation tended towards M19 *Calluna vulgaris-Eriophorum vaginatum* blanket mire. Towards the eastern end of the site, south of the plantation woodland, heather formed a significant component of the vegetation, although it was mainly in the mature growth phase with little or no pioneer or building heather. Other dwarf shrub species were also present including, cross-leaved heath, crowberry, bilberry, cranberry and cowberry. Hare's-tail cottongrass and tufted hair-grass were frequent, but purple moor-grass was only occasionally recorded.

6.11.6 The wet modified bog resource recorded within the far eastern section of the northern section comprises part of the Fenwick Moor PWS (primarily M19a) and is in places closer to good condition blanket bog communities with greater potential for recovery to SBL and ALBAP quality bog habitat. However, there was also some invasion by tree species *Picea sitchensis* and *Betula sp*. within the eastern section of the Site. As the vegetation slopes south towards the Soutors Burn, the dwarf shrub component is reduced, the grass component increases, particularly wavy hair-grass and the vegetation suggests an acid grassland element. Small amounts of bare peat were also found to be present.

6.11.7 The southern section comprising the proposed cable route and access track runs through relict, wet modified bog close to the northern section and then passes through the Whitelee Habitat Management Area (HMA) a large area dominated by wet modified bog on land formerly planted

with commercial forestry. The eastern section of the proposed cable route goes through an area dominated by commercial forestry with sections of more heavily degraded wet modified bog.

6.11.8 A detailed description of blanket bog vegetation communities is provided in **Volume 3B** of Volume 3.

Future baseline

6.11.9 Based on the 2020 baseline, the blanket bog habitat was found to be in degraded condition, with evidence of drainage, grazing, erosion and colonisation by conifer and broadleaf trees in the north eastern section, particularly where it is close to existing conifer plantation. Without the construction of the Project components, over a 40-year timescale, it is likely that the effects of drainage and grazing in particular will continue to degrade the blanket bog resource such that dewatering and grazing impacts will further lead to some drying out of the bog, and a gradual increase in heather and grass cover.

6.11.10 In the absence of the Project, it is likely that rough grazing will continue across the northern area of the site and forestry operations will still occur within the forestry plantation areas. Within the HMA in the area to be developed, habitats on shallow peat would tend towards heathland and woodland. Across the wider Whitelee HMA, modified bog is being actively restored and in the medium term it is expected that there will be a continuing improvement in the condition of bog habitat.

Predicted effects and their significance

Direct loss and temporary disturbance of wet modified bog communities (construction)

6.11.11 The Project would result in direct (permanent) habitat loss due to land take (prior to any habitat reinstatement or restoration) associated with the construction of access tracks (some of which are floating construction) and the Hydrogen Storage System (Further details are provided in **Volume 3E**).

6.11.12 The installation and operation of solar photovoltaic panels is likely to comprise both direct and indirect impacts, the effects of which are difficult to quantify. For example, some habitats will be permanently lost to support structures and shade, whereas some vegetation may persist between and under the edges of panels but undergo change as a result of partial shading or the interception of precipitation. The current condition of the bog is degraded and considered unlikely to improve significantly in the long term; however, further degradation over the lifetime of the scheme is possible, for the reasons outlined above. Therefore, the precautionary principle is applied in terms of predicted habitat loss, which assumes that all wet modified bog habitat under the footprint of the PV panels will be permanently lost during the construction and operation phases. The anticipated permanent wet modified bog habitat loss as a result of the Project is expected to be 19.72 ha (comprising 4 ha loss to development infrastructure and 15.72 ha beneath solar arrays). These permanent habitat losses are broken down by plant communities in **Table E.2** (Development infrastructure excluding solar arrays); **Table E.3** (Predicted loss/shading of habitat from solar arrays); and Habitat loss within Whitelee HMA (**Volume 3E**).

6.11.13 Preference has been given to siting infrastructure on the least sensitive habitats wherever possible (see **Section 6.9.1**).

6.11.14 In addition to direct habitat loss, it is expected that temporary disturbance to wet modified bog habitat (that will be reinstated following construction) will occur as a result of the following:

- Cable route installation (along the southern area, through Whitelee HMA).

- Cable route installation (along existing access tracks).
- Temporary infrastructure (including the Construction compound, Hydrogen lay down area and BESS temporary compound), including a 4m disturbance zone to allow machinery to work outwith the permanent footprint of any infrastructure component.

6.11.15 Based on the assumptions and calculations presented in **Table E.1** and **Table E.2** (**Volume 3E**), the temporary habitat loss of wet modified bog habitat loss during construction of the Project is estimated to be 0.51 ha.

6.11.16 The Project would result in the direct loss of 19.72 ha of wet modified bog together with temporary disturbance effects on 0.51 ha. The effects of this would be minimised through the implementation of good practice measures (**Table 6.9**), including proposals for full habitat re-instatement or restoration of temporarily disturbed habitat within the Site. This would be a medium magnitude of change affecting a large area of wet modified bog within the Site, which is assessed as being of Local importance for this habitat. Although vegetation within the disturbed area would be expected to recover in the medium to longer term, the overall effect is considered to be **significant** in EIA terms.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (construction)

6.11.17 The following assessment considers effects to wet modified bog plant communities which are sensitive to changes to surface water or groundwater hydrology resulting from construction activities associated with the Project. Potential impacts on the hydrology of surface waters are addressed in detail in **Chapter 8: Hydrology, Geology and Hydrogeology** below.

6.11.18 A great extent of the wider Site is covered by modified blanket bog on peat which is usually at least one metre deep, supporting several recognisable NVC blanket mire vegetation communities. Plants characteristic to these habitats are adapted to low nutrient, acidic and wet conditions, and therefore the maintenance of a high water-table is critical to the long-term maintenance of these species. That said, the water-table in the survey area is likely to be somewhat depressed due to agricultural activities including drainage and/or grazing along with historical plantation of coniferous woodland.

6.11.19 A further reduction in the level of the water table could result in changes in the composition of the vegetation, although this is unlikely to result in a fundamental change in the nature of the plant community, provided that good practice is followed during construction.

6.11.20 Based on the assumptions and calculations presented in **Table E.1** and **Table E.2** (**Volume 3E**), indirect disturbance to wet modified bog habitat loss during construction of the Project is estimated to be 4.86 ha.

6.11.21 The Project is anticipated to cause temporary (short term) change to the local hydrology regime (low magnitude), with possible minor changes in the composition of blanket bog vegetation of Local Importance up to ten metres from proposed infrastructure. The effect on the conservation status of blanket bog resulting from hydrological change during construction would be not significant.

Direct loss and temporary disturbance of blanket bog habitats (operation)

6.11.22 During the operational phase, annual maintenance visits to the solar arrays would be required, involving a tracked vehicle moving along each of the array rows. Site operatives would follow a tight working footprint with minimal passes across bog communities to ensure that disruption and disturbance is kept to a minimum.

6.11.23 Whilst temporary disturbance is expected, considering the precautionary assessment of direct loss during construction phase, it is not expected that there would be any further direct loss or temporary disturbance of blanket bog and therefore no likely significant effects on this feature during the operational phase.

Indirect disturbance and changes to composition of plant communities resulting from hydrological change (operation)

6.11.24 It is anticipated that the operational phase of the Project would not result in further habitat loss or degradation beyond that identified above in respect of construction (including consideration of the resultant habitat loss from solar arrays). It is however possible that there may be some localised changes to the composition of blanket mire communities within the vicinity of infrastructure due to changes in hydrology resulting from longer-term changes in surface water flows.

6.11.25 There should be no pollution or sedimentation to running water, unless major maintenance work was required on watercourse crossings or there was an accidental spillage of oil, concrete or other materials during maintenance of scheme infrastructure. However, good practice would be adopted to minimise the potential for pollution or sedimentation events during maintenance works.

6.11.26 Any such effects are considered to be of 'low' magnitude and the effect on the conservation status of wet modified bog resulting from hydrological change during operation would be not significant.

6.12 Assessment of effects: Otter

Baseline conditions

Desk study

6.12.1 Otter evidence recorded during surveys in 2009/10 and 2012 included a single holt, spraint and over-land runs; no other resting sites were recorded. The holt was recorded in a cavity under a wooden bridge on the Drumtee Water (NS 49633 46410). The density of otter signs was highest on Kingswell Burn although signs were also recorded on Collorybog Burn, Drumtee Water, Greenfield Burn. Areas of marshy grassland and dense conifer plantation woodland present within the survey area were also considered to provide opportunities for otter to lie up.

Otter surveys 2020

6.12.2 Evidence of otter activity was recorded along a number of watercourses within the study area, including Drumtee Water, Collorybog Burn and Dunton Water (**Figure 3C6.1, Volume 3C**). Field signs observed comprised spraints, the greatest density of which were recorded along the Drumtee Water and Dunton Water.

6.12.3 Two potential resting sites were recorded, one on the Dunton Water, and the other along Rough Hill Burn. Further details are presented in **Annex A, Table C-A.1** (**Volume 3C**) and locations are presented on **Figure C.2** (**Volume 3C**).

Future baseline

6.12.4 In the absence of the Project, otters are likely to continue to utilise the Site. Given the network of watercourses and availability of suitable potential shelter on the Site, it is likely that the limiting factor on the population is prey resource. On this basis, it is assumed that the future baseline in respect of otter would be similar to the current baseline.

Predicted effects and their significance

Disturbance and displacement of the local otter population including damage to resting sites (construction)

6.12.5 During surveys in 2020, several well used and apparently long-established otter travel routes were identified on the Development Site and the location of these and resting sites were taken into account when designing the Project, to avoid potential disturbance of these features wherever possible (see **Section 6.9.1**).

6.12.6 No well-used or recently occupied resting sites were recorded and there was no evidence of breeding identified at any of the resting sites (**Volume 3C**).

6.12.7 Otters are highly mobile and can move away from areas of disturbance as the Site and wider areas are resource abundant for shelter; however, any resting site that may be disturbed during construction or operation would have to be subject to measures to be set out within an Otter SPP and, if necessary, standard licensing procedures.

6.12.8 A single potential resting site is located within a standard distance threshold (30m) for disturbance to otters and is considered further:

- A potential resting site (couch) (TN12) (**Annex A, Volume 3C**) is located <10m from an existing access road and <10m from a watercourse crossing. The couch is assessed as a low status resting site, providing limited shelter in the form of a shelter beneath lower branches of a conifer and nearby fallen trees, which could provide suitable short-term shelter, but would be unlikely to be suitable for prolonged day time use. Whilst the likelihood of disturbance to otters at this resting site is considered limited, given the proximity to the proposed construction area, as a precaution an EPS licence is likely to be required in order to avoid contravention of legislation protecting otters.

6.12.9 Construction related disturbance/displacement effects to otters within the Site would be temporary and sporadic, and in light of the embedded measures outlined in **Table 6.9**, the magnitude of change would be low (and operational effects would be neutral).

6.12.10 Due to the extent of available watercourses/waterbodies and availability of suitable habitat within the Study Area that will remain undisturbed during construction, availability of foraging shelter habitat resource is not considered to be a limiting factor within the Site. Given the temporary nature of the construction works, the magnitude of change to the otter population is considered to be low, and the resultant effect on the site's integrity and the species conservation status is not significant.

Temporary severance of otter habitat and commuting routes (construction)

6.12.11 There is also potential for construction activities to cause fragmentation of otter habitat and prevent the free movement of otters across their territories.

6.12.12 Access tracks have avoided crossing watercourses where possible, but due to the number of watercourses on the Site, and limitations regarding access locations, it is not possible for the development to take place without some being crossed. The Project includes 7 crossings (including 2 culverted and five trenched). In the event that construction activities are scheduled to take place at more than one watercourse at any one time, this would be subject to ECoW approval, to avoid any cumulative impact on otter activity.

6.12.13 Whilst otter is present across the Development Site, otter territories are likely to cover many kilometres of watercourses/water bodies, and the Project is likely to represent only a very small proportion of an otter's foraging territory. Proposed works during construction would therefore not be expected to result in permanent blockage of existing commuting routes.

6.12.14 On this basis, and in light of the embedded measures outlined in **Table 6.9**, the temporary loss or barrier effects during the construction of watercourse crossings would result in a low magnitude of change to the otter population and the resultant effect on the site's integrity and the species conservation status is not significant.

Disturbance and displacement to otters (operation)

6.12.15 Operational effects on otters would be limited to potential occasional disturbance during routine maintenance and monitoring visits during the day to the Project. Such disturbance is likely to be sporadic, resulting in a 'very low' magnitude of change and the effect on the species conservation status is not significant.

6.13 Assessment of effects: Black grouse

Baseline conditions

Desk study

6.13.1 Black grouse is listed on the SBL and is red listed on Birds of Conservation Concern 4 (Eaton *et al.* 2015) with breeding numbers in the UK declining by 80% between 1991 and 2004. Defining the number of black grouse in Scotland is challenging with conflicting estimates from literature. Sim *et al.* (2008) estimated there to be 5,078 male black grouse in the UK in 2005, with approximately two-thirds of these occurring in Scotland. However, Forrester *et al.* (2007) estimate that in Scotland there are around 3,550 to 5,750 lekking males. However, In Scotland the breeding range is contracting, and numbers are declining, though the rate of decline varies regionally, being highest in southern Scotland, suggesting that the national and regional populations are in unfavourable conservation status. The NHZ 17 population was estimated by Wilson *et al.* (2015) to be 78 (range 25-148) displaying males in 2005.

6.13.2 As described in **Volume 3A,** the following Historical and contemporary records have been identified through Whitelee Windfarm Extension Phase 3 survey records (2007 – 2012) and Whitelee HMA Annual monitoring records (2016 – 2020):

- 2007 - 2011: The area surrounding the Site boundary was found to support a small number of black grouse. Two leks each of one male were located during surveys in 2007: both recorded to the east of the Site, each approximately 700m and 400m from the Site boundary. A female was present at one, indicating the likelihood of breeding occurring nearby. The eastern lek was also occupied by one male during 2009, 2010 and 2011 and droppings were located within the Site boundary in 2009.
- 2012: No displaying males were located within the Whitelee Windfarm Extension Phase 3 survey area during surveys in spring 2012, a single male was seen approximately 750m from the Site boundary during Whitelee Windfarm monitoring surveys in 2012 (MacArthur Green, pers comm).
- 2016: A single black grouse was recorded during dedicated searches. This was a displaying male recorded during on 28th April, approximately 400m to the east of the Site boundary. A male black grouse was recorded on several occasions during a moorland bird survey visit on 30th May. All records were from within the tree clearance area on Howeburn Bog (within the Site boundary) and were probably of the same bird.
- 2017: A single black grouse was recorded during dedicated searches. This was a displaying male recorded during on 25 April, approximately 575m from the project footprint.

- 2018: No black grouse were recorded within the HMA.
- 2020: No black grouse were recorded during any site visits within the HMA immediately adjacent to the project footprint. Hand searching of previously identified lekking sites uncovered no black grouse droppings or feathers.

6.13.3 Based on the historical presence of birds and more recent records of a single displaying bird within the vicinity of the Site, it is estimated that the Site and immediate vicinity could support approximately 1.3 % of the NHZ regional breeding population.

Future baseline

6.13.4 In the absence of development, given the historical decline in numbers and the fragility of the location population (i.e., no recent records and only a single displaying bird most recently recorded in 2017) it is possible that a breeding population may not persist at this location in future.

Predicted effects and their significance

Construction activity resulting in temporary disturbance or displacement

6.13.5 The nearest displaying bird was last recorded in 2017, approximately 450m from the Site and therefore within the ZOI, equivalent to 1.3% of the NHZ population.

6.13.6 Since then, no records of black grouse have been made at this location or across the wider HMA study area indicating that the breeding population is unlikely to have persisted.

6.13.7 Nevertheless, construction related disturbance/displacement effects would be minimised via the embedded measures outlined in **Table 6.9** with disturbance to nesting birds being unlikely.

6.13.8 Therefore, the magnitude of change to the NHZ 17 black grouse population is considered to be low, and the resultant effect on the species conservation status is not significant.

Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes

6.13.9 Even when considering a baseline estimate of a single male present within the Site and wider area, operational disturbance resulting from vehicle movements (a single vehicle movement every hour) to collect fuel from the Hydrogen compound approximately 700-900m (from the two nearest lek sites) would be temporary and sporadic. Taking into account the embedded measures outlined in **Table 6.9**, the magnitude of change to the NHZ 17 black grouse population is considered to be low, and the resultant effect on the species conservation status is not significant.

Operational displacement leading to barrier effects.

6.13.10 Similarly, in light of the low numbers of birds likely to utilise the Site and given the available foraging resource within the immediate vicinity of the Site and wider area, any displacement or barrier effects as a result of the solar arrays would be low, and the resultant effect on the species conservation status is not significant.

Operational collision risk.

6.13.11 Given the low numbers of birds likely to utilise the Site, the threat of collision with proposed exclusion fencing around the solar arrays is likely to be of low magnitude and therefore not significant.

6.14 Assessment of effects: Curlew

Baseline conditions

Desk study

6.14.1 Curlew is included on the SBL and is red listed on Birds of Conservation Concern 4 (Eaton *et al.* 2015). The Scottish curlew population is estimated to be 58,684 pairs (combining 45,627 breeding annually on farmland with 13,057 breeding in upland habitats) Wilson *et al.* (2015), but it was reported there has been a notable contraction of range in parts of south and western Scotland. The inclusion of the species on the BoCC red-list suggests that the national and NHZ/regional populations are likely to be in unfavourable conservation status. The NHZ 17 population is estimated by Wilson *et al.* (2015) to be 2,303 (range 2085-2,521) pairs in 2005.

6.14.2 Based on historical surveys, two pairs of curlew were recorded within the Site boundary within 200m of the proposed working area in 2009.

6.14.3 Based on contemporary data from an ongoing programme of breeding wader monitoring surveys across the Whitelee HMA which sits adjacent to the Site boundary, six territories were confirmed in 2017, ten confirmed in 2018 and two territories confirmed in 2020.

Future baseline

- In the absence of development, curlew are likely to continue to maintain their present population levels within the wider HMA. In the absence of contemporary data in order to establish the persistence of breeding birds within the northern section of the Site it is assumed that opportunities for breeding curlew have been maintained and a local population will continue to persist.

Predicted effects and their significance

Construction activity resulting in disturbance or displacement of breeding birds

- Based on historical and contemporary data for the Site and wider area, two historical breeding territories fall within the ZoI of the project footprint. Conditions within the Site itself are considered to remain relatively unchanged from previous surveys and the locations of both historical territories continue to be maintained as sheep grazed rush pasture. On this basis (and compared against the wider HMA population), the Site is likely to continue to support two breeding curlew territories.

6.14.4 This species has been shown to be affected by disturbance, particularly during construction (Pearce-Higgins *et al.* 2012). Based on the available historical data, it is possible that during the construction phase, the curlew population within around 500 m of the Project footprint may be reduced by up to two pairs. This would only affect a small proportion of the NHZ population (approximately 0.09% of the NHZ population of 2,303 pairs, Wilson *et al.* 2015), Therefore, the magnitude of change to the NHZ 17 curlew population is considered to be low, and the resultant effect on the species conservation status is not significant.

Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes

6.14.5 Based on historical and contemporary data for the Site and wider area, two historical breeding territories fall within the ZoI of the Project footprint, Operational disturbance resulting from vehicle

movements (a single vehicle movement every hour) to collect fuel from the Hydrogen compound would be temporary and sporadic and in light of the embedded measures outlined in **Table 6.9**, the magnitude of change to the NHZ 17 curlew population is considered to be low, and the resultant effect on the species conservation status is not significant.

Operational displacement leading to barrier effects.

6.14.6 Based on historical and contemporary data for the Site and wider area, two historical breeding territories fall within the ZoI of the Project. two breeding pairs are predicted to be permanently displaced as a result of the presence of solar arrays and associated infrastructure. Therefore, the magnitude of change to the NHZ 17 curlew breeding population is considered to be low and the effects would be not significant.

6.15 Assessment of effects: Lapwing

Baseline conditions

Desk study

6.15.1 Lapwing is included on the SBL and is red listed on Birds of Conservation Concern 4 (Eaton *et al.* 2015). The Scottish population is estimated to be between 71,500 and 105,600 pairs (Forrester *et al.* 2007). The BTO BirdTrends programme has reported a national decline by 43% across the UK, and 57% in Scotland between 1995 and 2014. The BTO's map of change in relative density between 1994-96 and 2007-09 indicates that decreases have been strongest in lowland regions and the south and that some increase may have occurred in some upland and northern regions of Britain. The NHZ trend is unknown but the regional and national populations are likely to be in unfavourable conservation status.

6.15.2 No evidence of breeding lapwing was recorded within the Study Area during surveys undertaken between 2009 - 2011.

6.15.3 Based on contemporary data from an ongoing programme of breeding wader monitoring surveys across the Whitelee HMA which sits adjacent to the Site boundary, six territories were confirmed in 2017, four of which were recorded within the Site boundary.

6.15.4 No evidence of breeding was recorded during surveys in 2018 or 2020.

Future baseline

6.15.5 In the absence of development, lapwing are likely to continue to maintain their present population levels within the wider HMA. In the absence of contemporary data in order to establish the persistence of breeding birds within the northern and southern sections of the Site it is assumed that opportunities for breeding lapwing have been maintained and a local population will continue to persist, particularly given the ongoing restoration of the Whitelee HMA.

Predicted effects and their significance

Construction activity resulting in disturbance or displacement of breeding birds

6.15.6 Based on historical and contemporary data for the Site and wider area, three historical breeding territories fall within the ZoI of the Project (two in proximity to the northern section; and one in proximity to the proposed cable route in the southern section). Conditions within the northern

section of the Site are considered to remain relatively unchanged from previous surveys and conditions within the HMA to the south of the northern section are likely to be unchanged over the past three years since 2017. On this basis (and compared against the wider HMA population), the Site is likely to continue to support around four breeding lapwing territories.

6.15.7 Based on the available historical data, it is possible that the construction phase may result in the temporary displacement of three territories (over a single breeding season) within around 500 m of the Project, which would be likely to constitute a small proportion of the NHZ population (the NHZ 17 population is not currently known). Works will be temporary in nature and suitable habitat is likely to be available within the vicinity of the Site including increasing availability of suitable restored bog habitat within the HMA. Therefore, the magnitude of change to the NHZ 17 lapwing population is considered to be low, and the resultant effect on the species conservation status is not significant.

Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes; and operational displacement leading to barrier effects.

6.15.8 Based on a historical presence of two territories within close proximity to the Project footprint, two breeding pairs are predicted to be permanently displaced from the north eastern corner of the Whitelee HMA as a result of the presence of the Hydrogen storage compound. However, breeding opportunities are likely to be available within the wider vicinity including both restored habitats within the surrounding Whitelee HMA and the proposed HMA within the northern section. The magnitude of change to the lapwing population is considered to be low, and the resultant effect on the species conservation status is not significant.

6.15.9 Disturbance resulting from vehicle movements (a single vehicle movement every hour) to collect fuel from the Hydrogen compound would be temporary and sporadic and in light of the embedded measures outlined in **Table 6.9**, therefore the magnitude of change to the lapwing breeding population is considered to be low and the effects would be not significant.

6.16 Assessment summary

6.16.1 A summary of the assessment is provided in **Table 6.11**.

6.16.2 The summary assessment below deals in an integrated way, with the effects of all phases of the Project. Potential effects are considered together as the assessment focuses on the favourable conservation status of each feature and as such, is assessed throughout the lifespan of the Project. Often changes to a feature would occur during several stages of the Project and the resultant effect may reverse during different phases. For example, during construction a population may decline, however, this effect may be reversed during operation. The summary below presents the magnitude of overall change, and whether that is adverse, beneficial or neutral.

Table 6.11 Summary of significance of adverse effects

Ecological Feature	Summary of Predicted Effects (During Construction and Operation)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Wet modified bog communities	Direct loss and temporary disturbance of blanket bog habitats due to land take associated with the construction of site infrastructure	Local/County	Medium	**Significant**	The Project is predicted to result in the direct loss of **19.72 ha** (comprising permanent loss of 4 ha to site infrastructure; and the permanent loss/degradation of 15.72 ha beneath solar array), and temporary disturbance of 0.51 ha of wet modified bog communities. Direct loss and temporary disturbance of wet modified bog habitats during construction activities is anticipated to be of a medium scale of magnitude in the short to medium term and this would have a **significant** effect on the conservation status of blanket mire communities. Whilst vegetation recovery within the disturbed areas would be expected in the medium to longer term, given the uncertainty regarding the response of bog vegetation to solar arrays, a worst-case scenario has been assumed for habitats beneath solar array.
	Indirect disturbance and changes to composition of plant communities resulting from hydrological change		Low	Not Significant	The Project is anticipated to cause temporary (short term) change to the local hydrology regime of a low magnitude, with some limited change in the composition of vegetation. However, the effect on the conservation status of the wet modified bog resource would be not significant.

Ecological Feature	Summary of Predicted Effects (During Construction and Operation)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
Otter	Disturbance/displacement effects to otters	Local	Low	Not significant	The magnitude of change as a result of the Project is low in respect of the otter population that utilises the Site. This is on the basis of the availability of alternative resting places and foraging habitat within the wider vicinity, the temporary and sporadic nature of disturbance effects and the likelihood of complete reversibility following removal of disturbance. Sensitive design layout and the protection of watercourses, as well as the implementation of an Otter SPP and other embedded measures during construction would ensure that the magnitude of any disturbance/displacement effects would be low and the resultant effect on the species' conservation status would be not significant.
	Direct damage to resting sites and disturbance to individuals using resting sites due to elevated levels of disturbance (such as increased noise, lighting, and human presence) during construction and operation and related works.		Low	Not significant	Construction and maintenance related disturbance/displacement effects to otters within the Development Site would be temporary and sporadic. In light of the embedded measures and the availability of alternative suitable foraging habitat and resting sites within the Site, the resultant effect on the species' conservation status would be not significant.

Ecological Feature	Summary of Predicted Effects (During Construction and Operation)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	Temporary severance of otter habitat and commuting routes		Low	Not significant	Embedded mitigation would reduce the risk from the temporary loss or barrier effects during the construction of watercourse crossings and the resultant effect on the species' conservation status would be not significant.
	Direct mortality due to construction related activities		Low	Not significant	Embedded mitigation would reduce the risk of direct mortality to individuals during the construction phase and the effect on the conservation status of otter would be not significant.
	Reduction in habitat quality as a result of hydrological connectivity and pollution incidents		Neutral	Not significant	Embedded mitigation measures would reduce the risk from the degradation of food resource by pollution of habitats used by otter, during both phases of the Project and the resultant effect on the species' conservation status would be not significant.
Black grouse	Construction activity resulting in disturbance or displacement of breeding birds		Low	Not significant	Construction related disturbance/displacement effects to black grouse within the ZoI would be temporary and sporadic and in light of the embedded measures outlined in **Table 7.9**, the magnitude of change to the NHZ 17 black grouse population is considered to be low, and the resultant effect on the species conservation status would be not significant.

Ecological Feature	Summary of Predicted Effects (During Construction and Operation)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes		Low	Not significant	Operational disturbance would be temporary and sporadic and in light of the embedded measures outlined in **Table 7.9**, the magnitude of change to the NHZ 17 black grouse population is considered to be low, and the resultant effect on the species conservation status is not significant.
	Operational collision risk.		Low	Not significant	The threat of collision with proposed exclusion fencing around the solar arrays is likely to be of low magnitude and therefore not significant, nevertheless exclusion fencing surrounding the PV arrays will have coloured or metallic markers to help mitigate collision risk.
	Operational displacement leading to barrier effects.		Low	Not significant	Displacement effects as a result of the solar arrays would be low, and the resultant effect on the species conservation status is not significant.
Curlew	Construction activity resulting in disturbance or displacement of breeding birds		Low	Not significant	Based on the available historical data, it is possible that during the construction phase, the curlew population within around 500 m of the site may be reduced by up to two pairs. This would only affect a small proportion of the NHZ population (approximately 0.09% of the NHZ population of 2,303 pairs, Wilson et al. 2015), which would be of low magnitude and not significant.

Ecological Feature	Summary of Predicted Effects (During Construction and Operation)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
	Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes		Low	Not significant	Operational disturbance resulting from vehicle movements (a single vehicle movement every hour) to collect fuel from the Hydrogen compound would be temporary and sporadic and in light of the embedded measures outlined in **Table 7.9**, the magnitude of change to the NHZ 17 curlew population is considered to be low, and the resultant effect on the species conservation status is not significant.
	Operational displacement leading to barrier effects.		Low	Not significant	Two breeding pairs are predicted to be permanently displaced as a result of the presence of solar arrays and associated infrastructure. Therefore, the magnitude of change to the NHZ 17 curlew breeding population is considered to be low and the effects would be not significant.
Lapwing	Construction activity resulting in disturbance or displacement of breeding birds		Low	Not significant	Based on the available historical data, it is possible that the construction phase may result in the temporary displacement of three territories (over a single breeding season) within around 500 m of the Project, which would be likely to constitute a small proportion of the NHZ population (the NHZ 17 population is not currently known). Given the temporary nature of the works, and the availability of breeding opportunities within the wider vicinity including both restored blanket bog habitats within the surrounding Whitelee HMA and the proposed HMA within the northern section, impacts

Ecological Feature	Summary of Predicted Effects (During Construction and Operation)	Importance of Ecological Feature[1]	Magnitude of Change[2]	Significance[3]	Summary Rationale
					would be of a low magnitude and not significant.
	Operational displacement leading to barrier effects.		Low	Not significant	As a worst case scenario, two breeding pairs are predicted to be permanently displaced from the north eastern corner of the Whitelee HMA as a result of the presence of the Hydrogen storage compound. However, breeding opportunities are likely to be available within the wider vicinity including both restored habitats within the surrounding Whitelee HMA and the proposed HMA within the northern section. The magnitude of change to the lapwing population is considered to be low, and the resultant effect on the species conservation status is not significant.
	Potential disturbance and displacement to birds due to vehicle movements and associated human activities during operation and for maintenance purposes		Low	Not significant	Disturbance resulting from vehicle movements (a single vehicle movement every hour) to collect fuel from the Hydrogen compound would be temporary and sporadic and in light of the embedded measures outlined in **Table 7.9**, therefore the magnitude of change to the lapwing breeding population is considered to be low and the effects would be not significant.

1. The importance of the feature is defined as per **Table 6.7**, **Section 6.7**, using the criteria set out in **Table 6.7**, and method in **Section 6.7**.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Section 6.9**, **Table 6.10** above and is defined as neutral, very low, low, medium, and high.
3. The significance of the environmental effects is either significant or not significant subject to the evaluation methodology outlined in **Section 6.9**.

6.17 Proposed Mitigation and Compensation

6.17.1 There is the potential for **significant** adverse impacts arising from construction works to sensitive habitats (in particular wet modified blanket bog). The following outlines additional mitigation and compensation measures proposed to address these effects.

Habitat Reinstatement

6.17.2 Habitat re-instatement would take place alongside the Hydrogen storage compound, BESS substation, temporary lay down areas and cable route. There is therefore potential for the majority of habitat disturbed during construction to be reinstated within and around the Project footprint in the medium term (3 to 5 years) following construction activities. This re-instatement would be informed by further surveys prior to reinstatement and future site monitoring.

Compensatory Habitat Restoration

6.17.3 The following sets out broad criteria for identifying and delivering compensatory habitat management which would compensate for the following areas of lost or potentially degraded habitat:

- 4 ha wet modified bog (direct/permanent loss).
- 13.15 ha wet modified bog (direct/solar array).
- 2.57 ha wet modified bog (direct/solar array within the HMA).
- 7.3 ha other habitats (direct/solar array within the HMA). Loss of all HMA will require compensation for the loss of HMA opportunity land.

6.17.4 The Project will therefore result in the combined direct and indirect loss of wet modified bog and land within Whitelee HMA of **27.02 ha**; and compensatory measures are therefore proposed. It is considered that as a precaution to allow for the uncertainty associated with how bog communities will respond to the installation of solar array, that a net balance will be required to offset worst case scenario loss or degradation of bog communities.

Candidate habitat management units

6.17.5 The area proposed for restoration to blanket mire (from currently modified/degraded blanket mire) is located within the northern area of the Site, sharing a boundary coincident with the Whitelee Windfarm Habitat Management Area (HMA).

6.17.6 The proposed HMA comprises two candidate Management Units (A and B) within which management will be implemented. Both units have been identified within the Site boundary as supporting wet modified bog which would benefit from positive management activities. The condition of the bog habitat within Units A and B is degraded/modified due to grazing pressure, historical drainage, conifer regeneration and localised erosion across the Site.

6.17.7 **Figure 6.3** (**Volume 3F**) illustrates the candidate HMAs and provides further detail on Units A and B (**Figure 6.4 and Figure 6.5, Volume 3F**), illustrating historical drains and areas for self-seeded conifer removal.

6.17.8 The aims of the Site HMP will be determined at a later date, but in relation to blanket mire would be anticipated to align with those of the existing Whitelee HMP, which are summarised as:

- Aim 1: Restore conditions for deforested blanket mire habitat.

- Aim 2: Restore conditions for unplanted blanket mire habitat.
- Aim 3: Improve quality of blanket mire habitat.

6.17.9 Management measures to be implemented would be likely to include the following:

- The blocking of historical drainage channels (using 'wave dams') has been proven to be improve the quality of bog habitats and has been used within the existing Whitelee HMP as well as the NatureScot Peatland ACTION project on several peatland restoration programmes.
- There are approximately 14 km of drains within the two HMA Units, which will benefit from drain-damming in order to prevent further damage to the hydrological regime. This physical intervention creates dams within the existing drains, preventing runoff, stabilising hydrology and enabling the growth of bog-forming species such as *Sphagnum* mosses. By applying a 10m hydrological zone of influence buffer around all identified drains, this provides a possible drain restoration area of 18.8 ha.
- Exclusion of grazing within Unit A (1-3) (October – May inclusive), and densities June – September not exceeding 0.05 Livestock Unit (LU)/ha subject to amendment by the Whitelee HMG. This would provide additional habitat restoration (over and above the drain restoration area) of 5.8 ha.
- Removal of self-seeded conifer regeneration from two combined areas of 4.54ha within Unit B.
- Monitoring is also proposed in order to establish whether the objectives of the HMP are being obtained. The monitoring of proposed HMA units would be undertaken as per the protocols outlined within the Whitelee HMP.

6.17.10 Combined opportunity areas for provision of blanket bog restoration would total up to **29.14ha** within the two candidate Habitat Management units.

6.17.11 All habitat restoration proposals detailed above would be subject to consultation with Whitelee Habitat Management Group and NatureScot.

6.17.12 A final HMP would include a confirmed Habitat Management Area (HMA) and associated Management Units where the Aims apply, which would be agreed with EAC, Whitelee Habitat Management Group and NatureScot prior to commencement of construction.

6.18 Assessment of cumulative effects

6.18.1 Significant effects may not occur when considering the Project in isolation, but in combination with nearby existing or proposed developments, cumulative effects may be significant. The context in which cumulative effects are considered depends upon the ecology of the species or habitat in question. The need to consider cumulative effects is a requirement of the EIA process, as specified by the EIA Regulations.

6.18.2 In order to undertake a cumulative impact assessment, it is necessary to define:

- The IEFs affected by the Project that may be subject to significant cumulative effects in combination with other projects.
- The relevant projects for which cumulative effects must be considered.

6.18.3 Upon defining these, a cumulative impact assessment is undertaken by drawing on the assessment of effects for important ecological features affected by the Project that are also considered in the EIA of other projects.

6.18.4 Based on the assessments provided in **Volume 3D** (Scoping of the Assessment) (**Volume 3**); and assessment of IEFs (**Section 6.11 – 6.14**) the only IEF taken forward for considered for cumulative assessment is Wet Modified Bog.

6.18.5 The loss of **19.72 ha** of wet modified bog as a result of the Project is assessed as Medium and significant, although as a result of the heavily degraded condition of the habitat within the Site and the proposed habitat restoration proposals to restore an equivalent area to that lost to the Project, the residual impact is considered to be negligible (Low beneficial). The contribution of the Project to cumulative impacts on wet modified bog within the wider Natural Heritage Zone (NHZ) 17 (West Central Belt) is therefore considered to be low (with an aim to be of an overall benefit pending successful habitat restoration outcomes). Therefore, an extensive cumulative impact assessment is not necessary. Cumulative impacts on wet modified bog are therefore considered to be Low and Not Significant in the context of the EIA Regulations.

6.19 Conclusions of significance evaluation

6.19.1 The combined loss and/or possible degradation of **19.72 ha** of wet modified bog within the footprint of the Project is considered to be a significant effect. However, **Section 6.16** sets out proposed habitat management proposals which would compensate for the loss of this area, which would reduce the residual effect on these habitats to not significant.

6.19.2 These proposals, which have adopted a precautionary approach and applied good practice principles will deliver long-term peatland benefits including the restoration of previously damaged habitat with the opportunity to recover favourable condition for both vegetation communities and wildlife species.

6.19.3 Proposals are likely to contribute a net positive balance to the blanket bog resource within the Site, including the restoration of a large extent of Fenwick Moor PWS, provide more favourable conditions for breeding waders and contribute an increase to the extent of the existing Whitelee HMA, which will help to safeguard peat bogs and wildlife species over the long term.

6.20 Implementation of Environmental Measures

6.20.1 **Table 6.12** describes the environmental measures embedded within the Project and the mechanism by which they would be implemented (e.g., planning condition) and who is responsible for their implementation.

Table 6.12 Summary of environmental measures relevant to ecology

Environmental Measure	Responsibility for Implementation	Compliance Mechanism
Construction Phase		
Preparation of Habitat Management Plan	Developer	Planning condition
Preparation of Breeding Bird Protection Plan	Developer	Planning Condition
Preparation of reinstatement and restoration plan	Developer	CEMP
Tool-box talks	Construction Manager and ECoW.	CEMP
Adherence to Pollution Prevention Plan as fully detailed in **EIA Report Volume 2, Chapter 9 Hydrology, Geology and Hydrogeology**.	Construction Manager and ECoW.	CEMP
Watercourse exclusion zones (20m buffers) and restrictions on timing of works within these zones implemented through the CEMP	Developer/Contractor	CEMP
Culvert construction/installation and monitoring requirements implemented via the CEMP	Developer/Contractor	Planning condition
Measures to control silt/sediment and pollution and limit noise emissions implemented through the CEMP & Peat Management Plan	Developer/Contractor	Planning condition
Operational Phase		
Water quality protection measures (e.g., adherence to SEPA GPPs).	Developer and ECoW	Planning condition
Maintain exclusion fencing surrounding the PV arrays with coloured markers (to avoid collision by black grouse)	Developer/Operator	Planning condition
All maintenance working areas would be clearly defined.	Developer and ECoW	Planning condition
Pollution risk due to operational activities including servicing and maintenance to be minimised through operator risk assessments and appropriate preventative measures	Developer/Operator	Controlled Activities Regulations (CAR)

6.21 References

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7. Landscape and Visual Impact Assessment

7.1 Introduction

7.1.1 This Landscape and Visual Impact Assessment (LVIA) considers the potential landscape and visual effects resulting from the Project.

7.1.2 The Project is located within an undesignated area of *Plateau Moorland with Windfarms,* approximately 4.8km distance northeast of Fenwick in East Ayrshire and adjacent to the boundary with East Renfrewshire, to the west / northwest of the existing Whitelee Windfarm.

7.1.3 The objective of this assessment has been to determine the landscape and visual effects of the Project on the existing landscape resource and visual amenity. The LVIA has been prepared by chartered landscape architects at Wood and should be read in conjunction with the Project Description set out in the Supporting Statement (S36) and Planning Statement (Full PP).

7.1.4 The Project has been considered against the requirements of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 and any relevant planning policies, relating to the landscape resource and visual amenity. The following landscape and visual receptors have been assessed:

- Landscape character, key characteristics, and elements.
- Designated landscapes.
- Views and visual amenity experienced by residents, recreational receptors and road / rail users.

7.1.5 The LVIA is supported by several appendices, set out in Volume 4, as follows:

- **Appendix 4A**: LVIA Methodology and Glossary.
- **Appendix 4B**: Residential Visual Amenity Assessment (RVAA).

7.1.6 A number of figures supporting the LVIA are presented in **Appendix 4C**, Volume 4, as follows:

- **Figure 7.1**: Landscape and Visual Study Area.
- **Figure 7.2**: Zone of Theoretical Visibility (ZTV) and Viewpoint Locations.
- **Figure 7.3**: Topography.
- **Figure 7.4**: Landscape Character.
- **Figure 7.5**: Transport and recreational routes.
- **Figure 7.6**: Residential Properties within 1km.
- **Figure 7.7a-b**: Viewpoint 1: A77/ B764 Junction.
- **Figure 7.8a-b**: Viewpoint 2: Access track to Drumtee.
- **Figure 7.9a-b**: Viewpoint 3: Lochgoin Monument.
- **Figure 7.10**: Viewpoint 4: A77, South Drumboy.
- **Figure 7.11**: Viewpoint 5: B763, Queenseat Hill.
- **Figure 7.12**: Viewpoint 6: A77, Laighmuir.

- **Figure 7.13**: Viewpoint 7: Clunch Road.

7.2 The Project

7.2.1 Please refer to Chapter 3 for full details of Project description.

7.3 Methodology

7.3.1 The assessment methodology is set out in **Appendix 4A** of Volume 4, which includes a glossary of terms and abbreviations used in this report. The methodology for the LVIA has been undertaken in accordance with best practice guidance which is listed in the references at the end of this report, they include, but are not limited to, the following:

- *Guidelines for Landscape and Visual Impact Assessment,* 3rd Edition, Landscape Institute and IEMA (May 2013), (GLVIA 3).
- *Planning Guidance for the Development of Large-Scale Ground Mounted Solar PV Systems,* Building Research Establishment, 2014.
- *Natural heritage considerations for solar photovoltaic installations*, NatureScot, Version 3, 2017.
- *An approach to Landscape Character Assessment*, Natural England, October 2014.
- *Visual Representation of Development Proposals,* TGN 06/19, Landscape Institute, September 2019.
- *Residential Visual Amenity Assessment,* TGN 2/19, Landscape Institute, March 2019.

7.4 Study Area

7.4.1 It is accepted practice within landscape and visual assessment work that the extent of the study area for a development proposal is broadly defined by the visual envelope of the Project and the anticipated extent of the Zone of Theoretical Visibility (ZTV) arising from the development itself, as defined in **Section 7.5** below. In this case a study area of 5km has been considered appropriate to cover all potentially significant landscape and visual effects. The study area is illustrated in **Figure 7.1**.

7.5 Zone of Theoretical Visibility (ZTV)

7.5.1 The ZTV illustrated in **Figure 7.2** is used to analyse the extent of theoretical visibility of the Project or part of the development to determine the Study Area and to assist with viewpoint selection. The ZTV provides a starting point in the assessment process and accordingly tends towards giving a 'worst case' or greatest calculation of the theoretical visibility. The ZTV is calculated using Resoft Wind Farm© software to generate the zone of theoretical visibility of the Project. This software creates a 3D computer model of the existing landscape and the development using OS Terrain 50 data which does not take account of any screening from vegetation or built form.

7.5.2 The ZTV in **Figure 7.2** illustrates the theoretical visibility of the three tallest, and therefore most visible, components of the Project:

- Solar panels within the solar PV farm (maximum height of 3m above ground level).
- Green hydrogen production facility (maximum height of 15m above ground level).

- BESS (maximum height of 8m above ground level).

7.5.3 The ZTV illustrates that the main areas of theoretical visibility would be within approximately 2.5km of each of the three main components. As the solar PV farm and green hydrogen production facility are located together, there is a large overlap of theoretical visibility of these components mostly in the northern part of the study area. Theoretical visibility beyond 2.5 km becomes patchy and reflects the rising landform to the west of the M77, forested areas and remote elevated areas to the northeast where both the solar PV farm and green hydrogen production facility would be visible, and elevated areas of forestry to the south and southwest where there is some theoretical visibility of the BESS.

7.6 Consultation

7.6.1 A request for a Screening Opinion was submitted to the Energy Consents Unit (ECU) in October 2020 which was received on 12 February 2021 that a full EIA Report would be required for the Project.

7.6.2 With regards to landscape and visual matters, ECU note:

"There would be landscape and visual impacts. The proposed development is in a location with limited sensitive receptors and is set within the existing wind farm context. The main adverse effect would be on the property at Cauldstanes, which is just south of the solar array, which has over the years been cumulatively affected by wind turbines. There would be additional effects on the property as a currently unaffected part of the view would be developed with solar panels in close proximity.

Landscape and Visual Impact Assessment should address:

- *Residential visual amenity assessment for nearby properties (within ZTV and 1km).*
- *Potential for visible water vapour plume.*
- *Requirement for lighting of any part of the proposal, but most likely the Hydrogen plant, and therefore potential night time effects.*
- *Potential for glint and glare effects on nearby roads and properties. Again the property at Cauldstanes would seem a likely recipient, being to the south of the facing slope."*

7.6.3 Visual effects on Cauldstanes are assessed in detail in the RVAA (**Appendix 4B** of Volume 4). Subsequently, visual effects on all residential properties within 1km of the Project are assessed in the RVAA.

7.6.4 Visual effects of the water vapour plume is assessed as part of the green hydrogen production facility in **Section 7.13**.

7.6.5 Night-time lighting is expected to be limited to local and task security lighting which will be directed downward where possible. There is not anticipated to be any other night-time lighting associated with the Project therefore night-time effects are scoped out.

7.6.6 The detailed assessment of glint and glare is a specialist area of expertise that is outwith the scope of an LVIA. A Glint and Glare Assessment (43122-WOOD-ZZ-XX-EP-OP-0001_S0_P01.1) has therefore been prepared as part of the EIA Report and is contained within **Volume 7A**.

7.6.7 In their screening opinion, East Ayrshire Council (EAC) note:

"*The approach to landscape and visual matters is generally acceptable although the removal of the BESS element from the scope appears to be partly based on its location within surrounding forestry. The forestry in this location is commercial in nature and therefore felling would be expected to take*

place in time. As such, long term screening cannot be relied upon and I would caution the removal of the BESS from the scope."

7.6.8 With regards to the BESS, the ZTV (**Figure 7.2**) illustrates that theoretical visibility of the BESS would mostly be isolated to the south within large areas of young and mature coniferous forestry with very few visual receptors. The nearest receptors to the BESS is a local Core Path IV9 located approximately 1.5km distance to the south and two locally promoted walking and cycling routes within Whitelee located approximately 1.5km distance to the north and northeast which would have very limited to no visibility of this component. Other receptors are located beyond 2km including residential properties such as Tayburn, Muir House and Meadowhead along the minor, unclassified road to the west from Waterside and other local Core Paths are all outwith the ZTV and would have *No View* of the BESS and the other components of the Project. Even with any future forestry felling operations, these receptors would continue to have very limited or no visibility of the BESS. Furthermore, the location of the BESS is already developed as an area of hardstanding with storage containers surrounded by wind turbines and it is likely that the introduction of the BESS would result in very limited additional effects. As a result, the effects of the BESS are scoped out of this assessment, however, where visible, views of the BESS from specific receptors is reported further in the assessment.

7.7 Scope of Assessment

7.7.1 As described in **Section 7.6** above, the effects of the BESS are scoped out of the assessment.

7.7.2 Due to the HV cable route being underground and not visible following restoration and reinstatement, the assessment of the HV cable route during operation is also scoped out.

7.7.3 The assessment therefore focuses on the landscape and visual effects of the construction and operation of the solar PV farm and green hydrogen production facility and associated infrastructure (including the link / haul road), and the construction effects of the HV cable route.

7.7.4 A site survey was carried out on the 4 November 2020, under fair weather conditions with good visibility. The survey was conducted during autumn when deciduous trees were losing leaf and therefore represents a time of year where there is greater potential visibility. It should be noted that there may be reduced visibility of the site during the summer months when surrounding deciduous vegetation is in leaf.

7.8 Viewpoint Selection

7.8.1 7 viewpoints listed in **Table 7.1** have been taken forward to the assessment stage.

Table 7.1 Viewpoint selection

Viewpoint	Distance to Project Site (m)	Viewpoint Type	Receptor Type	Visualisation Type presented
A77 / B764 Junction	356	Illustrative	Views experienced by road users and residential receptors	Annotated photograph and photomontage
Access track to Drumtee	1,066	Representative	Views experienced by residential receptors	Annotated photograph and photomontage

Viewpoint	Distance to Project Site (m)	Viewpoint Type	Receptor Type	Visualisation Type presented
Lochgoin Monument	1,358	Specific	Views experienced by visitors to the monument and recreational receptors accessing Whitelee Windfarm path network	Annotated photograph and photomontage
A77, South Drumboy	1,026	Illustrative	Views experienced by road users and residential receptors	Annotated photograph
B763, Queenseat Hill	1,936	Specific	Views experienced by road users at a layby along an elevated section of the road	Annotated photograph
A77, Laighmuir	2,790	Illustrative	Views experienced by road users and residential receptors	Annotated photograph
Clunch Road	3,465	Illustrative	Views experienced by road users and residential receptors	Annotated photograph

7.9 Assumptions and Limitations

7.9.1 The assessment of residential properties is limited to those within 1km of the Site. Due to the limitations of access to survey they have been assessed from the nearest public road or footpath with the aid of aerial photographs. In these cases, the assessment should therefore be regarded as an informed estimate of the likely visual effects.

7.9.2 One residential property, Moor Farm, is understood to be owned by the applicant who have confirmed that this property would be unoccupied during the lifetime of the Project components and has therefore been excluded from the assessment.

7.9.3 The assessment of the Project has been based on the 'worst-case' scenario (maximum visibility). No mitigation in terms of planting is proposed.

7.9.4 The detailed assessment of glint and glare is a specialist area of expertise that is outwith the scope of an LVIA. A separate Glint and Glare Assessment (43122-WOOD-ZZ-XX-EP-OP-0001_S0_P01.1) has therefore been prepared as part of the EIA Report. This report is included within **Appendix 7A** of Volume 7.

7.10 Landscape Planning Policy

7.10.1 The LVIA process has taken account of national and local planning requirements in relation to the Project, as described in the Supporting Statement which accompanies the planning application. Further information on strategic landscape planning guidance from EAC and ERC is provided here.

East Ayrshire Local Development Plan 2017 (LDP2017)

7.10.2 Policy RE1: Renewable Energy Developments states that:

"Proposals for the generation and utilisation of renewable energy in the form of new build development, infrastructure or retrofit projects will be supported in standalone locations and as integral parts of new and existing developments where it can be demonstrated that there will be no unacceptable significant adverse impacts on all of the relevant Renewable Energy Assessment Criteria set out in Schedule 1 of the LDP, that the scale of the proposal and its relationship with the

surrounding area are appropriate and that all relevant policies are met. In this regard, applications for renewable energy proposals should be accompanied by detailed supporting information";

7.10.3 Schedule 1: Renewable Energy Assessment Criteria. Relevant criteria for the LVIA include:

- *"Landscape and visual impacts.*
- *Cumulative impacts - likely cumulative impacts arising from all of the considerations below, recognising that in some areas the cumulative impact of existing and consented energy development may limit the capacity for further development.*
- *Impacts on communities and individual dwellings, including visual impact, residential amenity, noise and shadow flicker.*
- *Impacts on tourism and recreation.*
- *Public access, including impact on long distance walking and cycling routes and scenic routes identified in National Planning Framework 3."*

7.10.4 Policy ENV4: Gardens and Designed Landscapes (GDL) states that "*Development will not be supported where it will have significant adverse impacts upon (i) its character; (ii) important views to, from and within it and; (iii) important features that contribute to its value and that justify its designation, where applicable.*" The Project components are not located within a GDL, and the nearest GDL is outwith the study area.

7.10.5 Policy ENV 7: Wild Land and Sensitive Landscape Areas states that "*Any development deemed to have unacceptable impacts on wild land and SLAs will not be supported by the Council.*" The Project components are not located within a Wild Land Area or a Sensitive Landscape Area (SLA). The nearest SLA is over 6km south of the Site.

7.10.6 Policy ENV8: Protecting and Enhancing the Landscape which states that: "*The protection and enhancement of East Ayrshire's landscape character as identified in the Ayrshire Landscape Character Assessment will be a key consideration in assessing the appropriateness of development proposals in the rural area. The Council will require that:*

(i) Development proposals are sited and designed to respect the nature and landscape character of the area and to minimise visual impact. Particular attention will be paid to size, scale, layout, materials, design, finish and colour.

(ii) Where visual impacts are unavoidable, development proposals should include adequate mitigation measures to minimise such impacts on the landscape.

(iii) Particular features that contribute to the value, quality and character of the landscape are conserved and enhanced. Development that would result in the loss of valuable landscape features, to such an extent that character and value of the landscape, are unacceptably diminished, will not be supported. Such landscape features include:

a. Settings of settlements and buildings within the landscape.

b. Skylines, distinctive landform features, landmark hills and prominent views.

c. Woodlands, hedgerows and trees.

d. Field patterns and means of enclosure, including dry stone dykes.

e. Rights of way and footpaths."

East Renfrewshire Local Development Plan 2015 (ERLDP2015)

7.10.7 Although none of the components of the Project would be located within East Renfrewshire, it will be situated adjacent to the boundary and relevant policies are reviewed as part of the assessment. The ERLDP2015 was adopted in June 2015, and includes the following policies that are most relevant to this assessment:

7.10.8 Policy D1: Detailed Guidance for all Development states that "*Proposals for development should be well designed, sympathetic to the local area and demonstrate that the following criteria have been considered, and, where appropriate, met. In some cases, where the criteria have not been met, a written justification will be required to assist with assessment.*

1. The development should not result in a significant loss of character or amenity to the surrounding area;

4. The development should not impact adversely on landscape character or the green network, involve a significant loss of trees or other important landscape, greenspace or biodiversity features"

7.10.9 Policy E1: Renewable Energy states that "*The Council will support renewable energy infrastructure developments… Where appropriate, the applicant will be required to submit satisfactory mitigation measures to alleviate any adverse environmental impacts*."

7.11 Baseline of Landscape and Visual Receptors

Landscape Baseline

7.11.1 Information on the existing landscape resource or baseline conditions included in this assessment has been collected from local plans, OS maps, and relevant literature, as well as information gathered from field surveys and topographical information **(Figure 7.3)**. This baseline information is set out as an inventory of the existing landscape resource and focuses on those landscape receptors with most potential to be affected.

7.11.2 The baseline inventory includes the following landscape receptors:

- Landscape Character.
- Landscape Planning Designations.

Landscape Character

7.11.3 The Site consists of former upland agricultural land with an area of coniferous forestry to the north. Part of the site had been previously forested with coniferous forestry which has been clear-felled and now forms part of a moorland restoration area as part of the mitigation measures for the existing Whitelee Windfarm.

7.11.4 The landscape character within the study area is classified in the Landscape Character Assessment produced by NatureScot in 2019. This assessment divides the landscape into broad Landscape Character Types (LCT), which are illustrated, within the study area in **Figure 7.4**.

7.11.5 There are three LCTs within the Study Area, as follows:

- *79 Plateau Moorland with Windfarms – Ayrshire* LCT (the 'host' LCT).
- *214 Plateau Moorland with Windfarms – Glasgow & Clyde Valley* LCT.
- *66 Agricultural Lowlands-Ayrshire* LCT.

7.11.6 Of the three LCTs, ZTV analysis and site visits indicate very limited to no visibility of the Project from the *Agricultural Lowlands-Ayrshire* LCT due to distance, intervening landform, built-form and / or vegetation. This LCT is therefore excluded from further assessment on the basis that the effects would be Negligible to None.

7.11.7 The remaining two LCTs (*Plateau Moorland with Windfarms – Ayrshire*, and *Plateau Moorland with Windfarms – Glasgow & Clyde Valley*) are included in the assessment.

Landscape Designations

7.11.8 There are no statutory national, regional or local landscape designations within the study area.

Visual Baseline

Settlements and Residential Properties

7.11.9 There are two settlements within the study area, as follows:

- Fenwick.
- Waterside.

7.11.10 Both settlements are located outwith the ZTV and therefore exclude from the assessment.

7.11.11 There are approximately five residential properties within 1km of the Site which are shown on **Figure 7.6**. A Residential Visual Amenity Assessment (RVAA) has been undertaken to assess the effects on residential visual amenity likely to arise as a result of the Project (**Appendix 4B** of Volume 4).

Transport Routes

7.11.12 There are several key transport routes within the study area with potential visibility of the Project, as follows:

- M77.
- A77.
- A719.
- B764.
- Minor, unclassified road from the B764 at Kingswell to the A77 at Floak Bridge.
- Clunch Road from the A77 near Laighmuir to Damhead and the B762.

7.11.13 Site visits and viewpoint analysis (viewpoints 6 and 7) indicate that visibility would be very limited from the A719 and Clunch Road due to intervening distance, vegetation and / or built-form. These roads are therefore excluded from the assessment on the basis that effects would be minimal.

7.11.14 The M77, A77, B764 and the minor, unclassified road from the B764 at Kingswell to the A77 at Floak Bridge are included in the assessment.

7.11.15 Other transport routes not listed above are excluded from the assessment as they are outwith the ZTV and would have *No View* of the Project.

Recreational Routes

7.11.16 The visual assessment has considered the potential visual effects likely to be experienced by people (walkers / cyclists / horse riders / and others) on recreational routes within the study area. The recreational routes include local Core Paths, Heritage Paths and Scottish Hill Tracks as well as Sustrans Cycle routes and national level long distance routes such as Scotland's Great Trails.

7.11.17 Local recreational routes within the study area include:

- EAC Core Path IV9 (Kilmarnock to Whitelee).
- EAC Core Path IV10 (Dean Castle Country Park to Whitelee Forest).
- EAC Core Path IV12 (Hareshaw Hill) (overlapped by the Whitelee promoted Craigendunton Reservoir Right of Way).
- EAC Core Path IV16 (Irvine Valley to Whitelee).
- EAC Core Path B21 / B22 (Mauchline to Galston).
- EAC Core Path A11 (Robertland Path).
- ERC Core Path to Bennan Loch via Ballageich Hill from the B764.
- ERC Core Paths from Whitelee Visitor Centre and around Lochgoin Reservoir (partly overlapped by the Whitelee promoted Lochgoin Circuit Route).
- ERC Core Paths to the west and south of Myres Hill.
- Rights of Way between Fenwick and Waterside.
- Right of Way between the B764 and Blackwood Hill.
- Right of Way at Whiteleehill.

7.11.18 Whitelee promotes a range of walking, cycling and horse-riding routes, those within 5km include:

- Lochgoin Circuit Route (walking and cycling).
- Craigendunton Reservoir Right of Way.
- Dunwan off-track trekking / riding route.

7.11.19 There are also several promoted mountain bike trails at Whitelee located east of the site. These are located outwith the ZTV and therefore excluded from the assessment.

7.11.20 The A77 forms part of several local cycle routes including a Glasgow to Ayr route and several circular routes.

7.11.21 There are no nationally designated recreational routes within the study area.

7.11.22 ZTV analysis and site visits confirm that the following recreational routes within the study area are excluded from the assessment due to either no or very limited visibility due to a combination of distance and screening by intervening vegetation, landform and / or built form, such that the effects would be Negligible.

- EAC Core Path IV10 (Dean Castle Country Park to Whitelee Forest).
- EAC Core Path IV16 (Irvine Valley to Whitelee).
- EAC Core Path B21 / B22 (Mauchline to Galston) (see Viewpoint 7).
- EAC Core Path A11 (Robertland Path) (see Viewpoint 7).

- Rights of Way between Fenwick and Waterside.
- Right of Way between the B764 and Blackwood Hill.
- Right of Way at Whiteleehill.

7.11.23 The recreational routes included in the assessment are as follows:

- EAC Core Path IV9 (Kilmarnock to Whitelee).
- EAC Core Path IV12 (Hareshaw Hill) (overlapped with Whitelee promoted Craigendunton Right of Way).
- ERC Core Path to Bennan Loch via Ballageich Hill from the B764.
- ERC Core Paths from Whitelee Visitor Centre and around Lochgoin Reservoir (partly overlapped by the Whitelee promoted Lochgoin Circuit Route).
- ERC Core Paths to the west and south of Myres Hill.
- Whitelee promoted Dunwan off-track trekking / riding route.
- A77 local cycle routes.

7.11.24 Other recreational routes not listed above are excluded from the assessment as they are outwith the ZTV and would have *No View* of the Project.

Recreational and Tourist Destinations

7.11.25 Recreational and tourist destinations included in this assessment include those features that appear as prominent landmarks or landscape features, locations associated with passive recreation such as walking, and where there is a clear relationship between the feature / destination and the landscape. Gardens and Designed Landscapes (GDL) are included where these are open to the public, as well as National Trust gardens / land and Historic Environment Scotland visitor sites. The assessment excludes locations for team sports and other recreational / tourist destinations where the focus of activity is not on the landscape or is indoors - for example museums, libraries, and gift shops. The assessment has made general reference to areas that might be used for hunting / stalking activities but has excluded specific assessment as the primary focus would be the activity, rather than the landscape.

7.11.26 Recreational and visitor attractions within the study area include:

- Whitelee Windfarm Visitor Centre.
- Lochgoin Monument.
- Fenwick War Memorial.

7.11.27 ZTV analysis and site visits confirm that there would be No View of the Project from Fenwick War Memorial and it is therefore excluded from the assessment.

7.11.28 Effects on the Whitelee Windfarm Visitor Centre and Lochgoin Monument are included in the assessment.

Cumulative Developments

7.11.29 There are no other similar existing or proposed developments within the study area. A cumulative assessment is therefore excluded.

7.11.30 The existing Whitelee Windfarm, and other surrounding windfarms are included as part of the baseline in the main assessment.

7.12 Assessment of Landscape Effects

7.12.1 Landscape Effects are defined by the Landscape Institute in GLVIA 3, paragraphs 5.1 and 5.2 as follows.

"*An assessment of landscape effects deals with the effects of change and development on landscape as a resource. The concern … is with how the proposal will affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape and its distinctive character. … The area of landscape that should be covered in assessing landscape effects should include the site itself and the full extent of the wider landscape around it which the proposed Development may influence in a significant manner*."

7.12.2 These effects are assessed by considering the landscape sensitivity (value and susceptibility) against the magnitude of change. The type of effect may also be described as temporary or permanent, direct or indirect, cumulative and beneficial, neutral, or adverse.

Landscape Effects on Plateau Moorland with Windfarms

7.12.3 The landscape character within the study area is illustrated in **Figure 7.4**.

7.12.4 As noted in **Section 7.11** above, only the *Plateau Moorland with Windfarms* LCT is included in the assessment which is the 'host' LCT for the Project. All components of the Project would be located within this LCT.

7.12.5 Although the two areas of *Plateau Moorland with Windfarms* (*Plateau Moorland with Windfarms – Ayrshire,* and *Plateau Moorland with Windfarms - Glasgow & Clyde Valley)* are differentiated within the NatureScot LCT descriptions and are across two local authority areas, they are both part of an overall *Plateau Moorland with Windfarms* character typology and have similar key characteristics.

7.12.6 The *Plateau Moorland with Windfarms – Ayrshire* LCT is a relatively large LCT which stretches from Gabroc Hill to the northwest of the M77 to the northern edge of the River Irvine valley to the south where it breaks and continues as *Plateau Moorland – Ayrshire* beyond. The key characteristics are described in the NatureScot LCT description as:

- *"Comparatively level topography with extensive plateau rising to soft contoured ridges and flatter basins.*
- *Heather and grass moorland, with moss and lochs.*
- *Extensive areas of conifer forest.*
- *Sparse network of minor roads.*
- *Infrequent farms and houses in valleys and on lower hill slopes on outer fringes.*
- *Extensive operational wind farm development, with associated infrastructure, reducing wild character and sense of remoteness.*
- *Visible as largely horizontal backdrop skyline with wind turbines from the Ayrshire Basin, parts of the Irvine Valley and Glasgow."*

7.12.7 The *Plateau Moorland with Windfarms - Glasgow & Clyde Valley* LCT is also a large LCT. Key characteristics are described as:

- *"Large scale landform.*
- *Distinctive upland character created by the combination of elevation, exposure, smooth, plateau landform, moorland vegetation.*
- *Extensive wind turbine development, including the largest wind farm in Scotland at Whitelee.*
- *Sense of apparent naturalness and remoteness which contrasts with the farmed and settled lowlands, although this has been reduced by wind energy development."*

7.12.8 For the purposes of this assessment, there is little discernible separation between the boundaries of the two LCTs with each experiencing the same local features and characteristics. They have therefore been combined in this assessment as one *Plateau Moorland with Windfarms* LCT.

Landscape Sensitivity of the Plateau Moorland with Windfarms

7.12.9 The landscape assessment has been undertaken in accordance with GLVIA 3 and the methodology and glossary set out in **Appendix 4A** of Volume 4. The glossary defines the terms landscape sensitivity and capacity as follows:

- *"Landscape Sensitivity: The sensitivity of the landscape to a particular development considers the susceptibility of the landscape and its value.*
- *Landscape Capacity: The amount of specified development or change which a particular landscape and the associated visual resource is able to accommodate without undue negative effects on its character and qualities."*

7.12.10 The large scale of the landscape in combination with commonly available landcover, localised screening from gently undulating landform and forestry, and presence of other renewable energy developments such as wind turbines result in a Medium to Low Susceptibility to change from the introduction of the Project.

7.12.11 The 'host' *Plateau Moorland with Windfarms* LCT is not located within an area designated for its scenic value. However, parts of the wider landscape are promoted as local walking, cycling and horse-riding routes and is therefore considered to have a Medium value.

7.12.12 The overall sensitivity to the Project components is therefore *Medium.*

Plateau Moorland with Windfarms: Magnitude and Level of Effect During Construction

7.12.13 The construction phase would result in localised direct landscape effects on restricted parts of the Site and its component landscape elements. None of these are highly sensitive (moorland, semi-improved grassland and restoration moorland, all of Low sensitivity) and although the construction works would affect localised areas, ranging from Zero to High magnitude of change, towards the completion of the Project, the likely effects on the fabric and constituent elements of the landscape would range from **Major / Moderate** and Significant (within the Site itself) reducing to **Negligible** and Not Significant. The landscape character of the Site would change from permanent pasture (comprising moorland, semi-improved grassland and restoration moorland) into a solar PV farm. A summary of the landscape effects of the components of the Project and associated infrastructure on the Site area of the *Plateau Moorland with Windfarms* LCT is provided in **Table 7.2** below.

Table 7.2 Plateau Moorland with Windfarms: Effects During Construction

Component	Landscape Effect
Solar PV Farm **There are four main areas where the solar panels are proposed as shown in Figure 7.4.**	As the works commence on Site the magnitude of change within the area of the solar PV farm and up to approximately 0.3km (beyond which the landscape is generally contained by forestry, wind turbines, major roads restricting indirect visual effects on the perception of landscape character beyond the Site boundary) would range from Zero to High during the construction phase of the solar PV farm. Overall, the landscape effects on the *Plateau Moorland with Windfarms* LCT would range from **None** and Not Significant, increasing to **Major / Moderate** and Significant on the Site and up to 0.3km of the solar PV farm upon completion. The landscape character of the Site would change from permanent pasture (comprising moorland, semi-improved grassland and restoration moorland) into a solar PV farm. The nature of these landscape effects would be temporary (during construction and permanent thereafter), direct, and adverse. Considering the wider *Plateau Moorland with Windfarms* LCT, this would amount to a limited localised effect (**Slight** and Not Significant) on the landscape character that would have a limited effect on the overall integrity of the host LCT. The geographical extent and their nature would be the same as recorded for the operational phase.
Green hydrogen production facility **The green hydrogen production facility would be located adjacent to the solar PV Farm as shown in Figure 7.4.**	The construction phase would result in localised direct landscape effects on the Site and its component landscape elements. None of these are highly sensitive (moorland and restoration moorland, both of Low sensitivity) and although the construction works would affect localised areas, ranging from Zero to High magnitude of change, towards the completion of the Project, the likely effects on the fabric and constituent elements of the landscape would range from **Major / Moderate** and Significant (within the green hydrogen production facility site itself and 0.2km beyond) reducing to **Negligible** and Not Significant. The landscape character of the Site would change from permanent pasture (comprising moorland / restoration moorland) into a green hydrogen production facility including access, a temporary construction area and associated infrastructure. Considering either the Site as a whole, or the wider Plateau Moorland with Windfarms LCT, this would amount to a limited effect (**Slight to Negligible** and Not Significant) on the landscape character or the overall integrity of the host LCT. The nature of these landscape effects would be temporary (during construction and permanent thereafter), direct, and adverse.
New Site Access and Internal Link / Haul Road **The proposed link / haul road would connect from the B764 to the southeast, following the contours of the landform before turning due east to the solar PV Farm as shown in Figure 7.4.**	Approximately 1,481m of the proposed link / haul road would be required to be constructed. This would directly affect areas of moorland vegetation, semi-improved grassland and occasional water courses (where crossings are required) and other landscape elements of Low sensitivity. The affected area would be small in comparison to this overall landscape resource and the magnitude of change would be Low such that the level of effect on landscape elements would be **Slight** and Not Significant, temporary (during construction and permanent thereafter), direct, and adverse to neutral. In terms of landscape character, the link / haul road would have a limited effect on the wider landscape character which features both farm access tracks and windfarm access tracks. The magnitude of change would range from Medium within the Site boundary or 100m from the link / haul road, reducing to Negligible beyond. There would be a **Moderate to Slight** and Not Significant localised landscape effect during construction. Considering either the Site as a whole, or the wider *Plateau Moorland with Windfarms* LCT, this would amount to a limited effect on the landscape character or the overall integrity of the host LCT. The nature of these landscape effects would be temporary (during construction and permanent thereafter), direct, and adverse to neutral.

Component	Landscape Effect
Temporary Construction Compound **A temporary construction compound would be located approximately 100m to the southeast of the B764 junction adjacent to the proposed link / haul road. A further temporary construction compound would be located at the eastern end of the access track at the green hydrogen production facility, and another compound located adjacent to the BESS, as shown in Figure 7.4.**	The area of affected moorland and semi-improved grassland vegetation would be very small in comparison to this overall landscape resource (Low sensitivity) and the magnitude of change would be Negligible such that the level of effect on landscape elements (semi-improved grassland vegetation) would be **Negligible** and Not Significant, temporary, direct, and adverse. In terms of landscape character, the construction compounds would add further built development (although temporary) to this landscape as part of the overall construction activity. Given the limited area affected, the magnitude of change would range from High within approximately 100m of the compounds, reducing to Negligible / Zero beyond, subject to visibility. There would be a **Major / Moderate** and Significant localised landscape effect (within approximately 100m) during construction. The nature of these landscape effects would be temporary direct, and adverse. Considering either the Site as a whole, or the wider *Plateau Moorland with Windfarms* LCT, this would amount to a limited effect on the landscape character or the overall integrity of the host LCT.
HV Cable Route	The proposed HV cable route (approximately 4km in length) would be routed underground from the solar PV farm to Rough Hill, along track verges where possible, where it would connect with the existing HV cable route routed towards the existing Whitelee Windfarm Extension substation (as shown in **Figure 7.4**). In short areas where it does not follow existing tracks, new sections of track will be added. The landscape effect would be **Moderate** and Not Significant in short sections where existing vegetation is replaced with new track to **Negligible to None** and Not Significant elsewhere on completion. The nature of these landscape effects would be temporary, direct, and adverse during construction; altering to neutral upon completion.
Construction Lighting	During construction, some limited health and safety lighting would be required at the site entrance office and temporary construction compounds and there would also be lights from vehicles moving around the site during periods of darkened daylight hours such as heavy rain / dark skies. These effects would be limited to a smaller area within 0.3-1km from the site, resulting in a **Major / Moderate** and Significant level of effect on the night-time appearance of the *Plateau Moorland with Windfarms* LCT during maximum periods of construction activities / lighting requirements. The nature of these effects would be temporary, direct and adverse.

7.12.14 The duration of these effects would be short-term according to the construction period but leading on to long-term (reversible) effects for those components of the Project that would be retained through the operational period of the solar PV farm, green hydrogen production facility, BESS and link / haul road). The link / haul road would remain in the landscape as permanent development.

7.12.15 The nature of these effects would be temporary or long-term (reversible), (permanent for the link / haul road) direct, and adverse, due largely to the nature of construction activity across the site during this period.

Plateau Moorland with Windfarms: Magnitude and Level of Effect During Operation

7.12.16 During operation, the completed Project would gain a more 'settled' appearance when compared to the same area during the construction period, although landscape effects would continue throughout the operational period.

7.12.17 The solar PV farm and link / haul road would be located on south and southwest facing slopes - relating to the Drumtee Water to the immediate south and Kingswell Burn to the west. The solar PV farm would be relatively low in the landscape and, although it would be a new element in the landscape, the solar PV farm would be seen in the context of surrounding built development including the existing Whitelee Windfarm, the M77 (and associated overbridges) and farm buildings. Due to its relatively low-lying nature and rising landform to the north and east, the

Project would have the greatest effect on a localised area of the *Plateau Moorland with Windfarms* LCT on the Site and within 0.3km of the built components. As such it is inconceivable that it would change any of the key features and characteristics of the *Plateau Moorland with Windfarms* LCT, overall.

7.12.18 The green hydrogen production facility would be located on a southwest facing slope and would be relatively low in the landscape. Although it would be a new element in the landscape, it would be similar in scale and appearance to agricultural buildings and would be seen in the context of surrounding built development including the existing Whitelee Windfarm, the M77 (and associated overbridges) and farm buildings. Due to its relatively low-lying nature and rising landform to the north and east, it would have the greatest effect on a localised area of the Plateau Moorland with Windfarms LCT on the Site and up to 0.2km of the built components. As such it is inconceivable that it would change any of the key features and characteristics of the Plateau Moorland with Windfarms LCT, overall.

7.12.19 The magnitude of change within this localised area (within the Site and up to 0.3km of the solar PV farm and link / haul road, and up to 0.2km of the green hydrogen production facility) would be High leading to a **Major / Moderate** and Significant effect on a relatively small and geographically contained area. The landscape character of the Site would change from permanent pasture (comprising moorland, semi-improved grassland and restoration moorland) into a new element. The remainder of the LCT would not be significantly affected by the Project.

7.12.20 The duration of these effects would be long-term (through the operational period of the Project) and reversible as a result of the decommissioning (with the exception of the link / haul road). The nature of these effects would also be direct, cumulative and adverse.

7.12.21 Considering the *Plateau Moorlands with Windfarms* LCT, the effects would be limited due to the large scale of this landscape and presence of other infrastructure, most notably, the existing Whitelee turbines and major roads including the M77 and A77 that are already part of this landscape.

Plateau Moorland with Windfarms: Magnitude and Level of Effect During Decommissioning

7.12.22 During decommissioning the Site would return to a 'construction site' for a temporary period and the level of effect would be variable over the Site and according to the phase of activity. In overall terms the magnitude would reduce from operational levels to Negligible with the removal of the various components and associated above ground infrastructure (excepting the link / haul road). The residual landscape effect would be **Slight** to **Negligible** and Not Significant. The nature of these effects would be permanent, direct, and neutral when compared to the pre-existing landscape of the local area.

Effects on Landscape Designations

7.12.23 As described in **Section 7.11**, there are no landscape designations within the study area.

7.13 Assessment of Visual Effects

7.13.1 Visual effects are assessed by considering the sensitivity of the receptor (people in the landscape) and the magnitude of change that would affect the view or overall visual amenity. They are defined by the Landscape Institute in GLVIA 3, paragraphs 6.2 as follows:

"An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity. The concern here is with assessing how the surroundings of individuals or groups of people may be specifically affected by changes in the content and

character of views as a result of the change or loss of existing elements of the landscape and/or introduction of new elements."

7.13.2 The type of effect may also be described as temporary or permanent, direct or indirect, cumulative and beneficial, neutral, or adverse. The assessment methodology is set out in **Appendix 4A** of Volume 4.

7.13.3 The visual assessment has been set out as follows:

- Visual Effects during Construction and Decommissioning.
- Visual Effects during Operation.
- Visual Effects on Viewpoints.
- Visual Effects on Views from Settlements and Residential Properties.
- Visual Effects on Views from Transport Routes.
- Visual Effects on Views from Recreational Routes.
- Visual Effects on Views from Recreational and Tourist Destinations.

7.13.4 Visualisations of the Project are provided from 7 viewpoint locations and illustrated in **Figures 7.7-7.13.**

Visual Effects during Construction and Decommissioning

7.13.5 The majority of the greatest visual effects would be experienced as a result of views of the proposed solar PV farm and green hydrogen production facility, during the operational period and this forms the main focus of the assessment. However, there would also be some visual effects associated with the construction and decommissioning phases of the Project and the infrastructure components. A description of the visual effects associated with the construction and decommissioning phases is set out here.

Visual Effects during Construction

7.13.6 The assessed levels of effect will tend to increase from Zero, at the start of construction and progressively increase to a maximum level of effect, equal to that occurring during operation, upon completion of the construction period. The construction effects although temporary are likely to involve greater movement of machinery and visibility of contrasting construction activity, background noise and associated lighting. The nature of these effects would be temporary, direct, and adverse. Some construction activities may be temporary (temporary construction compounds and construction of the underground cable route) and subject to restoration on completion of the construction period.

7.13.7 An assessment of each of the component parts of the Project, likely to be constructed during the construction period is provided in **Table 7.3** below.

Table 7.3 Visual effects during construction

Component	Visual Effect
Solar PV farm There are four main areas where the solar panels are proposed as shown in **Figure 7.4**.	Although the solar panels are low lying (up to 3m in height) and therefore less visually obtrusive in terms of height, they cover a larger horizontal expanse that can be more visible in the landscape from nearby receptors. The construction of the solar panels would be mainly visible to users from a short stretch of the B764 and A77, a small number of nearby residential properties, recreational receptors to the east, and Site and farm workers, in the context of existing turbines, such that the magnitude of change would range from Medium reducing to Negligible and Zero with distance resulting in Moderate and Not Significant visual effects reducing to No View and Not Significant. The nature of these effects would be long term (reversible), direct, and adverse to neutral.
Green hydrogen production facility The **green hydrogen production** facility would be located adjacent to the solar PV Farm as shown in **Figure 7.4**.	The green hydrogen production facility and its components would have the appearance of an industrial development and resembles the size and scale of local farm complexes. The construction of the facility would be most notable to a very small number of nearby residential properties to the west and southwest, recreational receptors to the east, and site and farm workers, such that the magnitude of change would range from Medium reducing to Negligible and Zero with distance resulting in Moderate and Not Significant visual effects reducing to No View and Not Significant The nature of these effects would be long term (reversible), direct, and adverse to neutral.
New Site Access and Internal Link / haul road The proposed link / haul road would connect from the B764 to the southeast, following the contours of the landform before turning due east to the solar PV Farm as shown in **Figure 7.4**.	Parts of the construction activities associated with the link / haul road would be visible to road users from a short stretch of the B764 where the link / haul road joins the road and forms a new junction. Views of these works would also be experienced by people within the Site or travelling across the immediate landscape and are likely to include Site or farm workers of Low sensitivity. Some parts of the link / haul road construction will be visible to a very small number of nearby residential properties, such that the magnitude of change would be Medium-Low reducing to Negligible and Zero with distance resulting in Moderate to Slight and Not Significant visual effects reducing to No View and Not Significant. The nature of these effects would be permanent, direct and adverse to neutral.
Temporary Construction Compound A temporary construction compound would be located approximately 100m to the southeast of the B764 junction adjacent to the proposed link / haul road. A further temporary construction compound would be located at the eastern end of the link / haul road at the **green hydrogen production** facility, and another compound located adjacent to the BESS, as shown in **Figure 7.4**.	The main temporary construction compound would be visible to road users from a short stretch of the B764 and a small number of nearby residential properties, such that the magnitude of change would be Medium-Low reducing to Negligible and Zero with distance resulting in Moderate and Not Significant visual effects reducing to No View and Not Significant. The nature of these effects would be temporary, direct and adverse, altering to neutral post restoration. Views of the green hydrogen production facility temporary construction compound would be limited to a small number of recreational receptors to the east. The magnitude of change would be Low to Negligible or Zero and the level of effect Slight / Negligible to No View and Not Significant. The nature of these effects would be temporary, direct and adverse, altering to neutral post restoration. There would be no visibility of the BESS temporary construction compound.
HV Cable Route	Construction activities in relation to the laying of the HV cable route would be visible to site or farm workers, a very small number of nearby residential properties to the west and southwest, and to recreational users accessing Core Path IV12 (overlapped with the Whitelee promoted Craigendunton Right of Way) which the HV cable route crosses. Core Path IV12, however would be closed for a very short period whilst the HV cable is laid across the road. The magnitude of change would range from High-medium (Core Path IV12) to Negligible and Zero, resulting in a Major / Moderate and Significant level of effect (Core Path IV12) to No View and Not Significant. The nature of these effects would be temporary, direct, and adverse during construction; altering to neutral upon completion.

Component	Visual Effect
Construction Lighting	During the construction and decommissioning periods, some limited health and safety lighting would be required at the Site entrance office and temporary construction compounds and there would also be lights from vehicles moving around the Site during periods of darkened daylight hours such as heavy rain / dark skies. These effects would be limited to a smaller area within approximately 0.2-0.3km of the light sources and the visual effects would be Moderate and Not Significant, extending out to approximately 0.3km from the light sources within the Site. The nature of these effects would be temporary, direct, and adverse to neutral.

Visual Effects during Operation

7.13.8 The assessed levels of effect are likely to be at their greatest during the period of operation, due to the visibility of the proposed solar PV farm and green hydrogen production facility. Overall, the appearance of the Project would recover a 'calmer' visual character with negligible levels of maintenance activity visible on site. The main visual assessment although focused on the proposed solar PV farm and green hydrogen production facility, also refers to the associated infrastructure, assessed above in **Table 7.3**.

Visual Effects during Decommissioning

7.13.9 During decommissioning the Project would return to a construction site for a temporary period and the level of visual effect would gradually reduce with the removal of the solar PV farm, the green hydrogen production facility, the BESS and eventually any temporary construction compounds, required during the decommissioning. Therefore, the visual effects likely to be experienced during the decommissioning period would be largely reversed with least visual effects on completion of the decommissioning. As with the construction period, although temporary, these works are likely to involve greater movement of machinery and visibility of contrasting construction activity, background noise and associated lighting. The internal link / haul road would remain as a permanent feature for use by the landowner but would 'grass over' subject to the level of use. The HV cable route would be left in situ. In overall terms the level of visual effect would reduce to **Slight** and Not Significant, and the nature of these effects would be permanent, direct, and neutral when compared to the pre-existing baseline landscape of the local area.

Viewpoint Analysis

7.13.10 Viewpoint analysis is used to assist the assessment and is conducted from selected viewpoints within the study area. The purpose of this is to assess both the level of visual effect for particular receptors and to help focus the assessment. The viewpoint analysis has been conducted from 7 viewpoint locations which have been agreed with EAC through screening and are illustrated in **Figures 7.7 – 7.13**.

Viewpoint 1 – A77 / B764 Junction (**Figure 7.7a-b**)

Baseline

7.13.11 This viewpoint is located on the B764 near the junction with the A77 at approximately 356m to the west of the site. At this point the road is slightly elevated and affords view directly towards the site before dipping slightly in elevation and turning northeast towards Kingswell. The view looks across Kingswell Burn in the foreground to the rising landform of Tent Knowe. The view is short to mid-range with the rising landform forming the majority of the skyline and coniferous forestry forming

the rest to the centre left of the view. Vegetation consists of semi-improved grassland on the lower slopes in the foreground and moorland grasses beyond, continuing towards the coniferous forestry. Main-made elements in the view include the Whitelee wind turbines which punctuate the skyline and recede beyond the horizon, partially screened by the landform and trees, the B764 and Best Friends residential property to the left of the view, post and wire fencing, road signage, telegraph poles and field gates.

Sensitivity

7.13.12 The viewpoint is not located in an area designated for its scenic qualities or views and the value of the viewpoint is therefore assessed as Medium. The view would be experienced by road users, mainly vehicles and occasional cyclists / walkers. The susceptibility of the road users is considered to be Medium since they would experience transient views of the landscape. The overall sensitivity is therefore considered to be *Medium*.

Magnitude of Change

7.13.13 The western edge of the solar PV farm would be visible towards the centre of the view to the fore of the coniferous forestry and on the skyline, and in the context of other built elements including wind turbines and telegraph poles. The solar panels would be visible low on the horizon following the landform, affecting approximately 35° of the horizontal FoV. The link / haul road would also be partially visible, spanning the lower slopes of Tent Knowe to the fore of the solar PV farm in the middle ground of the view, as illustrated in **Figure 7.7b**. Other components of the Project including the green hydrogen production facility and the BESS would be screened by rising landform from this viewpoint. Although the solar panels would appear as a new element in the view, their low horizontal form and small vertical Field of View (FoV) blends in with the existing landform such that the existing Whitelee turbines would remain the most prominent element in the view. The magnitude of change would be *Medium to Low*.

Level and Type of Effect

7.13.14 The level of effect would be **Moderate to Slight** and Not Significant**.** The nature of the effect would be long term (reversible), direct and adverse to neutral.

Viewpoint 2 – Access track to Drumtee (**Figure 7.8a-b**)

Baseline

7.13.15 This viewpoint is located on the access track to Drumtee Farm and is representative of views for local residents to the southwest / west of the site. It is located at approximately 1,066m distance southwest of the site. The view is mid-range and looks along the access track, across the gently undulating *Plateau Moorland* to the rising plateau on the skyline of the view. The landform rises on either side of the Drumtee Water in the centre of the view. Vegetation in the view consists of areas of semi-improved grassland mixed with moorland grasses across the majority of the view with coniferous forestry on the skyline to the centre left of the view and clumps of deciduous trees surrounding farm buildings. Manmade elements in the view include the Whitelee wind turbines which are seen as focal points on the skyline in the centre and right of the view and recede beyond the horizon, partially screened by the landform and trees, the access track leading to Drumtee, post and wire fencing, telegraph poles, Drumtee Farm to the right of the view and Cauldstanes Farm to the centre-left.

Sensitivity

7.13.16 The viewpoint is not located in an area designated for its scenic qualities or views and the value of the viewpoint is therefore assessed as Medium. The viewpoint is a transient view that is representative of the view experienced by local residents accessing the track who would have a Medium susceptibility to change. The overall sensitivity is therefore assessed as *Medium*.

Magnitude of Change

7.13.17 The southwestern parts of the solar PV farm would be visible towards the centre of the view where the solar panels would appear low between undulating topography below the forestry and following the horizon line, affecting approximately 40° of the horizontal FoV. The upper parts of the Green Hydrogen Production Facility would be visible on the horizon beyond the solar PV farm and rising agricultural fields affecting less than 5° of the horizontal FoV and would appear as an agricultural building of similar scale to the Drumtee and Cauldstanes farm buildings. The existing Whitelee turbines would be visible above much of the solar PV farm as tall, rotating elements on the skyline, and would remain the main focal point as illustrated in **Figure 7.8b**. Other components of the Project including the BESS and link / haul road would be screened by intervening landform. Although the solar panels would appear as a new element in the view, they would be visible in the middle distance beyond expansive foreground moorland and scrub vegetation where they would occupy a small part of the vertical field of view near the skyline. As such they would appear as a midground element, relating to the agricultural field pattern. The solar panels' low horizontal form closely follows the contours of the landform and blends with other existing horizontal elements such as forestry, further integrating the solar PV farm into an agricultural view where the Whitelee turbines would remain the most prominent element. The magnitude of change would be *Medium to Low*.

Level and Type of Effect

7.13.18 The level of effect would be **Moderate to Slight** and Not Significant. The nature of the effect would be long term (reversible), direct and adverse to neutral.

Viewpoint 3 – Lochgoin Monument (**Figure 7.9a-b**)

Baseline

7.13.19 This viewpoint is located at a high point and visitor destination at Lochgoin Monument at approximately 1,358m to the east of the site, surrounded by Whitelee Windfarm. There are long range views which span across the lower lying agricultural lands and coastline to the west towards the Isle of Arran and Mull of Kintyre beyond which form the distant horizon in clear conditions. The view looks across the western edge of the *Plateau Moorland* towards the *Agricultural Lowlands* beyond. The foreground of the view consists of improved grassland with moorland beyond in the middle distance. Blocks of coniferous forestry are visible to the right and left of the view in the upland landscape and amongst the lower lying agricultural fields beyond where deciduous trees are also visible forming shelterbelts and field boundaries. Man-made elements in the view include the Whitelee wind turbines, improved grassland fields, post and wire fencing, agricultural troughs and field gates, coniferous forestry, distant farms and settlements and access tracks.

Sensitivity

7.13.20 The viewpoint is not located in an area designated for its scenic qualities or views but it is marked on OS maps and promoted as a visitor destination. The value of the viewpoint is therefore assessed as High-Medium. The view would be experienced by visitors whose attention is likely to be on

surrounding views and landscape features which include tall turbines. Susceptibility to change from the introduction of the Project components is therefore assessed as High-Medium. The overall sensitivity is therefore assessed as *High-Medium*.

Magnitude of Change

7.13.21 Much of the eastern and southern parts of the solar PV farm, and upper parts of the green hydrogen production facility would be visible to the centre right of the view. The solar panels and green hydrogen production facility would appear as low-lying elements in these wide views, beyond the existing Whitelee wind turbines, and set well below the horizon, affecting approximately 20° of the horizontal FoV, as illustrated in **Figure 7.9b**. Other components of the Project including the BESS (in the south) and link / haul road would not be visible. Although the solar panels and green hydrogen production facility would appear as a new element in the view, their low horizontal form and small vertical FoV blends in with the existing landform (and forestry) such that the existing Whitelee turbines would remain the most prominent element in the view. The magnitude of change would be *Low*.

Level and Type of Effect

7.13.22 The level of effect would be **Moderate to Slight** and Not Significant. The nature of the effect would be long term (reversible), direct and adverse to neutral.

Viewpoint 4 – A77, South Drumboy (**Figure 7.10**)

Baseline

7.13.23 This viewpoint is located along the A77 as it descends southbound towards Kingswell Burn at approximately 1,026m to the northwest of the site. The view is mid to long range and looks across the shallow valley landform created by Kingswell Burn to the rising landform of the *Plateau Moorland* beyond. The foreground of the view consists of the A77 beyond which rough moorland grassland is visible mixed with areas of improved grassland to the left of the view and to the fore of Kingswell Farm. Other vegetation in the view includes some roadside scrub towards the foreground of the view and large areas of coniferous forestry to the left and centre-left. The horizon transitions from forestry to the left of the view to the lower slopes of Tent Knowe behind Kingswell Farm with distant hills beyond and the rising valley landform to the right. Man-made elements in the view include the road (and cycle path), post and wire fencing, telegraph poles, coniferous forestry, Kingswell Farm and the Whitelee wind turbines.

Sensitivity

7.13.24 The viewpoint is not located in an area designated for its scenic qualities or views, and the value of the viewpoint is therefore assessed as Medium. The view would be experienced by road users and cyclists. The susceptibility of the road users is considered to be Medium since they would experience transient views of the landscape. However, the susceptibility of cyclists would be High to Medium as they may also be focused on views in the surrounding landscape. The overall sensitivity is therefore assessed as *Medium* (road users) and *High to Medium* (cyclists).

Magnitude of Change

7.13.25 The majority of the solar PV farm would be screened by intervening landform and coniferous forestry. There would be some views of the western edge of the solar panels, as indicated in **Figure 7.10**. The solar panels would be seen as a low-level feature in the distance, backclothed by landform and spanning a relatively small horizontal and vertical FoV. The link / haul road would also

be partially visible, spanning the lower slopes of Tent Knowe to the east of the solar PV farm**.** The green hydrogen production facility and BESS would not be visible due to screening from intervening landform. The magnitude of change would be *Low to Negligible*.

Level and Type of Effect

7.13.26 The level of effect would be **Slight** (road users) and **Moderate** to **Slight** (cyclists) and Not Significant. The nature of the effect would be long term (reversible), direct and adverse to neutral.

Viewpoint 5 – B764, Queenseat Hill (**Figure 7.11**)

Baseline

7.13.27 This viewpoint is located at a layby along an elevated section of the B764 at Queenseat Hill. It is located approximately 1,936m distance northeast of the site. The view is mid to long range and looks west / southwest across the gently undulating *Plateau Moorland* dominated by the Whitelee wind turbines to the southwest and south. Distant hills form the skyline of the view beyond the *Plateau Moorland*, visible in clear conditions and merge with coniferous forestry in the centre of the view. A large expanse of moorland is visible in fore and midground of the view alongside coniferous forestry in the midground of the view either side of the B764. Apart from the Whitelee wind turbines and coniferous forestry, other man-made elements in the view include the road, post and wire fencing, road signage, other distant turbines, and a meteorological mast.

Sensitivity

7.13.28 The viewpoint is not located in an area designated for its scenic qualities or views and the value of the viewpoint is therefore assessed as Medium. The view would be experienced by road users, mainly vehicles and occasional cyclists. The susceptibility of the road users is considered to be Medium since they would experience transient views of the landscape. However, the susceptibility of cyclists would be *High to Medium* as they may also be focused on views in the surrounding landscape. The overall sensitivity is therefore assessed as *Medium* (road users) and *High to Medium* (cyclists).

Magnitude of Change

7.13.29 The majority of the solar PV farm and green hydrogen production facility would be screened by intervening landform and coniferous forestry. Only the upper parts of the green hydrogen production facility would be visible above forestry, and below the horizon, and would appear as a relatively low-lying component due to its position slightly away from the eastern edge of the site and in relation to the vertical scale of the wind turbines. The solar PV farm would be screened by coniferous forestry. As a result of future felling operations, there would be some limited views of the eastern edge of the solar PV farm and slightly greater visibility of the green hydrogen production facility. Where visible, the solar panels would be backclothed by landform and forestry, affecting a small horizontal FoV. Although the solar PV farm and green hydrogen production facility would appear as new elements in the view, their low horizontal form and smaller vertical FoV would blend in with the existing landform such that the existing Whitelee turbines remain the most prominent element in the view. The BESS would not be visible due to intervening landform and vegetation. The magnitude of change would be *Low to Negligible*.

Level and Type of Effect

7.13.30 The level of effect would be **Slight to Negligible** (road users) and **Moderate to Slight** (cyclists) and Not Significant. The nature of the effect would be long term (reversible), direct and adverse to neutral.

Viewpoint 6 – A77, Laighmuir (**Figure 7.12**)

Baseline

7.13.31 This viewpoint is located at the junction of the A77 and A719 at Laighmuir at approximately 2,790m west of the site. The view is mid-range and looks northeast / east along the shallow Kingswell Burn valley towards the rising west facing valley slopes. Vegetation in the view comprises improved grassland along the valley floor, rough grassland on the rising slopes either side of the valley floor and improved grassland fields flanking the upper rising valley slopes. The remnants of a hedge are visible in the valley floor and maintained hedges are repeated along field boundaries. In the distance coniferous forestry is visible on the skyline in the centre of the view and the edge of the *Plateau Moorland* with the Whitelee wind turbines is also visible. The M77 and A77 road corridors also flank either side of the valley floor creating engineered 'steps' in the landform. The M77 is the main focal point in the view due to traffic movement, colour and noise. Other man-made elements in the view include street lighting, road signage, telegraph poles, residential properties, post and wire fencing, coniferous forestry, and the Whitelee wind turbines.

Sensitivity

7.13.32 The viewpoint is not located in an area designated for its scenic qualities or views, however it is located on a promoted cycle route and the value of the viewpoint is therefore assessed as High-Medium. The view would be experienced by road users, cyclists and nearby residents at Laighmuir. The susceptibility of the road users is considered to be Medium since they would experience transient views of the landscape. However, the susceptibility of cyclists would be High to Medium as they may also be focused on views in the surrounding landscape. Susceptibility to change for residents would be High. The overall sensitivity is therefore assessed as *Medium* (road users), *High to Medium* (cyclists) and *High* (residents).

Magnitude of Change

7.13.33 Parts of the western edge of the solar PV farm would be visible towards the background beyond the M77 road corridor and the Drumtee access overbridge, as indicated in **Figure 7.12**. The solar panels would be seen as a low-level feature to the fore of the Whitelee turbines partly back clothed by coniferous forestry and partly on the horizon. There would be very limited visibility of the upper parts of the green hydrogen production facility beyond the solar PV farm. Together they would occupy a small to medium horizontal FoV but a very small vertical FoV and would be seen in the context of the linear horizontal expanse of the M77 road and Drumtee overbridge forming a relatively minor addition to the view. The BESS would not be visible due to intervening landform and vegetation. The magnitude of change would be *Low to Negligible*.

Level and Type of Effect

7.13.34 The level of effect would be **Moderate to Slight** and Not Significant for road users and cyclists and **Moderate** and Not Significant for residents**.** The nature of the effect would be long term (reversible), direct and adverse to neutral.

Viewpoint 7 – Clunch Road (**Figure 13**)

Baseline

7.13.35 This viewpoint is located along Clunch Road on rising landform, approximately 3,465m to the west / northwest of the site. The view is mid to long-range and views across the sloping landform towards the shallow Kingswell Burn valley with the rising west facing valley slopes and areas of *Plateau Moorland* with Whitelee wind turbines in the distance. Vegetation in the view comprises improved grassland fields in the foreground with deciduous and mixed field boundary trees / shelterbelts to the centre of the view and coniferous forestry to the right. Beyond the midground trees are filtered views across the valley to the rising west facing slopes showing the transition from improved grassland on the lower slopes to moorland vegetation on the upper plateau. Coniferous forestry forms a distant skyline through the midground trees with more distant hills visible beyond. Man-made elements in the view include agricultural fields, residential properties, post and wire fencing, shelterbelts, coniferous forestry, and the Whitelee wind turbines.

Sensitivity

7.13.36 The viewpoint is not located in an area designated for its scenic qualities or views; however, it is located on a local Core Path and the value of the viewpoint is therefore assessed as High to Medium. The view would be experienced by road users, walkers, and nearby residents. The susceptibility of the road users is considered to be Medium since they would experience transient views of the landscape. Susceptibility to change for residents and walkers would be High. The overall sensitivity is therefore assessed as *Medium* (road users) and *High* (walkers, residents).

Magnitude of Change

7.13.37 The solar PV farm, green hydrogen production facility and BESS would be largely screened by a combination of intervening vegetation and landform. Whilst there would be some filtered views of the solar PV farm and green hydrogen production facility in the winter, these components would be barely discernible. The magnitude of change would be *Negligible*.

Level and Type of Effect

7.13.38 The level of effect would be **Slight / Negligible** and Not Significant for road users and **Slight** and Not Significant for walkers and residents**.** The nature of the effect would be long term (reversible), direct and neutral.

Visual Effects on Views from Settlements and Residential Properties

7.13.39 As noted in **Section 7.11**, there would be No View from the settlements of Waterside and Fenwick within the study area.

7.13.40 A residential visual amenity assessment (RVAA) has been included for those properties within 1km as illustrated in **Figure 7.6** and this is detailed in **Appendix 4B** of Volume 4. The methodology for the RVAA accords with GLVIA 3 and the Landscape Institute's *Residential Visual Amenity Assessment: Technical Guidance Note*, dated 15 March 2019.

- There are five residential properties within 1km of the site which are illustrated in **Figure 7.6**. The views from the private access track to Cauldstanes would be significantly affected by the solar PV farm component of the Project, however, views from the property itself would not be significantly affected by the Project. None of the other properties within 1km would also be significantly affected by the Project.

- The experience of a significant view of the Project is not the same as an unacceptable effect or indicative of a failure in terms of maintaining residential amenity.

7.13.41 In summary, none of the residential properties included in the RVAA would be unacceptably affected by the Project in terms of their residential visual amenity.

Visual Effects on Views from Transport Routes

7.13.42 This Section of the assessment considers the visual effects on views of the Project from the transport routes within the study area. The visual effects on views from these routes is set out in **Table 7.4** below.

7.13.43 The views from these routes would be experienced transiently by road users (mainly drivers and where appropriate cyclists and walkers) who would experience the Project as part of the changing sequence of views experienced from the road. Each of these routes were driven or travelled in both directions to assess the potential effects and each assessment has been assisted on-site with the use of sequential wirelines transects, ZTV maps and True View Visuals 3D augmented reality software.

Table 7.4 Visual Effects on Views from Transport Routes

Transport Route	Description of Effects
M77	The M77 serves as the main route from Glasgow to Kilmarnock where it transitions to the A77 providing access to the Ayrshire coastline. Within the 5km study area the M77 travels from Fenwick to a point north of Loganswell Farm following the sinuous, low lying landforms alongside watercourses, cutting through rising landforms in places and supported by engineered embankments elsewhere. Although there are open views from some parts of the route, there is also mixed woodland screening along the route. The Project would be located near Junction 6 of the route at approximately 700m distance to the west. The route is not located in an area designated for its scenic qualities or views and the value of the viewpoint is therefore assessed as Medium. The view would be experienced by road users whose susceptibility is considered to be Medium to Low since they would experience transient views of the landscape and travelling at speed up to 70m/hr. The overall sensitivity is therefore assessed as *Medium*. <u>Assessment:</u> ZTV coverage indicates theoretical visibility of the solar PV farm and green hydrogen production facility for approximately 1.2km distance at, and to the north of, Junction 6 with further patches of theoretical visibility indicated at Laighmuir and just north of Fenwick. In reality, the road is in a slight cutting as it approaches Junction 6 from the north and a combination of screening from roadside landform and coniferous roadside planting would screen views of the Project although there would be glimpses as the cutting dips and trees thin out. Coniferous planting continues along the slip road at the junction, which goes into a cutting towards the A77 junction. There would be a glimpsed view of parts of the solar PV farm and green hydrogen production facility for northbound traffic as the M77 crosses the A77 overbridge, but there would be no visibility from near Laighmuir or just north of Fenwick due to the cutting and / or roadside vegetation. The BESS would not be visible from this route. The magnitude of change would range from Negligible to Zero and the level of effect would be Slight / Negligible to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.

Transport Route	Description of Effects
A77	The A77 runs alongside the M77 for much of its length and continues on from the M77 providing a connection from Glasgow to Stranraer via the Ayrshire coastline. Within the 5km study area the A77 runs to the northwest of the M77 to the west of the Kingswell Burn valley and crosses beneath the M77 at Junction 6, turning north and then northeast as it follows the M77. At its closest point, it is located approximately 200m to the site. The route is not located in an area designated for its scenic qualities or views, however, it is located on a promoted cycle route and the value of the route is therefore assessed as High to Medium. Views would be experienced by road users whose susceptibility is considered to be Medium since they would experience transient views of the landscape. Susceptibility to change for cyclists would be High to Medium along this route. The overall sensitivity is therefore assessed as *Medium* (road users) and *High to Medium* (cyclists). Assessment: ZTV coverage indicates theoretical visibility of the solar PV farm and green hydrogen production facility for approximately 3km between Gardrum Mill and Raithhill and further theoretical visibility for approximately 600m between Junction 6 and the B764 junction as the road turns north. After this there would be theoretical visibility of the solar PV farm for approximately 1.2km to South Drumboy. In reality, views between Gardrum Mill and Raithhill would be intermittent and distant although there would be some clearer views from elevated sections where the Project would be visible in the direction of travel. Viewpoint 6 (Figure 7.12) illustrates visibility along this section of the route (Low to Negligible magnitude). There would be closer range views in the section of the route between Junction 6 and the B764 where parts of the solar PV farm and green hydrogen production facility would be visible in the direction of travel (northbound) although they would be visible beyond street lighting, road signage and some roadside vegetation, and in the context of the existing Whitelee wind turbines (Medium to Low magnitude). From north of the B764 junction to South Drumboy, views would be limited due to roadside vegetation with the greatest visibility near South Drumboy where the road is slightly elevated. In these views, parts of the solar PV farm would be visible as illustrated in Viewpoint 4 (Figure 7.10) (Low to Negligible magnitude). The BESS would not be visible from this route. The magnitude of change would range from Medium *to Low (*Junction 6 and the B764) to Zero and the level of effect would range from Moderate to Slight *(*Junction 6 and the B764) to No View and Not Significant (road users), and Moderate *(*Junction 6 and the B764) to No View and Not Significant (cyclists). The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
B764	The B764 connects the A77 / M77 with Eaglesham and East Kilbride. Within the 5km study area the B764 runs from the A77 to the northeast of Whitelee Windfarm near Kirktonmoor. The road follows the rising landform from Kingswell Burn, past Kingswell Farm towards the *Plateau Moorland* where it reaches its most elevated location at Queenseat Hill. Although there are open views along much of the route, it passes through dense coniferous forestry from Kingswell to Soame Bridge. The proposed link / haul road would form a junction with this route. The route is not located in an area designated for its scenic qualities or views, however, it is partly located on a Core Path and the value of the viewpoint is therefore assessed as High to Medium. The view would be experienced by road users whose susceptibility is considered to be Medium since they would experience transient views of the landscape. Susceptibility to change for cyclists and walkers would be High to Medium along this route. The overall sensitivity is therefore assessed as *Medium* (road users) and *High to Medium* (cyclists and walkers). Assessment: Despite its close relative proximity to the site, ZTV coverage indicates theoretical visibility of the solar PV farm for approximately 600m distance between the A77 and south of Kingswell Farm and further theoretical visibility of the green hydrogen production facility with the solar PV farm for approximately 1.1km distance at Queenseat Hill. Viewpoint 1 (Figure 7.7a-b) illustrates visibility between the A77 / B764 junction and south of Kingswell Farm. Along this section there would be open views towards the western edge of the solar PV farm and a new junction with the link / haul road (Medium magnitude). The view from the route near Queenseat Hill is illustrated in Viewpoint 5 (Figure 7.11) and would feature very limited sections of the eastern edge of the solar PV farm and upper parts of the green hydrogen production facility seen in the context of the existing Whitelee wind turbines (Low to Negligible magnitude). The BESS would not be visible from this route. The magnitude of change would range from Medium to Low *(*between the A77 / B764 junction and south of Kingswell Farm) to Zero and the level of effect would range from Moderate to Slight *(*between the A77 / B764 junction and south of Kingswell Farm) to No View and Not Significant (road users), and Moderate *(*between the A77 / B764 junction and south of Kingswell Farm) to No View and Not Significant (cyclists and walkers). The nature of these effects would be long-term (reversible), indirect and adverse to neutral.

Transport Route	Description of Effects
Minor, unclassified road from the B764 at Kingswell to the A77 at Floak Bridge	This minor, unclassified road follows the relatively low-lying topography from Kingswell Farm and around Drumboy Hill following the course of the Soame Burn and the Earn Water tributary. The route is flanked by coniferous forestry in places but there are also open views along the route. At its closest point it is located approximately 400m distance north of the site. The route is not located in an area designated for its scenic qualities or views and the value of the viewpoint is therefore assessed as Medium. The view would be experienced by road users, mainly vehicles with very occasional cyclists / walkers whose susceptibility is considered to be Medium since they would experience transient views of the landscape. The overall sensitivity is therefore assessed as *Medium*. Assessment: ZTV coverage indicates theoretical visibility of the green hydrogen production facility for approximately 750m distance as the road curves around Drumboy Hill near Shieldhill. In reality, the green hydrogen production facility is likely to be screened by intervening coniferous forestry to the east and northeast of Kingswell Farm (Negligible to Zero magnitude). However, if the coniferous forestry were to be felled as part of the future felling operations, the upper parts of the green hydrogen production facility are likely to be visible (Low to Negligible magnitude). The solar PV farm and BESS would not be visible from this route. The magnitude of change would range from Negligible to Zero (Low during future forestry felling operations) and the level of effect would be Slight / Negligible to No View and Not Significant (Moderate / Slight and Not Significant during forestry felling operations). The nature of these effects would be long-term (reversible), indirect and adverse to neutral.

Visual Effects on Views from Recreational Routes

7.13.44 The visual assessment has considered the potential visual effects likely to be experienced by people (walkers / cyclists / horse riders / joggers / others) on recreational routes within the study area. The visual effects on views from these routes is set out in **Table 7.5** below.

7.13.45 Each of these routes were walked and / or visited and walked in sections according to the ZTV coverage and the assessment has been assisted on-site with the use of sequential wirelines and True View Visuals 3D software.

7.13.46 All of the routes have been assessed as of *High* sensitivity on account of their High to Medium value as recreational routes and the High susceptibility of the people using these routes, mostly walkers and cyclists, whose attention would be focused on the landscape around them.

Table 7.5 Visual Effects on Views from Recreational Routes

Recreational Route	Description of Effect
EAC Core Path IV9 (Kilmarnock to Whitelee)	Core Path IV9 follows minor roads and paths from Kilmarnock until Raithmuir where it follows forest tracks skirting to the north of Whiteleehill and High Overmuir to Snab Bent on the East Ayrshire boundary. Within the 5km study area it passes to the south of the study area from Raithmuir to Whiteleehill. Some of the mature coniferous forestry has been recently felled along the route opening up some views of the surrounding landscape including the prominent Whitelee wind turbines. At its closest point, the site would be located 1.5km north of this route. Assessment: ZTV coverage indicates theoretical visibility of the green hydrogen production facility and the BESS for much of the route within the study area with theoretical visibility of all of the components of the Project indicated for approximately 300m as the path passes to the north of Whiteleehill. In reality, visibility to the north along much of the route would be screened by intervening young and mature coniferous forestry. There would, however, be some views from the elevated section of the route at Whiteleehill (where young coniferous forestry allows) where the BESS would be visible, beyond the prominent Whitelee wind turbines, in a relatively low position in the landscape appearing similar in form to other adjacent buildings such as the Rough Hill substation. There would be very limited views of the solar PV farm and green hydrogen production facility from this route which would be set low in the landscape at over 4.2km beyond the Whitelee wind turbines and would be mainly screened by intervening landform and / or young coniferous forestry.

Recreational Route	Description of Effect
	The magnitude of change would be *Negligible to Zero* and the level of effect would be Slight to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
EAC Core Path IV12 (Hareshaw Hill) / Whitelee promoted Craigendunton Right of Way	These routes follow the track from Hareshaw Lodge to Hareshaw Hill at Craigendunton Reservoir to the south of the solar PV farm and green hydrogen production facility. There are elevated sections of the route as it gently climbs from Airtnoch to Craigendunton Reservoir with areas of open moorland and views over young coniferous forestry. As the route reaches Craigendunton Farm it enters more mature forestry with further young forestry beyond. At its closest point, the site would be located 1.6km north of the routes. Assessment: ZTV coverage indicates theoretical visibility of the green hydrogen production facility and solar PV farm for approximately 1 km as the path passes to the north of Craigendunton Farm and where the path extends around Craigendunton Reservoir (approximately 500m). In reality, visibility to the north along much of the route would be screened by intervening young and mature coniferous forestry – although some views of the southern parts of the solar PV farm and upper parts of the green hydrogen production facility would be possible, beyond the Whitelee wind turbines, where forestry is recently felled and during future felling operations along this route. The remainder of the route is outwith the ZTV. The BESS would not be visible from this route due to screening from intervening landform. This route, however, will be temporarily stopped up during construction to allow for the burial of the cable route (see effects during construction in Table 3) and there may be some residual effects relating to disturbed ground or cleared areas. The magnitude of change during operation would range from Low to Negligible, to Zero and the level of effect would be Moderate to Slight, to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
ERC Core Path to Bennan Loch via Ballageich Hill from the B764	This route connects the B764 to the A77 north via Ballageich Hill and Bennan Loch. At its closest point, the site would be located 2.8km northeast of the route. Assessment: The majority of this route is outwith the ZTV. The only section of visibility would be from a 900m stretch of route as it climbs the slopes of Ballageich Hill where the solar PV farm and green hydrogen production facility would be theoretically visible. In clear weather conditions, the solar PV farm and green hydrogen production facility would appear as small and low-lying features in these panoramic views to the south and southwest where they would blend into the landform due to their low horizontal form and smaller vertical FoV and where the Whitelee wind turbines would be the prominent element. The BESS would not be visible from this route due to screening from intervening landform. The magnitude of change would be Low to Negligible, and the level of effect would be Moderate to Slight, to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
ERC Core Paths from Whitelee Visitor Centre and around Lochgoin Reservoir (partly overlapped by the Whitelee promoted Lochgoin Circuit Route)	There are several recreational routes within Whitelee Windfarm including a Core Path Network promoted by East Renfrewshire and the Lochgoin Circuit Route promoted by Whitelee which overlaps with some of the ERC Core Paths and continues into East Ayrshire. These routes follow the Whitelee Windfarm access track network from the Visitor Centre, skirting round Brown hill and Blackwood Hill before turning southwest along the southern side of Lochgoin Reservoir, after which they pass Lochgoin Farm before turning northeast towards Brown Hill to complete the circuit. There are open views of the Whitelee wind turbines that surround this route. At its closest point, the routes are is located approximately 1.2km distance east of the site. Assessment: ZTV coverage indicates patchy theoretical visibility of the solar PV farm and green hydrogen production facility along these routes, with the greatest theoretical visibility to the northwest of the routes for approximately 1.9km between Lochgoin Farm and Topfaulds Hill. In these open views (similar to Viewpoint 3 (Figure 7.9b), the central and eastern parts of the solar PV farm and parts of the green hydrogen production facility would be visible, in clear weather conditions, as low-lying features, beyond the prominent Whitelee wind turbines, backclothed by landform and forestry and would sit below the horizon. Further theoretical visibility is indicated to the west of Brown Hill and

Recreational Route	Description of Effect
	Blackwood Hill, and as the route travels to the southeast of Lochgoin Reservior for approximately 1.7km. At almost 3km distance from these sections of the route, the solar PV farm and green hydrogen production facility would blend into the landform due to their low horizontal form and smaller vertical FoV would be barely noticeable in these open views where the Whitelee wind turbines would be the prominent element. The BESS would not be visible from these routes due to screening from intervening landform. The magnitude of change would range from Low to Negligible for the northwest sections of the routes to, Negligible to Zero elsewhere. The level of effect would range from Moderate to Slight and Not Significant for the northwest sections of the routes, and Slight to No View and Not Significant elsewhere. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
ERC Core Paths west and south of Myres Hill	These routes are on the edge of the study area and converge at Myres Hill where there are potential elevated views west. There is some deciduous and recently felled coniferous woodland to the west of Myres Hill. At their closest, the routes pass approximately 2.3km east of the site. Assessment: ZTV coverage indicates theoretical visibility of the green hydrogen production facility and the BESS as the routes curve around the western side of Myres Hill. Subject to screening from young coniferous forestry, there would be open views to parts of the green hydrogen production facility to the northwest, in clear weather conditions, which would appear as distant low-lying features beyond the prominent Whitelee wind turbines. There would also be potential views of the BESS to the southwest beyond the existing Rough Hill substation and would be barely discernible. The solar PV farm would not be visible from these routes. The magnitude of change would be Negligible to Zero and the level of effect would be Slight to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
Whitelee promoted Dunwan off-track trekking / riding route	The Whitelee Dunwan off-track trekking / riding route combines a mixture of wind turbine access track routes and off-track sections of route. The route starts at the Whitelee Windfarm Visitor Centre at Queenseat Hill and follows the access track to the north of Brown Hill where it departs the track and continues northeast towards Braehead Hill before turning south to Dunwan Hill and re-joining the access track again to the north of Knockenbeg Hill. From here it follows the track, skirting the northern edge of Lochgoin Reservoir and heads back to Brown Hill to complete the circuit. At its closest point, the route is approximately 2km distance to the northeast of the site. Assessment: ZTV coverage indicates theoretical visibility of the solar PV farm and green hydrogen production facility along the route from the visitor centre to around Brown Hill (approximately 700m). In these open views to the west, the components would be visible as low-lying features, in clear weather conditions, beyond the prominent Whitelee wind turbines, backclothed by landform and forestry and would sit below the horizon. The remainder of the route is outwith the ZTV. The BESS would not be visible from this route. The magnitude of change would range from Negligible to Zero and the level of effect would be Slight to No View and Not Significant elsewhere. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
A77 local cycle routes	These cycle routes follow the same route as the A77 which is assessed in Table 7.4. In summary, the level of effect for cyclists would range from Moderate and Not Significant (over a small area between Junction 6 and the B764) to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.

Visual Effects on Views from Recreational and Tourist Destinations

7.13.47 The visual assessment has considered the potential visual effects likely to be experienced by people at recreational / visitor or tourist destinations or attractions, which are overlapped by the ZTV, within the study area in **Table 7.6** below. Each of these locations were visited and / or assessed with the use of ZTVs and wirelines.

7.13.48 All of the destinations have been assessed as of *High* sensitivity on account of their High to Medium value as recreational and tourist destinations, and the High susceptibility of the people visiting these destinations, whose attention would be focused on the landscape around them.

Table 7.6 Visual Effects on Views from Recreational and Tourist Destinations

Recreational and Tourist Destination	Description of Effect
Whitelee Windfarm Visitor Centre	Whitelee Windfarm Visitor Centre is located at Queenseat hill to the northeast of the study area. Its elevated position provides views across the gently undulating landscape to the west. It is a popular visitor attraction and includes a visitor centre, and facilities for walkers, cyclists and horse riders accessing the routes around the windfarm as well as a nearby mountain bike track and picnic area. The Project would be located approximately 2.1km to the southwest of the visitor centre at its closest point. The recreational routes promoted by the visitor centre are assessed in Table 7.5. Assessment: Both the visitor centre and picnic area are within the ZTV coverage indicating theoretical visibility of the solar PV farm and green hydrogen production facility. In open views to the west, these components would be visible, in clear weather conditions, as low-lying features, beyond the prominent Whitelee wind turbines, backclothed by landform and forestry and would sit below the horizon. Much of the mountain bike track is outwith the ZTV. The BESS would not be visible from this destination due to screening from intervening landform. The magnitude of change would range from Negligible to Zero and the level of effect would be Slight to No View and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.
Lochgoin Monument	Assessed in the viewpoint analysis section above as part of Viewpoint 3 (Figure 7.9a-b). In summary, the level of effect would be Moderate to Slight and Not Significant. The nature of these effects would be long-term (reversible), indirect and adverse to neutral.

7.14 Summary of Landscape and Visual Effects

7.14.1 A summary of the landscape and visual effects are provided in **Table 7.7** below.

Table 7.7 Summary and Evaluation of the Predicted Landscape and Visual Effects

Receptor	Sensitivity	Primary Assessment: LVIA	
		Magnitude (Standalone)	**Level of Effect (Standalone)**
Direct Landscape Effects on the 'Host' Landscape Character Type: Plateau Moorland with Windfarms LCT			
Construction Effects: Plateau Moorland with Windfarms LCT	Medium	Zero to High (within Site and up to 0.2-0.3km)	**Major/ Moderate** (within 0.2-0.3km) to None
Operational Effects: Plateau Moorland with Windfarms LCT	Medium	High (within Site and up to 0.2-0.3km) to Zero	**Major / Moderate** (within 0.2-0.3km) to None
Decommissioning Effects: Plateau Moorland with Windfarms LCT	Medium	Negligible	Slight to Negligible

Receptor	Sensitivity	Primary Assessment: LVIA	
		Magnitude (Standalone)	Level of Effect (Standalone)
Viewpoint Analysis			
1. A77 / B764 Junction	Medium	Medium to Low	Moderate to Slight
2. Access track to Drumtee	Medium	Medium to Low	Moderate
3. Lochgoin Monument	High - Medium	Low	Moderate to Slight
4. A77, South Drumboy	High – Medium (cyclists) Medium (road users)	Low to Negligible	Moderate to Slight (cyclists) Slight (road users)
5. B763, Queenseat Hill	High – Medium (cyclists) Medium (road users)	Low to Negligible	Moderate to Slight (cyclists) Slight to Negligible (road users)
6. A77, Laighmuir	High – Medium (cyclists) Medium (road users) High (residents)	Low to Negligible	Moderate to Slight (cyclists and road users) Moderate (residents)
7. Clunch Road	High (walkers) Medium (road users)	Negligible	Slight (walkers) Slight to Negligible (road users)
Settlements			
There would be No View from the settlements of Waterside and Fenwick within the study area.			
Transport Routes			
M77	Medium	Negligible to Zero	Slight – Negligible to No View
A77	High – Medium (cyclists) Medium (road users)	Medium to Low, to Zero	Moderate to No View (cyclists) Moderate to Slight, to No View (road users)
B764	High – Medium (cyclists) Medium (road users)	Medium to Low, to Zero	Moderate to No View (cyclists) Moderate to Slight, to No View (road users)
Recreational Routes			
EAC Core Path IV9 (Kilmarnock to Whitelee)	High	Negligible to Zero	Slight to No View
EAC Core Path IV12 (Hareshaw Hill) / Whitelee promoted Craigendunton Right of Way	High	Low to Negligible, to Zero	Moderate to Slight, to No View

Receptor	Sensitivity	Primary Assessment: LVIA	
		Magnitude (Standalone)	**Level of Effect (Standalone)**
ERC Core Path to Bennan Loch via Ballageich Hill from the B764	High	Low to Negligible, to Zero	Moderate to Slight, to No View
ERC Core Paths from Whitelee Visitor Centre and around Lochgoin Reservoir (partly overlapped by the Whitelee promoted Lochgoin Circuit Route)	High	Low to Negligible, to Zero	Moderate to Slight, to No View
ERC Core Paths west and south of Myres Hill	High	Negligible to Zero	Slight to No View
Whitelee promoted Dunwan off-track trekking / riding route	High	Negligible to Zero	Slight to No View
A77 local cycle routes	High – Medium	Medium to Low, to Zero	Moderate to No View
Recreational and Tourist Destinations			
Whitelee Windfarm Visitor Centre	High	Negligible to Zero	Slight to No View
Lochgoin Monument	High	Low	Moderate to Slight

*Significant effects are indicated in bold

7.15 Conclusions

7.15.1 The LVIA has been undertaken in accordance with GLVIA 3 by chartered landscape architects at Wood. The assessment process has encompassed the construction, operation, and decommissioning phases of the Project.

7.15.2 The Project would comprise five main components: a green hydrogen production facility; a solar PV farm; a link / haul road; the BESS; and an underground HV cable route. These are located in a semi-rural setting, to the northwest and west of the existing Whitelee Wind Farm, and approximately 4.8km distance northeast of Fenwick in East Ayrshire and adjacent to the boundary with East Renfrewshire, within an undesignated area of *Plateau Moorland with Windfarms*.

7.15.3 The Site is located in an area where the existing landscape character and features act to reduce the site's sensitivity and limit both the visibility and numbers of people close to the Site who might otherwise view the components of the Project. The most visible components of the Project would be the solar PV farm and to a lesser extent, the green hydrogen production facility, whilst there would be very limited visibility of the BESS from the surrounding area.

7.15.4 As with most built developments, the Project would generate localised significant landscape effects where construction activity and built components would affect landscape character and elements. Landscape Effects are concerned with how the Project would affect the elements that make up the landscape, the aesthetic and perceptual aspects of the landscape, and its distinctive character. The local topological features and scale of the Project would be such that significant landscape effects would be limited to the Site and up to 0.2-0.3km on the host *Plateau Moorland with Windfarms* LCT. In addition, the Project would be visible in the landscape in the context of the Whitelee wind turbines, a key feature of the LCT which present a noticeable manmade element in the landscape, as well as the M77, a key linear feature in the *Plateau Moorland with Windfarms* LCT, along with coniferous forestry, dispersed farms and agricultural buildings. As such the Project would present as a 'new' element in the landscape, but in part of the landscape already characterised by large scale man-made features where it would be perceived as a relatively small scale, mostly horizontal additional feature that would be less visible due to the surrounding undulating landform.

7.15.5 The Site is not located within any designated landscapes, neither are there any designated landscapes within the study area.

7.15.6 Significant visual effects (Moderate) would only be limited to the transient views from the private access track of the residential property at Cauldstanes to the southwest. This would be largely due to the solar PV farm component of the Project. However, there would be no significant visual effects from the property itself and any other visual receptors within the study area. Views of the Project would be mostly limited to receptors within approximately 1km of the solar PV farm and green hydrogen production facility components of the Project, in particular to the west and southwest, with limited visual effects from other directions and beyond 1km. There would also be very limited views of the BESS from the surrounding area.

7.15.7 The greatest views of the Project would be residents at Cauldstanes, Best Friends and Drumtee, road users and cyclists of the A77 and B764 along short sections of these routes. Except for the views from the access track to Cauldstanes being significantly affected, none of these receptors would be significantly affected by the Project. None of the residential properties would be unacceptably affected by the Project in terms of their residential visual amenity.

7.15.8 Visual effects from the east and south including all the recreational routes would be limited and not significant due to the landform which slopes down to the west such that most views of the solar PV farm and green hydrogen production facility would be mid to long range. Where visible in these views, the components would be seen as low-lying features, beyond the prominent Whitelee wind turbines, backclothed by landform and forestry and would sit below the horizon.

7.15.9 The overall effects of the Project on the landscape and visual resource are limited to a very small geographical area (within approximately 0.2-1km) and a small number of receptors within this area would be affected. Significant landscape effects would only be limited to the Site and up to 0.2-0.3km of the host *Plateau Moorland with Windfarms* LCT and views from the access track to one residential property as a result of the Project. Further the Project would be seen and experienced in a contemporary landscape alongside existing windfarm development.

7.16 References

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8. Geology, hydrology and hydrogeology

8.1 Introduction

8.1.1 This Chapter of the EIA Report comprises a Hydrological Impact Assessment (HIA) Report which considers the potential effects of the Project with respect to Geology, Hydrology (including Flood Risk) and Hydrogeology. The Project comprises the two Proposed Developments, namely the proposed solar photovoltaic (PV) farm, Battery Energy Storage System (BESS) and ancillary infrastructure (including main haul / link road, access tracks and high voltage (HV) cable) (S36) and the green hydrogen production facility (Full PP). This Chapter should be read in conjunction with relevant parts of the Ecology and Ornithology Chapter (**Chapter 6**), where common 'receptors of effect' have been considered and where there is an overlap or relationship between the assessment of effects.

8.1.2 Whilst there are some information gaps, as listed below, none significantly affect the ability to undertake an assessment of effects:

- Surface flow monitoring and water quality surveys have not been undertaken on the Site.
- No monitoring data are available regarding groundwater levels across the Site, but the extensive coverage of peat in some areas is taken to indicate the presence of shallow groundwater.
- A data request for licensed abstractions and discharges information was not responded to by the Scottish Environment Protection Agency (SEPA) within the standard twenty working days of the receipt date of the request[26]. Reliance has therefore had to be placed on an abstractions and discharges dataset obtained from the SEPA website. It cannot be confirmed that this dataset is complete and correct, and not all details of these abstractions/discharges are known e.g., historic abstraction quantities or water quality.

8.2 Structure

8.2.1 The layout of the remainder of the Chapter is as follows:

- **Section 8.3** provides a cross-reference regarding the Site and Project description with **Section 3** of the EIA Report.
- **Section 8.4** provides the key legislation and planning context, together with a listing of relevant key technical guidance.
- **Section 8.5** identifies the Study Area used to help define the extent of the baseline data search and the data sources accessed as part of the desk study.

[26] It has been advised that the SEPA Access to Information Team began working remotely on 17th March 2020 due to COVID-19. This has reduced its capacity and access to usual systems and sources of information. As a result the Team is experiencing disruptions to its services. Furthermore, on 24th December 2020, SEPA suffered a serious cyber-attack, meaning that it has lost access to most of its' systems, including email. Therefore, it is unlikely that any response will be available from SEPA prior to report submission. Updates on the SEPA's service status following this attack are available at https://regulatoryapproach.sepa.org.uk/cyber-attack-service-status/

- **Section 8.6** characterises the local Geology, Hydrology (including flood risk) and Hydrogeology environment, both current and anticipated future baseline, so that the most likely effects of the Project can be determined, and appropriate additional mitigation identified.
- **Section 8.7** lists all Project consultation undertaken to date.
- **Section 8.8** sets out the scope of the assessment in terms of its spatial and temporal extent. It then identifies the water features (receptors) that could potentially be affected by the Project and explains why other features are not considered for assessment i.e., 'scoped out'. The potential hydrological and hydrogeological effects that are to be taken forward for assessment are finally summarised.
- **Section 8.10** presents the water-specific embedded mitigation measures.
- **Section 8.11** describes how an environmental impact assessment-based methodology is applied and adapted as appropriate to address the specific needs of the water environment assessment.
- **Section 8.12** presents an assessment of the effects on each identified 'scoped in' receptor.
- **Section 8.13** introduces additional mitigation measures.
- **Section 8.14** presents the conclusions of the significance evaluation.
- **Section 8.15** summarises the environmental measures embedded within the Project and the means by which they would be implemented.
- **Section 8.16** lists the references quoted in the Chapter.

8.3 Site and Project

8.3.1 A description of the Site, the Project and its associated components is provided earlier in this report within **Chapter 3**. For the purpose of the Technical Assessment contained within this Chapter, reference should be made to this earlier Chapter of the EIA Report.

8.4 Relevant Legislation, Planning Policy and Technical Guidance

8.4.1 This Section provides the key legislation and planning context for the Project, together with a listing of relevant key technical guidance.

Legislative Context

8.4.2 The key legislative drivers relating to the water environment that have been considered in this assessment include the following (in chronological order, oldest first):

- Control of Pollution Act 1974 (as amended).
- European Union (EU) Groundwater Directive (1980/68/EEC).
- Agriculture Act 1986.
- Environment Protection Act 1990.
- Land Drainage Act 1991 and 1994.
- Water Resources Act 1991 and 1994.

- Environment Act 1995.
- Pollution Prevention and Control Act 1999.
- EU Water Framework Directive (WFD, 2000/60/EC).
- Control of Substances Hazardous to Health Regulations 2002 (COSHH).
- Water Environment and Water Services (Scotland) Act 2003 (WEWS).
- Environmental Liability Directive (2004/35/EEC).
- Water Environment (Register of Protected Areas) (Scotland) Regulations 2004.
- Nature Conservation (Scotland) Act 2004.
- EU Dangerous Substances Directive (codified version) (2006/11/EC).
- EU Freshwater Fish Directive (codified version) (2006/44/EC).
- Groundwater Daughter Directive (2006/118/EEC).
- Private Water Supplies (Scotland) Regulations 2006.
- Water Environment (Oil Storage) (Scotland) Regulations 2006.
- EU Floods Directive (2007/60/EC).
- Environmental Liability (Scotland) Regulations 2009.
- Flood Risk Management (Scotland) Act 2009.
- Flood Risk Regulations 2009.
- Water Environment (Groundwater and Priority Substances) (Scotland) Regulations 2009.
- Flood and Water Management Act 2010.
- Water Quality (Scotland) Regulations 2010.
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR).
- Waste Management Licensing (Scotland) Regulations 2011.
- Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013.
- Water Act 2014.
- Construction Design and Management Regulations 2015.
- Water Environment (Miscellaneous) (Scotland) Regulations 2017.
- Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017.
- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, as amended.
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

8.4.3 Of this list, the main legislation of relevance to the Project includes the following:

- The WFD is a wide-ranging directive that establishes a legal framework for the protection, improvement and sustainable use of surface waters, transitional waters, coastal waters and groundwater resources. The WFD is translated into Scottish legislation by WEWS.

- Regulation of activities relating to the water environment, as per the requirements of WFD and WEWS, is implemented through CAR. This covers activities including abstraction, discharges, impoundments and engineering works that could impact on a watercourse. Depending on the size and nature of the activity, General Binding Rules (GBR) need to be followed, the activity registered or a full licence obtained.
- There are also daughter directives of the WFD that are relevant to the Project. Most notably, this includes the Groundwater Daughter Directive, which aims to protect groundwater from pollution by assessing and monitoring the chemical status of groundwater and preventing and limiting indirect discharges of pollutants to groundwater. The Directive also pertains to the quality of fresh waters needing protection or improvement to support fish life. This condition was previously under the Freshwater Fish Directive that was repealed in 2013.

Planning Policy Context

National Policy

8.4.4 The National Planning Framework (NPF) 3 was published in June 2014 (and revised in December 2020) and sets the long-term context for development planning in Scotland. However, it does not contain any specific policies regarding Geology, Hydrology (including flood risk) and Hydrogeology, and renewable energy developments.

8.4.5 The Scottish Government (SGt) Scottish Planning Policy (SPP) was published in 2014 (and revised in December 2020) and sets out national planning policies that reflect the priorities of the Scottish Ministers for the operation of the planning system and the development and use of land through sustainable economic growth. SPP 167 and 168 relate to "other renewable electricity generating technologies and storage", whilst SPP 254 - 268 specifically cover flooding and drainage, and so both sets of policies are summarised at the head of **Table 8.1.**

8.4.6 National planning policy is supported by Planning Circulars, Planning Advice Notes (PANs), and Specific Advice Sheets (SASs), as well as Ministerial/Chief Planning Letters to Planning Authorities, which set out detailed advice from the SGt in relation to planning issues. The PANS and SASs considered most relevant to the Project are also summarised in **Table 8.1** (in chronological order, oldest first)**.**

8.4.7 There have been no changes to the key national planning policy documents since their publication. However, the following relevant changes to national guidance and advice publications have occurred:

- The SGt's Chief Planner issued a letter regarding renewable energy targets and the consideration of socio-economic impacts (dated 11th November 2015) and Draft Advice on Net Economic Benefit and Planning (March 2016).
- The Carbon and Peatland Map 2016, published by Scottish Natural Heritage (SNH, now NS) on 29th June 2016, identifies areas considered likely to host Scotland's nationally important resource of deep peat, carbon rich soils and priority peatlands habitats. Under Table 1 of the SPP these are to be identified on wind energy spatial frameworks as *"Group 2 – Areas of Significant Protection"*.
- In June 2016, the SGt published its draft Peatland and Energy Policy Statement, which provides the basis from which the SGt and its agencies will act in developing and implementing policies in relation to peatland and energy. This policy is a material consideration for new energy developments and the impact they may have on peatland habitats.

Development Plan Policy

8.4.8 The statutory development plans applicable to the Project comprise the East Ayrshire Local Development Plan (LDP, adopted April 2017) and the East Renfrewshire LDP (adopted 2015), together with statutory Supplementary Planning Guidance (SPG). The Development Plan policies particularly relevant to water are listed in **Table 8.1**. EAC's Wind Energy Development SPG (which includes reference to renewable energy projects in general) requires such development proposals to demonstrate that they have been designed to minimise any detrimental impact on the water environment. Likewise, ERC's SPG states that it is generally supportive of solar PV technology and that the potential for the development of solar farms largely rests on the selection of locations that minimise the impact on the surrounding environment.

Table 8.1 Planning Policy Issues Relevant to Geology, Hydrology (Including Flood Risk) and Hydrogeology

Policy reference	Policy issue	Considered in Section
National planning policies		
SGt SPP 2020, Policies 167 and 168	These policies provide guidance to planners and developers on the identification of areas capable of accommodating renewable electricity projects including energy storage projects.	8.6
SGt SPP 2020, Policies 254 - 268	These policies provide guidance to planners and developers on how to approach the issues of flood risk and drainage. They establish that a precautionary approach to flood risk from all sources should be taken, alongside ensuring development proposals would increase the flood resilience of their surroundings. Development proposals that would have a significant probability of being affected by flooding or increase the probability of flooding occurring elsewhere are not permitted by the SPP.	8.6 (paragraphs 8.6.37 and 8.6.38) 8.10 (paragraph 8.10.6)
SGt Planning and Sustainable Urban Drainage Systems (PAN 61), July 2001	This PAN gives good practice advice for planners and developers on the use of sustainable drainage systems (SUDS) and complements the SUDS Design Manual for Scotland and Northern Ireland.	8.10 (paragraph 8.10.32)
SGt Water and Drainage (PAN 79), September 2006	This PAN clarifies the role of the planning authority in setting the direction of development to inform the planning and delivery of new water infrastructure in a coordinated way. It explains the role of Scottish Water (SW) and SEPA and encourages joint working to ensure a common understanding of capacity constraints and agreement on the means of their removal. It advises on the appropriateness of private schemes and the handling of SW developments.	N/A
SAS: Peatland Survey 2017: Guidance on Developments on Peat Land	This guidance defines a consistent sampling methodology to quantify and qualify the peat material on site and provides advice as to how to publish peat surveys as part of a developers wider site investigations.	8.6 (paragraph 8.6.13)
Development plan policies		
East Ayrshire LDP		

Policy reference	Policy issue	Considered in Section
Policy ENV 11: Flood Prevention	This policy indicates that EAC will take a precautionary approach to flood risk from all sources and will promote flood avoidance in the first instance. In regard to surface water flooding it states within The Flood Risk Framework that *all developments should be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5%. Mitigation measures should not have an adverse effect on the risk of flooding off site, taking account of rain falling on the site and run-off from adjacent areas.* In addition, development proposals should *minimise impermeable surfaces and incorporate sustainable drainage systems, with adequate maintenance arrangements, to avoid increased surface water flooding.*	8.6 (paragraphs 8.6.37 and 8.6.38) 8.10 (paragraph 8.10.6)
Policy ENV12: Water, Air and Light and Noise Pollution	This policy states that there will *be a presumption against any development that will have an adverse impact on the water environment in terms of pollution levels and the ecological value of water habitats ..... or which have the potential to, cause significant adverse impacts on water bodies as a result of morphological changes to water bodies such as engineering activities in the form of culverts or changes to the banks or bed.* *Where developments are proposed on or close to existing water bodies, design solutions should explore how best to maintain their water quality ..... and manage surface water through sustainable drainage systems (SUDS).*	8.10 (paragraphs 8.10.7 and 8.10.32)
East Renfrewshire LDP		
Policy E1: Renewable Energy	This policy states that ERC will support renewable energy infrastructure developments, but the applicant will be required to submit satisfactory mitigation measures to alleviate any adverse environmental impacts.	8.10
Policy E3: Water Environment	Development should not compromise the objectives of the WFD. In assessing proposals, ERC will take into account the River Basin Management Plan (RBMP) for the Scotland River Basin District.	8.6 8.8
Policy E4: Flooding	This policy states that avoidance will be the first principle of flood risk management. A flood risk assessment taking account of climate change will be required for any development within the SEPA functional flood plain. There will be a presumption against development within functional flood plains. The functional flood plain equates to the 'medium to high risk' category. Water attenuation areas are designed to reduce the incidence of flooding in other locations and there will be a presumption against development within these areas.	8.6 (paragraphs 8.6.37 and 8.6.38) 8.10 (paragraph 8.10.6)
Policy E5: Surface Water Drainage and Water Quality	This policy states that SUDS will require to be incorporated into all new development. This will moderate surface water run-off from the site and mitigate any impacts on water quality.	8.10 (paragraphs 8.10.24 – 8.10.27 and paragraph 8.10.32)

Policy reference	Policy issue	Considered in Section
	There will be a general presumption against the culverting of watercourses as part of new development. Culverts may be acceptable where they are necessary to carry water under a road. The physical area of any development covered by impermeable surfaces should be kept to a minimum to assist with flood risk management.	

Technical Guidance

8.4.9 Relevant policy and general guidance utilised includes the following (in alphabetical order, by lead author organisation and then report number or chronological, oldest first):

- British Standards Institute (BSI):
  - BS6031: 2009 Code of Practice for Earth Works (2009).
  - BS59302:199+A22010 Code of Practice for Site Investigations (2010).
  - BVS10175:2011 Code of Practice for Investigation of Potentially Contaminated Sites (2011).
- Construction Industry Research and Information Association (CIRIA) reports:
  - Report C515: Groundwater Control - Design and Practice, second edition (2016).
  - Report C521: Sustainable Urban Drainage Systems - Design Manual for Scotland and Northern Ireland (2000).
  - Report C532: Control of Water Pollution from Construction Sites (2001).
  - Report C624: Development and Flood Risk - Guidance for the Construction Industry (2004).
  - Report C648: Control of Water Pollution from Linear Construction Projects (2006).
  - Report C649: Control of Water Pollution from Linear Construction Projects - Site Guidance (2006).
  - Report C650: Environmental Good Practice on Site, second edition (2005).
  - Report C651: Environmental Good Practice - Pocket Book (2005).
  - Report C689: Culvert Design and Operation Guide (2010).
  - Report C692: Environmental Good Practice on Site (2010).
  - Report C698: Site Handbook for the Construction of SUDS (2007).
  - Report C753: The SUDS Manual (2015).
- Department for Food, Environment and Rural Affairs (Defra) Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (2009).
- Forestry Commission (FC), Forestry Commission Scotland (FCS) and co-authored reports:
  - FCS and SNH Floating Roads on Peat (2010).
  - FC Forests and Water, 5th Edition (2011).

  - FC The UK Forestry Standard (2017).
- Ministry of Agriculture, Forestry and Food (MAFF) Good Practice Guide for Handling Soils (2000).
- Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) A Functional Wetland Typography for Scotland (2009).
- SEPA lead author publications:
  - Engineering in the Water Environment: Good Practice Guide – Temporary Construction Methods (2009).
  - Regulatory Position Statement - Developments on Peat (February 2010).
  - SEPA and SGt Engineering in the Water Environment: Good Practice Guide – Sediment Management (June 2010).
  - SEPA and SGt Engineering in the Water Environment: Good Practice Guide – River Crossings (November 2010).
  - CAR: A Practical Guide (2015).
  - Guidance WST-G-052: Development on Peat and Off-site Uses of Waste Peat (2017).
  - Planning Information Note 3: Flood Risk Advice for Planning Authorities (August 2017).
  - Technical Flood Risk Guidance for Stakeholders (July 2018).
  - CAR Flood Risk Standing Advice for Engineering, Discharge and Impoundment Activities (undated).
- SEPA Land Use Planning System Guidance Notes (LUPS-GU, relevant to all renewable (including non-wind) energy developments within Scotland):
  - No. 4: Planning Guidance on On-shore Wind Farm Developments (2017).
  - No. 8: SEPA Standing Advice for Planning Authorities and Developers on Development Management Consultations (2016).
  - No. 27: Use of Trees Cleared to Facilitate Development on Afforested Land (2014).
  - No. 31: Guidance on Assessing the Impacts of Wind Farm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (2017).
  - No. 50 - Controlling the Environmental Effects of Surface Mineral Workings.
- SEPA Policies:
  - No. 19: Groundwater Protection Policy for Scotland (2009).
  - No. 41: Development at Risk of Flooding: Advice and Consultation (Oct 2016).
- SEPA Guidance for Pollution Prevention (GPP) Notes and former (now discontinued) Pollution Prevention Guidance (PPG) Notes:
  - GPP 1 Understanding your Environmental Responsibilities – Good Environmental Practices (October 2020).
  - GPP 2: Above Ground Oil Storage Tanks (January 2018).
  - PPG 3: Use and Design of Oil Separators in Surface Water Drainage Systems (April 2006).

- GPP 4: Treatment and Disposal of Wastewater where there is no Connection to the Public Foul Sewer (November 2017).
- GPP 5: Works and Maintenance in or near Water (February 2018).
- PPG 6: Working at Construction and Demolition Sites (2012).
- GPP 8: Safe Storage and Disposal of Used Oils (July 2017).
- GPP 13: Vehicle Washing and Cleaning (April 2017).
- PPG 18: Managing Fire Water and Major Spillages (June 2000).
- GPP 20: Dewatering of Underground Ducts and Chambers (January 2018).
- GPP 21: Pollution Incident Response Planning (July 2017).
- GPP 26: Storage and Handling of Drums and Intermediate Bulk Containers (February 2019).

- SEPA Position Statements (PS) and Supporting Guidance (SG), namely:
  - WAT-PS-06-02 Culverting of Watercourses (June 2015).
  - WAT-PS-07-02 Bank Protection (April 2012).
  - WAT-PS-10-01 Assigning Groundwater Assessment Criteria for Pollutant Inputs (August 2014).
  - WAT-SG-21: Bank Protection Environmental Standards for River Morphology (July 2012).
  - WAT-SG-23: Engineering in the Water Environment, Good Practice Guide, Bank Protection Rivers and Lochs, First edition (April 2008).
  - WAT-SG-25: Engineering in the Water Environment, Good Practice Guide, River Crossings, Second edition (November 2010).
  - WAT-SG-26: Engineering in the Water Environment, Good Practice Guide, Sediment Management, First edition (June 2010).
  - WAT-SG-29: Engineering in the Water Environment, Good Practice Guide, Temporary Construction Methods, First edition (March 2009).
  - WAT-SG-31: Prevention of Pollution from Civil Engineering Contracts: Special Requirements, Version 2 (June 2006).
  - WAT-SG-75: Sector Specific Guidance: Construction Sites (February 2018).
  - WAT-SG-78: Sediment Management Authorisation, Version 1 (December 2012).
- SGt publications:
  - Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments, Second edition (April 2017).
  - River Crossings and Migratory Fish: Design Guidance (February 2012).
  - PAN 1/2013 - Environmental Impact Assessment (August 2013).
  - Zero Waste Plan (June 2010).
  - Planning Advice on Flood Risk (June 2015).

- SNH lead author publications:
  - Constructed Tracks in the Scottish Uplands, Second edition (Updated September 2015).
  - Environmental Impact Assessment Handbook V5 (2018).
- Scottish Renewables (SR) lead publications:
  - SR and SEPA Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste (January 2012).
  - SR, SNH, SEPA, FCS, Historic Environment Scotland (HES), Marine Scotland Science (MSS) and Association of Environmental and Ecological Clerks of Works (AEECoW), Good Practice During Wind Farm Construction, Fourth edition (2019).
- Local and Regional Land Drainage Byelaws.

8.5 Data Gathering Methodology

8.5.1 This Section identifies the Study Area used to help define the extent of the baseline data search and the data sources accessed as part of the desk study.

Study Area

8.5.2 Due to the nature of the Project and the location of the various elements within the Site, from here-on reference is made to 'the Northern Section' (containing the solar PV farm and green hydrogen production facility) and 'the Southern Section' (containing the BESS) of the Site.

8.5.3 The desk study data for this Section of the HIA have been gathered with respect to a defined Study Area. Two different buffer widths have been used to define the Study Area around the two sections of the Site (**Figure 8.1**). A 1km buffer area has been assigned to the Northern Section, since this area will undergo the most extensive works, whilst a 250m buffer has been applied to the Southern Section, since in this area construction activities are limited, and a cable buffer zone has already been assigned. The distances of these buffer areas have been applied on the basis of professional judgement and the relative level of excavation required within the Northern and Southern sections of the Site.

8.5.4 Data for beyond the Study Area have also been collected where catchment areas for distant water features may intersect the Study Area, such as for abstractions and conservation sites. It should be noted that the Study Area encompasses land within both the EAC and the ERC local authority areas.

Desk Study

8.5.5 The appraisal of existing baseline conditions for the purposes of this assessment has involved the collection and interpretation of a wide range of data and information from published material. The data collected, and other sources of information, are listed in **Table 8.2.** The assessment is also related to, and uses information from, the Ecological Impact Assessment (EcIA) (Volume 2, Chapter 6).

Table 8.2 Sources of Desk Study Information for Geology, Hydrology (Including Flood Risk) and Hydrogeology

Source	Data
Ordnance Survey (OS) 1:50,000 Landranger Sheet 64 Glasgow – Motherwell & Airdrie; 70 - Ayr, Kilmarnock & Troon; Sheet 71 - Lanark & Upper Nithsdale **OS 1:25,000, Explorer Sheet 334: East Kilbride, Galston & Darvel** **OS 1;10,000 Raster map**	Topography and features
Centre for Ecology and Hydrology (CEH) National River Flow Archive (NRFA)[27] **CEH-GEAR data[28]** **Rainfall data[29]** **Climate station data: Saughall[30]** **SEPA rainfall data: Picketlaw Reservoir Gauging Station[31]**	Climate
British Geological Survey (BGS) 1:625000 Hydrogeological Map of Scotland (1988) **BGS 1:10000 DiGMap BG 2009** **GeoIndex[32]** **BGS/Natural Environment Research Council (NERC). A GIS of Aquifer Productivity in Scotland. Explanatory Notes. Commissioned Report CR/04/047N[33]** **BGS Aquifer classification map layer on Scotland's Environment website[34]** **SEPA/BGS/Scotland and North Ireland Forum for Environmental Research (SNIFFER) Vulnerability of Groundwater in the Uppermost Aquifer (Scotland)** **BGS Groundwater Vulnerability (Scotland)[35]**	Geology, ground conditions and hydrogeology
National Soil Map of Scotland (Macaulay Institute for Soil Research)[36]	Soils and peat
River Network Map **CEH NRFA[37]**	Hydrology and flows
SEPA flood map[38] **Landmark 1 in 75, 1 in 100 and 1 in 1000 year flood maps**	Flood risk
SGt The RBMP for Scotland River Basin District 2015-2027	RBMP and water quality

27 www.ceh.ac.uk/data/nrfa/index.html

28 https://nrfa.ceh.ac.uk/catchment-rainfall

29 https ://www.metoffice.gov.uk/

30 https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcuurcfer

31 https://www2.sepa.org.uk/rainfall

32 https://mapapps2.bgs.ac.uk/geoindex/home.html

33 http://nora.nerc.ac.uk/504764/1/CR-04-047N_SEPA%20Aq%20productivity.pdf

34 https://map.environment.gov.scot/sewebmap/

35 http://www.bgs.ac.uk/discoverymetadata/13603084.html

36 http://soils.environment.gov.scot/

37 www.ceh.ac.uk/data/nrfa/index.html

38 http://map.sepa.org.uk/floodmap/map.htm

Source	Data
SGt interactive mapping[39] **SEPA interactive mapping facility for the RBMP[40]** **Water Body Data Sheets[41]** **SEPA data request: information on river water quality**	
SEPA data request: information on locations of CAR licences **PWSs[42]** **Licenced sites data download from SEPA website[43]** **PWS data request directly to EAC and ERC** **SEPA interactive mapping facility for licenced sites[44]**	Abstractions and discharges
NS information on protected areas[45] **Ecology surveys - as per EIA Report Chapter 6: Ecology and Ornithology.**	Wetlands and peatlands
SPR, (2012), Whitelee Wind Farm Extension Phase 3 - Environmental Statement (Chapter 9 Geology, Soils and Hydrogeology and Chapter 10 Surface Water)	Background information including PWS data

8.5.6 A summary of the organisations that have approached to provide data, together with the nature of that data, is as follows:

- SEPA (information still awaited)[46]:
  - River water quality data and observed flow gauging data.
  - Abstraction and discharge CAR licence data.
  - Information regarding PWSs.
  - Groundwater quality, groundwater level data and groundwater Source Protection Zones (SPZs).
  - Flood information data.
- Local Authority – EAC, ERC:
  - Location and details regarding PWSs.

39 https://map.environment.gov.scot/sewebmap/?layers=riverClass

40 https://www.sepa.org.uk/data-visualisation/water-environment-hub/?riverbasindistrict=Scotland

41 https://www2.sepa.org.uk/WaterBodyDataSheets

42 http://dwqr.scot/private-supply/pws-location-map/ (withdrawn May 2020)

43 https://www.sepa.org.uk/environment/environmental-data/

44 https://map.environment.gov.scot/sewebmap/?layers=licensedSites

45 https://sitelink.nature.scot/

46 It has been advised that the SEPA Access to Information Team began working remotely on 17th March 2020 due to COVID-19. This has reduced its capacity and access to usual systems and sources of information. As a result the Team is experiencing disruptions to its services. Furthermore, on 24th December, 2020 SEPA suffered a serious cyber-attack, meaning that it has lost access to most of its' systems, including email. Therefore, it is unlikely that any response will be available from SEPA prior to report submission. Updates on the SEPA's service status following this attack are available at https://regulatoryapproach.sepa.org.uk/cyber-attack-service-status/

8.6 Overall Baseline

8.6.1 This Section, with the support of overarching **Figures 8.2** to **8.5**, characterises the local Geology, Hydrology (including flood risk) and Hydrogeology environment, both current and anticipated future baseline, so that the most likely effects of the Project can be determined, and appropriate additional mitigation identified. The description utilises the data sources listed in **Table 8.2**.

Current Baseline

Topography

8.6.2 The Site is located approximately 6km south west of Eaglesham within an area of commercial forestry plantation and bogland, and adjacent to Whitelee Wind Farm. The ground elevations within the Southern Section range from approximately 220 metres Above Ordnance Datum (mAOD) at Howeburn Moss (National Grid Reference (NGR) NS 5055 4628) in the north eastern part, to 275mAOD on higher ground at Rough Hill (NS 5443 4539) within the southern part. In the Northern Section, elevations range from 200mAOD in the south western corner, near Drumtee (NS 4965 4639), to 265 mAOD at the high point in the north eastern corner (NS 5148 4807).

Rainfall

8.6.3 The average annual rainfall depth based on the meteorological data for the Saughall (NS 5983 3642) Met. Office climate station (1981-2010) is 1387mm. Saughall is approximately 10km to the south east of the Site and at an elevation of 221mAOD.

8.6.4 The SEPA average annual rainfall (2011-2019) at the Picketlaw Reservoir gauging station (NS 5670 5150), approximately 6km north east of the Site and at an elevation of approximately 140mAOD, is 1644mm.

8.6.5 Finally, the average annual rainfall for a rain gauge at Newmilns (NX 5320 3710), operated by the NRFA, is 1402mm for the period 1976-2019. This gauge is located on the River Irvine, approximately 7.5km to the south of the Site and at an elevation of 60.9mAOD.

Geology

8.6.6 The bedrock geology (**Figure 8.2**) of the Site mainly comprises extrusive igneous rock of Carboniferous age, which predominantly consists of microporphyritic basalt of the Clyde Plateau Volcanic (CPV) Formation. This is part of the Strathclyde Group and the rocks comprise lavas, tuffs and volcaniclastic sediments with a wide range of compositions. On BGS geological mapping the CPV Formation is recorded as being present at surface or at shallow depth at a number of locations, for example at NS 5076 4699.

8.6.7 The bedrock is truncated by two sets of faulting with a north east to south west trend and a north west to south east trend. This faulting occurs within the Study Area and also across the wider area, forming boundaries to other Carboniferous volcanic formations to the north and south, in turn forming a corridor of CPV Formation which runs from the north of the Site through to the Whitelee Forest in the south east of the site.

8.6.8 BGS maps indicate that the superficial deposits beneath the Site comprise predominantly peat deposits, which are present in the centre and the east of the site (**Figure 8.3**). Devensian diamicton till is shown to underlie the peat and is predominantly encountered at the surface in the western part of the Northern Section. Peat is also present at isolated locations to the east of the property known as 'Moor' (for example, at NS 5131 4793), and also along Collorybog Burn and Drumtee

Water. Alluvium (silt, sand and gravel) occur along the main river valleys within the Study Area, although they are discontinuous in some places.

8.6.9 Boreholes in the east of the Southern Section were drilled for the Whitelee Wind Farm at NS 54679 45081 and NS 55171 45368, and correspond to the Whitelee Wind Farm Extension substation and proposed BESS compound locations respectively. These boreholes are approximately 670m apart. They indicate that the peat and till deposits are thin (<1m and 3m respectively) at the Whitelee Wind Farm Extension substation location, whilst peat is missing and till is very thick (~22m) at the proposed BESS. Basalt was found beneath the superficial deposits in both boreholes.

8.6.10 The 2012 EIA (SPR, 2012) produced as part of a previous planning application for a proposed extension to Whitelee Wind Farm found historic quarries on OS historical mapping, including one that "*lies within the application boundary, while the other is located to the north of the site*". The EIA states that "*they may consequently affect groundwater baseline quality of water resources located down gradient but they will not impact on the Proposed Development and therefore do not need to be considered further in this assessment*".

8.6.11 Local Geodiversity Sites (LGSs), previously known as RIGS (Regionally Important Geological and Geomorphological Sites), are locally designated. No LGSs exist within the Study Area.

Soils

8.6.12 Soils are dominated by peat, peaty gleys and peaty podzols, the distribution of which appears to be topographically controlled. Above approximately 280mAOD peaty podzols are present, whilst below approximately 240mAOD peaty gleys are dominant. Between these ranges and across most of the Site, peats are found.

8.6.13 A peat survey has been undertaken in the vicinity of the proposed solar PV farm within the Northern Section. The results indicate that peat is prevalent across this entire area, with five distinct peat bodies present in which the depths of peat are in excess of 3m.

8.6.14 Much of the peat landscape has a low usability as rough grassland, and the Site has limited usability due to the wetness of the soils. Isolated areas of land to the south of Kingswell (NS 5001 4776) and surrounding Cauldstanes (NS 4999 4683) that comprise peaty gleys are deemed capable of producing a narrow range of crops, although it is noted that these areas are primarily used for rough grazing.

8.6.15 In addition, mineral gleys are found to the south of Dick's Law (NS 5034 4538), broadly along the line of the Dunton Water.

Hydrogeology

8.6.16 The Carboniferous Strathclyde Group bedrock beneath the Site is a Class 2C low productivity aquifer in which highly indurated greywackes have limited groundwater in the near-surface weathered zone and secondary fractures. As a result, the bedrock can locally yield only small amounts of groundwater with short and localised flow paths in near-surface weathered zone and secondary fractures. Small amounts of groundwater can be used as a resource, but borehole yields are typically low with an overall mean of 0.6l/s, whilst springs are rare yielding up to 2l/s.

8.6.17 The boreholes within the east of the Southern Section, at the Whitelee Wind Farm Extension substation and BESS locations, recorded standing groundwater levels at 7.60 metres below ground level (mbgl) and 1.86mbgl respectively, and yields of 5m^3/h and 16m^3/h respectively. Although the latter borehole has a slightly lower elevation (~10m lower), the difference in yield does demonstrate the variability in permeability that exists within fractured basalt in the area.

8.6.18 The predominant superficial deposits underlying the Site are peat and till, and therefore the superficial aquifer is also classified as of low productivity. Where alluvial deposits are present within the floodplains of the Drumtee Water, Dunton Water and Gowkshaw Burn, the superficial aquifer is considered to be of slightly higher productivity, with intergranular flow and flow rates in the range 1 to >10l/s.

8.6.19 No springs or wells are identified on OS mapping within the Site. There are also no SEPA groundwater quality monitoring locations within the Study Area. However, the Study Area does include the Whitelee groundwater Drinking Water Protection Area (DWPA), and the Whitelee WFD bedrock groundwater body (ID 150599) beneath and beyond the Site is classified as having a Good overall status. For assessment purposes the bedrock aquifer and Whitelee WFD groundwater body is labelled as receptor GW01 on **Figure 8.4**, with the superficial aquifer identified as GW02.

Hydrology

8.6.20 The Northern Section is principally drained by the Collorybog Burn and the Drumtee Water (**Figure 8.5**). The Collorybog Burn flows through the central area of the Northern Section in a general westerly/south westerly direction. It rises from ~ 600m east of the Site (NS 5258 4800), entering the Site at Collory Bog (NS 5203 4777). In the east of the Northern Section, two (generally) parallel unnamed tributaries flow southwards into Collorybog Burn at NS 5189 4777 and NS 5178 4777. The Collorybog Burn is then confluent with the Drumtee Water at NS 5055 4702.

8.6.21 A small oblong pond (about 36 x 18m in size) is located within the north east of the Site at NS 5201 4772, about 220 m to the west of the road leading to the Lochgoin Farm. This feature is likely to be manmade and from aerial photography a connecting channel from the north of the pond to the Collorybog Burn can be identified.

8.6.22 The Drumtee Water is formed of numerous tributaries located to the east of the Northern Section. As well as the Collorybog Burn these include Soutors Burn, Mid Burn, Bught Burn, Howe Burn and some unnamed tributaries. Soutors Burn enters the Site in the south eastern corner of the Northern Section (NS 5219 4740), flowing in a south westerly direction and discharging into the Drumtee Water at NS 5162 4695. This is the same point of confluence with Drumtee Water as Bught Burn which forms to the east of the Site near the Lochgoin Monument (NS 5243 4687). The Mid Burn, which drains Craigenfaulds Moss to the east of the Site, is confluent with Soutors Burn at NS 5183 4724.

8.6.23 An unnamed burn in the east of the Northern Section rises from NS 5156 4740 and flows south west to its confluence with Drumtee Water at NS 5054 4723. Another unnamed burn flows from the edge of Howeburn Moss (NS 5043 4659) to its confluence with Drumtee Water at NS 5012 4661.

8.6.24 A drain located south west of Cauldstanes flows southwards into Drumtee Water at NS 4992 4658. Another drain south of Drumtee flows west then north west into Drumtee Water at NS 4960 4638.

8.6.25 Howe Burn is also confluent with Drumtee Water near Drumtee (NS 4965 4641). It has numerous unnamed tributaries within the Site that drain westwards from Howeburn Bog (NS 5085 4630).

8.6.26 In the Southern Section, Pochweer Burn enters the Site at the eastern boundary (NS 5178 4589) and flows south west to its confluence with Dunton Water near Craigendunton (NS 5148 4532). The Dunton Water, which flows in a westerly direction, takes overflow from Craigendunton Reservoir (NS 5264 4575) adjacent to the northern boundary of the Southern Section, and is eventually confluent with the Craufurdland Water at Dunton Cove (NS 5097 4488). The Calf Fauld Burn flows along the southern Site boundary and is also confluent with the Craufurdland Water at Dunton Cove. It rises on Rough Hill (NS 5205 4490) and flows in a westerly direction, just south of Craigendunton.

8.6.27 A lochan is present near Dick's Law in the south west of the Southern Section called Windyhill Dam (NS 5055 4536). This water feature appears to be formed of a depression in flat local topography with no tributary watercourses flowing into it. However, two unnamed watercourses drain from it in a south westerly direction. They converge with each other at Windy Hill (NS 5028 4507), and the resulting watercourse is eventually confluent with Craufurdland Water (NS 4987 4446) ~ 600m south west of the Site.

8.6.28 The Birk Burn which has its headwaters (Myers Burn) on Myres Hill (NS 5680 4659), ~1.7km north east of the Southern Section, and Drumduff Hill (NS 5783 4613), ~ 2.5km east of the Southern Section, flows generally west across the north east of the Southern Section. It discharges to the Craigendunton Reservoir (NS 5320 4570) adjacent to the northern boundary of the Southern Section. The Birk Burn has a sluice gate at NS 5495 4582, causing a ponded area on the watercourse behind the sluice, just inside the south eastern boundary.

8.6.29 Rough Hill Burn, rises to the east of the Southern Section at NS 5611 4585. It flows south west, passing ~75m south of the electrical substation at NS 5532 4533, and is confluent with the Gowkshaw Burn at Crinshill Moss (NS 5469 4468). The Gowkshaw Burn rises ~1.3km east of the Southern Section boundary on Crook Hill (NS 5714 4591) and flows south west, then west, largely forming the southern boundary of the Southern Section. After its confluence with the aforementioned Rough Hill Burn at Crinshill Moss, the watercourse flows away from the Site in a south westerly direction, and is eventually confluent with the Craufurdland Water at Hareshaw Mill (NS 4862 4293).

8.6.30 A number of tributaries draining the Southern Section are confluent with the Gowkshaw Burn. Montgomery's Gill rises at NS 5581 4521 and discharges into it at NS 5528 4482. Slough Burn and three unnamed burns flow southward towards the Rough Hill Burn, draining the southern slopes of Rough Hill, and discharging into the Gowkshaw Burn at NS 5388 4434, NS 5405 4446, NS 5408 4453 and NS 5434 4457 respectively. As mentioned above, the Gowkshaw Burn is eventually confluent with the Craufurdland Water.

8.6.31 The watercourses draining the Northern Section, including the Drumtee Water and those that are confluent with it, are in turn confluent with the Kingswell Burn at NS 4853 4634. The Kingswell Burn/Fenwick Water/Kilmarnock Water WFD surface water body (ID 10399) is part of the River Irvine catchment within the Clyde sub-basin. It is classified as of Moderate overall status and is described as a heavily modified water body (HMWB) on account of physical alterations that cannot be addressed without a significant impact on water storage for public drinking water.

8.6.32 The Craufurdland Water/Dunton Water (upstream of Hareshawmuir Water) WFD surface water body (ID 10401) is part of the River Irvine catchment within the Clyde sub-basin district and is classified as of Good overall status. The water body has also been designated as a HMWB on account of physical alterations that cannot be addressed without a significant impact on water storage for public drinking water.

8.6.33 Two reservoirs are located close to the Site. The nearest is the previously mentioned Craigendunton Reservoir (NS 5264 4575) which is located adjacent to the northern boundary of the Southern Section. One of the tributaries for this is the previously mentioned Birk Burn, which drains the north eastern part of the Southern Section. Lochgoin Reservoir (NS 5387 4768) is located approximately 1km east of the Northern Section and 1.2km north of the Southern Section. This reservoir is upstream of the Site, and overflow from it drains into Craigendunton Reservoir via the Loch Burn.

8.6.34 The potential watercourse and reservoir receptors are numbered for assessment purposes and approximately located in **Table 8.3** and **Figure 8.4**.

Table 8.3 Watercourses and Reservoirs

Receptor no.	Water receptor name	NGR
W01	Drumtee Water, associated tributaries and associated WFD surface water body	NS 5027 4688
W02	Craufurdland Water/Dunton Water, associated tributaries, lochan and associated WFD surface water body	NS 5128 4525
W03	Craigendunton Reservoir and catchment, including Birk Burn	NS 5264 4575
W04	Lochgoin Reservoir	NS 5387 4768
W05	Windymill Dam	NS 5055 4536

8.6.35 There are no river gauging stations close to the Site, the nearest being the gauge on the River Irvine at Newmilns (No. 803010) approximately 7.5km to the south of the Site. Details for the gauge are given in **Table 8.4**.

Table 8.4 River Flow Gauging Station

Station no.	River	Location	NGR	Catchment area km^2	Station level (mAOD)	Mean flow (m^3/s)	Baseflow Index (BFI)	Operating period
83010	Irvine	Newmilns	NX 532 371	72.8	60.9	2.441	0.28	01/1977 - N/A
Note: Details of the flow gauging stations are from https://nrfa.ceh.ac.uk/data/search								

8.6.36 There is a SEPA surface water quality monitoring point within the Site on the Dunton Water (NS 5162 4529), but its data are not available online. A data request has been made to SEPA, but as mentioned earlier no response has been received at the time of writing.

Flood Risk

8.6.37 The SEPA Flood Risk maps have been used to identify different flood zone areas and the extent of flooding possible within the Site as well downstream catchments. Within the Site there is a high[47] to medium[48] likelihood of surface water (fluvial) flooding along the lines of the tributaries, but other than watercourse crossings no permanent infrastructure is proposed to be located in these areas.

8.6.38 Surface flooding is also indicated as a high to medium likelihood within the forestry areas within the Site, particularly along forest rides, and along Drumtee Water (before confluence with Collorybog Burn), Collorybog Burn and Howeburn and unnamed tributaries draining Howeburn Bog. River flooding is indicated as a high to medium likelihood along Drumtee Water (after its confluence with Collorybog Burn), Dunton Water and Pochweer Burn. It is noted, however, that none of the proposed buildings are located within any of these flood zones.

[47] High likelihood: A flood event is likely to occur in the defined area on average once in every ten years (1:10), or a 10% chance of happening in any one year.
[48] Medium likelihood: A flood event is likely to occur in the defined area on average once in every two hundred years (1:200), or a 0.5% chance of happening in any one year.

Abstractions and Discharges

8.6.39 Licenced abstractions and discharges within the Study Area of the Site boundary are shown in **Table 8.5**, and these potential receptors are shown on **Figure 8.4**.

Table 8.5 Licenced Abstractions and Discharges

Receptor no.	Licence no.	NGR	Site name/ address	Description	Licence type	Start date
A01	CAR/R/1032595	NS 50860 48030	Moor Cottage, Eaglesham Moor Road, Fenwick	Real estate, renting and business activities	Registration	05/12/2008
A02	CAR/R/1071911	NS 49988 47691	Raithhill Farm, Fenwick Ayrshire*	Location is Kingswell	Registration	12/06/2009
A03	CAR/R/1082024	NS 48912 47049	Harelaw Farm, Glasgow Rd, Kilmarnock	-	Registration	18/03/2010
A04	CAR/R/1094040	NS 53717 44033	Croilburn Farm, Waterside, Kilmarnock	Real estate, renting and business activities	Registration	16/06/2011
A05	CAR/S/1028613	NS 49403 48093	Culvert Between M77 and A77 at South Drumboy	Construction	Simple Licence	24/07/2008
A06	CAR/S/1179082	NS 48900 47050	Harelaw Farm and Catering Services, Fenwick	Other community, social and personal service activities	Simple Licence	03/04/2019
A07	CAR/S/1179239	NS 48909 47049	Harelaw Farm Wedding Venue, Fenwick	Other community, social and personal service activities	Simple Licence	03/04/2019
A08	RES/R/1127950	NS 52701 45829	Craigendunton	Scottish Water abstraction	Registration	14/09/2015
A09	RES/R/1127954	NS 53870 47675	Lochgoin Reservoir	Scottish Water abstraction	Registration	20/10/2015

Notes: Licenced abstractions and discharges data was requested from SEPA via a data request sent on the 9th November 2020. At the time of writing the requested SEPA data had not been received and hence licenced sites data was download from the SEPA website[49]. It therefore cannot be confirmed that the licence data presented here is fully up-to-date and the type of activity each licence pertains to, i.e. abstractions or discharges, cannot always be distinguished.
*This recorded NGR location is located at Kingswell but the site address at Raithhill Farm is a couple of km to the west of the Site and appears to be erroneous data. For this assessment it is assumed this licence is for Kingswell.

8.6.40 With respect to the licensed registrations, only one is present within the Site boundary, namely that at Moor Cottage (CAR/R/1032595). This may correspond to the 2012 records of a PWS at this location described below. This licence is located just to the east of the building called "Moor" on OS mapping and could be related to the tributary in that locality that flows north and then west into the Kingswell Burn.

8.6.41 Three licences are located at Harelaw Farm, including two simple licences (CAR/S/1179082 and CAR/S/1179239), approximately 500 m to the west of the Site boundary, to the west of the M77. The types of licences cannot be determined but a small tributary flows to the west of the property in a southerly direction, discharging into the Kingswell Burn (NS 4875 4668).

8.6.42 Other licences of note within the Study Area which are assumed to be abstractions are at Croilburn Farm (CAR/R/1094040), located to the south of the Gowkshaw Burn and the Site boundary, and at the previously mentioned Craigendunton (RES/R/1127950) and Lochgoin Reservoirs (RES/R/1127954). Amlaird Water Treatment Works is supplied with raw water from these two reservoirs.

8.6.43 Details regarding the registered PWSs within the Study Area are shown in **Table 8.6** and on **Figure 8.4**.

Table 8.6 Private Water Supplies*

Receptor no.	Source name	NGR	Location description	PWS class/type[50]	Source type
P01	Drumtee	NS 49902 46233	Drumtee Farm, Fenwick, KA3 6ET	B	Spring
P02	Lochgoin Farm	NS 53066 47063	Lochgoin Farm, Fenwick, Kilmarnock KA3 6EX	B	Borehole
P03	Best Friends Cottage	NS 49732 47255	Best Friends Cottage, Fenwick, KA3 6EX	B	Borehole
P04	Kingswell	NS 50877 58194**	Kingswell Farm, Fenwick, KA3 6EX	B	Spring
P05	Cauldstanes	NS 49960 46817	Cauldstanes, Fenwick, KA3 6EX	B	Borehole
P06	Moor	NS 50870 48113***	Moor, Fenwick, KA3 6EX	B	Well
P07	Shieldhill	NS 51214 49227****	Shieldhill, Fenwick, KA3 6EX	B	Borehole

[49] https://www.sepa.org.uk/environment/environmental-data/
[50] Type A supplies are those which supply 50 or more people, or 10m^3 water or more a day, and any PWS which is used in a commercial or public activity. Type A supplies are governed by the Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017. The Type B classification relates to smaller, domestic supplies (<10m^3 per day). These are governed by The Private Water Supplies (Scotland) Regulations 2006.

Notes:
*Data is from a freedom of information data request made to the EAC and received on the 24th November 2020. The data is from the PWS Register and annual PWS return. The PWS Register is continually updated and the list is not exhaustive, as there is no legal requirement to register a private water supply with the EAC.
** NGR provided by the EAC is erroneous (it puts the PWS 10 km to the north of the Site at Barrhead) as it does not correspond to the known vicinity of the property or mapped location in the 2012 Whitelee Wind Farm Extension Phase 3 EIA. The location presented in **Figure 5.3** is that of the dwelling rather than the supply.
*** Location estimated from information provided by EAC.
**** The exact location of the Shieldhill PWS is unknown as the EAC database only contains the property location.

8.6.44 Only one of the above PWSs is located within the Site, namely that at Cauldstanes, by way of a separate borehole. The next closest is the supply at the Best Friends Cottage, adjacent to the north western site boundary and south of the Kingswell Bridge on the Kingswell Burn. This is a type B supply and its source of supply is from a borehole. Please refer to the information provided above within **Table 8.6** and corresponding **Figure 8.4** contained within **Volume 5A.**

8.6.45 The Kingswell Farm property also lies just outside the north western Site boundary approximately 600m north east of Best Friends Cottage PWS. This is supplied by a groundwater spring source situated in the forest to the north of Moor and the B764 carriageway, draining superficial deposits of till, with ground rising to the east. Information on this supply from the 2012 Whitelee Wind Farm Extension Phase 3 EIA (Chapter 9: Geology, Soils, and Hydrogeology) states that there is a collection tank in the marshy field to the north of the B764 opposite Moor Farm. In relation to this it is stated that it is *"sometimes referred to as the 'Moor Tank'"*. It was examined in the field and appeared to be a likely supply to Kingswell. It was stated that *"the Moor Tank at the time appeared to be quite old and did not appear to be isolated from the incursion of surface water"*.

8.6.46 EAC has confirmed that a PWS is present for Moor. It is understood that this property is unoccupied and owned by ScottishPower, and that the well is almost completely overgrown.

8.6.47 The PWS at Drumtee Farm is located approximately 200m to the south west of the Northern Section and to the north of Howe Burn. This is a type B supply from a groundwater spring source and lies on till superficial deposits with ground rising to the northeast.

8.6.48 The Lochgoin Farm PWS is located approximately 900m south east of the Northern Section. The 2012 Whitelee Wind Farm Extension Phase 3 EIA says that surveys confirmed the presence of a spring downhill of the property. However, recent data from the EAC indicates that it is a type B supply and its source of supply is from a borehole.

8.6.49 ERC has confirmed the presence of a PWS at Shieldhill Farm. The supply is listed as a borehole, but the exact location is unknown. It is assumed for the purpose of this assessment that the borehole lies within close proximity of the property. The farm is located ~ 900 m north of the northern site boundary, and ~ 2 km north of the nearest proposed infrastructure.

Conservation Sites

8.6.50 There are no statutory or designated biodiversity sites within the Study Area. The nearest statutory designated conservation sites are a Site of Special Scientific Interest (SSSI) and a Scheduled Monument. The Brother and Little Lochs SSSI (NS 5050 5250) is notified for the presence of freshwater habitats (oligotrophic loch) and non-vascular plants (varnished hook-moss). This SSSI is located approximately 4.5km north of the Site. The nearest Scheduled Monument is Dunwan Hill Fort (NS 5469 4895), located approximately 2.7km north east of the Site.

8.6.51 There are a number of non-statutory sites, the nearest site being the Fenwick Moor Provisional Wildlife Site (PrWS) which sits within the Site (but outside the proposed developable area). Craigendunton Reservoir is also a PrWS.

8.6.52 Present in the Site are habitats that are regarded as potential Groundwater Dependent Terrestrial Ecosystems (GWDTEs). A Phase 1 habitat survey was undertaken on the 21st August 2020. A National Vegetation Classification (NVC) survey undertaken in the Northern Section on the 24th and 25th September 2020 indicated the presence of species that potentially have some groundwater dependency. A further Phase 1 habitat survey undertaken on the 25th and 26th November 2020 in the Southern Section also found the presence of highly groundwater dependent NVC communities along parts of the cable route and in the area of the BESS and substation buildings.

8.6.53 Potential GWDTEs found within the Northern Section and their potential groundwater dependency are as follows:

- M23a - highly dependent (e.g., NS 5101 4793).
- M23b - highly dependent (e.g., NS 5086 4727).
- M25a - moderately dependent (e.g., NS 5016 4714).
- M6d - highly dependent (e.g., NS 5107 4731).

8.6.54 Potential GWDTEs recorded within the Southern Section and their potential groundwater dependency are as follows:

- M23b - highly dependent (e.g., NS 5517 4525).

8.6.55 There is a band of M23 GWDTE at higher elevations, to the south of the forestry plantation and south of the Collorybog Burn, in the north of the NVC mapped area. A band of M6b GWDTE runs north east to south west through the Northern Section (south of the NVC mapped area), just to the north of the southern felled plantation area and broadly parallel to the Drumtee Burn. The M25a GWDTE is found at lower elevations to the south west of the Northern Section. Whilst there is no obvious topographic gradient that would generate a significant groundwater hydraulic gradient to provide groundwater support to these habitats, the area does have significant surface water inputs.

8.6.56 In the Southern Section, M23 rush-pasture type vegetation occurs in various places along the proposed cable route. A sizeable patch of this vegetation stretches from just south of the proposed green hydrogen production facility and the Drumtee Water (NS 5123 4691), southwards through Howeburn Moss and Bog (NS 5053 4638) to Hunter's Meadow (NS 5069 4575). Like the Northern Section, there is no significant or obvious topographic gradients within this area. Therefore, water supply to this community is likely to be sourced from the perched water on the low permeability till and peat soils (i.e., rain-fed), plus surface runoff in the Drumtee Burn and Howe Burn which intersect the habitat.

8.6.57 Other smaller M23 habitats are present in the vicinity of the cable route occurring at the route's intersection of Pochweer Burn (NS 5168 4573) and Dunton Water (NS 5168 4533), close to Dunton Water to the south of the Criagendunton Reservoir (NS 5239 4532), and on higher ground on Rough Hill (NS 5445 4532). Another sizeable community is present in the south east of the Southern Section, occurring along the Rough Hill Burn (NS 5515 4521) adjacent to both the BESS and existing substation. With the exception of the communities located on Rough Hill, it is likely that the predominant water supply to these communities is from the adjacent watercourses. The communities on Rough Hill are more likely to be fed by run off from the higher ground to the north east in combination with some perched (rain-fed) water within the peaty, and therefore relatively boggy, ground.

8.6.58 Overall, wider-scale groundwater supply to the habitats identified is likely to be limited, with the majority of the supply coming instead from surface or very near-surface infiltration and surface runoff.

8.6.59 All of these conservation sites and GWDTEs are numbered and located in **Table 8.7** and those close to the Site are also shown on **Figure 8.4**.

Table 8.7 Conservation Sites and GWDTEs

Site name	Receptor no.	Type	NGR location	Description	Location
Brother and Little Loch	C01	SSSI	NS 50500 52500	Lochs notified for the presence of freshwater habitats and non-vascular plants	4.5km north of the Site
Dunwan Hill Fort	C02	Scheduled Monument	NS 54690 48950	Monument	2.7km north east of the Site
Fenwick Moor (Greenfield Burn)	C03	PrWS	NS 51803 47580	The site is a wet peat bog with ponds containing uncommon invertebrates and characteristic moorland plants. Designated by East Ayrshire Council	Within the Site
Potential GWDTEs	C04	GWDTEs	See **Figure 8.4**	High and Moderate groundwater dependent NVC habitats	Various locations across the Site
Craigendunton Reservoir	C05	PrWS	NS 52512 45745	Open water	Adjacent to the northern boundary of the Southern Section
Lochgoin Reservoir and Dunwan Dam	C06	Site of Importance for Nature Conservation (SINC)	NS 53652 47755	Artificially created lochs are also within the wider Queenseat to Drumduff Hill SINC and are likely to be of higher ornithological than biological importance	2km east of the Site
East Collary	C07	Ancient Woodland	NS 50600 42900	Woodland	2.5km south west of the Site
Crins Hill	C08	PrWS	NS 54023 44185	Grassland	250m south of the Site

Future Baseline

8.6.60 Changes could potentially occur to the Study Area in the future in relation to climate change and land use. **Section 8.8** below defines the years for which the assessment needs to be carried out and the developments/changes that need to be considered within the assessment.

8.6.61 Climate change could affect the amount and intensity of rainfall, and temperature and evapotranspiration. The UK Climate Projections 2018 (UKCP18) include predictions for Scotland. The high emissions scenario predicts an increase in summer temperatures by 0.6-4.8°C and an increase in winter temperatures by 0.6-4.5°C by the 2070s. This would be accompanied by wide range of rainfall patterns, from 40% drier to 8% wetter in the summer and 3% drier to 9% wetter in the winter by the 2070s. These changes could alter the hydrological characteristics of the Site and wider catchment areas over time.

8.6.62 Given the nature of the terrain and distance from any major urban areas, any future land use change in the area from its current rural nature is unlikely over the lifespan of the Project. The LDPs give no indication of future major developments in the area.

8.7 Consultation

8.7.1 In October 2020, a Request for a Screening Opinion was submitted to the ECU. Its purpose was to establish the likelihood of the requirement for an EIA for the Project.

8.7.2 In February 2021, the ECU provided its Screening Response. Within this response, it was confirmed that the Project would require to be supporting by an EIA. In respect of hydrological considerations, the ECU provided minor detail which was centred on the proximity of GWDTEs as well as areas of medium to high flood risk within 1km of the Site – specifically referring to areas within the north of the site in close proximity to the proposed solar PV farm and green hydrogen production facility. Additionally, the ECU provided commentary on the potential impact to PWS, stating that where PWS may be within 2km of the Site, that these should be considered within the HIA and recommendations for mitigation be put in place where found to be necessary.

8.7.3 Additional to the ECU's comments contained within the Screening Response, copies of the consultation responses to the Screening Request from EAC, East Renfrewshire Council (ERC) and South Lanarkshire Council (SLC) were included. A brief summary of the three Council's opinions is outlined below:

- EAC – Advised that Project would represent a non-EIA development. Noting that *"potentially significant effects would be limited and could be addressed through appropriate mitigation"*. The Council then recommend that risk assessment and consideration of mitigation measures will be required where PWS locations are within 2km of any proposed infrastructure – echoing the advice from the ECU within the Screening Response.
- ERC – Advised that the Site is within the upper reaches of the Kilmarnock Water and as such it *"is not expected that there would be any impact on residents within East Renfrewshire with a private water supply"*. Also, concluded the Project would represent a non-EIA development.
- SLC – Advised non-EIA and no significant effects on the neighbouring authority.

8.7.4 A consultation process has subsequently been undertaken for the Project with both the ECU and EAC as well as with statutory consultees including NS.

8.8 Scope of Assessment

8.8.1 This Section sets out the scope of the assessment in terms of its spatial and temporal extent. It then identifies the receptors that could potentially be affected by the Project and explains why other water features are not considered for assessment i.e. 'scoped out'. The potential hydrological and hydrogeological effects that are to be taken forward for assessment are then summarised.

Spatial Scope

8.8.2 The spatial scope of the assessment of Geology, Hydrology (including flood risk) and Hydrogeology covers the Study Area (including 1km buffer area of the Northern Section and 250m buffer of the Southern Section) described in **Section 8.2**, on the basis that the majority of the effects on the water environment due to the Project are considered unlikely to extend beyond this area. The only theoretical receptors identified outside this Study Area are downgradient abstractions, properties/infrastructure at risk of flooding and conservation sites, on the basis that any changes

resulting from the Project in the surface and groundwater environment could theoretically affect their catchments, flood risk and water supply respectively.

Temporal Scope

8.8.3 The temporal scope of the assessment of Geology, Hydrology (including flood risk) and Hydrogeology is consistent with the construction and operational periods for the Project.

8.8.4 The construction period for the Project would be up to 12 months in duration and would comprise the activities listed within **Chapter 9**: Traffic and Transport of the EIA Report. The HIA assumes decommissioning would occur at the end of the operational phase.

Receptors

8.8.5 The receptors identified as requiring assessment are located in **Figure 8.6** and **Table 8.8**, and are ordered in the table broadly in accordance with their first appearance in the **Section 8.6** baseline, i.e., groundwater, surface water, and then composite receptors. The features are referred to by means of a one- or two-letter category character and a two-digit sequential number code as used in the baseline. To help identify those parts of the assessment that relate to the Section 36 application (pertaining to the solar PV farm, BESS and ancillary infrastructure) and those that relate to the Full PP Planning Statement (green hydrogen production facility), **Table 8.8** also indicates the relevance of each receptor with respect to each or both parts of the Project, and this approach is taken through into the later (**Section 8.12**) assessment itself.

8.8.6 It is important to note that this report examines potential impacts of the Project on the water environment supporting potential GWDTEs and conservation sites, not the habitats themselves, which is instead a matter for the ecology and ornithology assessment contained within **Chapter 6** of the EIA Report.

8.8.7 Given the nature of the Project, it is the watercourse receptors that have been identified as likely to be most significantly affected. This is due to the general proximity of the proposed access track, cable route and construction sites to the watercourses and because the access track and cable route also cross several watercourses.

Table 8.8 Water Receptors Requiring Further Impact Assessment

Reference no.	Receptor	Location	Relevant to Project element
Aquifers and associated WFD groundwater bodies			
GW01	Bedrock aquifer and Whitelee WFD groundwater body	Beneath and beyond the Site	Both green hydrogen production facility and solar PV farm / BESS / ancillary infrastructure
Watercourses, reservoirs and associated WFD surface water bodies			
W01	Drumtee Water, tributaries and associated WFD surface water body	Within the Site	Both green hydrogen production facility and solar PV farm / BESS / ancillary infrastructure
W02	Craufurdland Water/Dunton Water, tributaries and associated WFD surface water body	Downstream of the Site	Solar PV farm / BESS / ancillary infrastructure

Reference no.	Receptor	Location	Relevant to Project element
W03	Craigendunton Reservoir and catchment, including Birk Burn	Adjacent to the Southern Section	Solar PV farm / BESS / ancillary infrastructure
Licensed abstractions			
A04	Croilburn Farm, Waterside, Kilmarnock	Downstream of the BESS	Solar PV farm / BESS / ancillary infrastructure
A08	Craigendunton Reservoir	Adjacent to the Southern Section	Solar PV farm / BESS/ ancillary infrastructure
PWSs			
P01	Drumtee	NS 49902 46233	Solar PV farm / BESS/ ancillary infrastructure
P03	Best Friends Cottage	NS 49732 47255	Solar PV farm / BESS/ ancillary infrastructure
P05	Cauldstanes	NS 49960 46817	Solar PV farm / BESS/ ancillary infrastructure
Conservation sites and GWDTEs			
C03	Fenwick Moor (Greenfield Burn)	Within the Site	Both green hydrogen production facility and solar PV farm / BESS / ancillary infrastructure
C04	Previously identified potential GWDTEs	Within the Site	Both green hydrogen production facility and solar PV farm / BESS / ancillary infrastructure
C05	Craigendunton Reservoir	Adjacent to the northern boundary of the Southern Section	Solar PV farm / BESS/ ancillary infrastructure

8.8.8 The following theoretical receptors have been excluded from further assessment because the potential effects are not considered likely to be significant:

- The underlying solid geology comprises mainly extrusive igneous rocks but is not considered to be of local or regional importance and no features of geological interest have been designated e.g., LGSs. Furthermore, disturbance of the geology during project construction would be minimal, sufficient only to establish buildings and tracks, and with no borrow pits proposed. On this basis, any geological effect would be insignificant, and it is proposed that geology is not considered a receptor.
- Groundwater within the overlying till and other superficial deposits can be generally regarded as a low productivity aquifer (GW02), and so can be excluded from the assessment. Where peat is present, the BGS does not consider this as an aquifer and so this too can be excluded. However, these groundwaters are still taken account of in the assessment in terms of their role in supporting the mosaic of peatlands and potential GWDTEs.
- The Lochgoin Reservoir (W04) is in a separate surface water catchment from the Site, ~ 1km east of the Northern Section and ~ 1.2km north of the Southern Section. On the basis that

there is no possible hydrological connection with the Site, Lochgoin Reservoir has been excluded from the assessment.

- The Windyhill Dam (W05) is located within the Site on relatively flat topography near Dick's Law. With no discernible gradient for significant surface water flow and given the distance from the proposed cable route (~ 300m), this receptor has been excluded from the assessment.
- SEPA flood risk mapping indicates that there are currently no flood risk issues that would affect the Project's infrastructure and watercourse crossing locations. Any potential effect of the Project on the downstream flood risk is of concern, but the increase in impermeable area and forestry clearance would be minor, and design and adoption of standard best practice would ensure that construction and post-development run-off would not exceed pre-development rates. Furthermore, there are few property receptors immediately downstream, with no major settlements along the route of the Drumtee Water or Dunton Water and other tributaries. The topography of the Site is also relatively flat, with no significant gradients for rapid surface water run-off. Flood risk has therefore been excluded from further assessment.
- With the exception of the Croilburn Farm (A04) and Craigendunton Reservoir (A08), the licenced activities can be excluded from the assessment based on distance from, and the lack of a hydrological connection with, the Site. For example, abstraction licence A01 (Moor) is located just inside the northern Site boundary, and is upgradient and in a separate surface water catchment from the Project infrastructure, whilst A02 is located at Kingswell, just north of the boundary, with a PWS located north of Moor, >1km north of Project infrastructure.
- Four of the PWSs receptors, namely Lochgoin Farm (P02), Kingswell (P04), Moor (P06) and Shieldhill (P07), are beyond the surface water and groundwater catchments underlying the Site, and so too have been excluded from the assessment. Detailed evidence for this rationale is given in **Table 8.9**.
- Brother and Little Loch SSSI (C01) and Dunwan Hill Fort (C02) are in separate surface water catchments and are a significant distance from the Site. Lochgoin Reservoir and Dunwam Dam SINC (C06), East Collary (C07) and Crins Hill (C08) are also located outside of the Site, with the closest of these being the Crins Hill PrWS, 250m south of the Site and ~1 km south west of the nearest proposed infrastructure. With little hydrological connection between the Site and these conservation sites, impacts on them is considered unlikely and as such they have been excluded from the assessment.

Table 8.9 Private Water Supplies and Associated Risk

Reference No.	PWS Name	PWS Details	Relationship to Site	PWS Type	Risk
P01	Drumtee	Spring is located next to Drumtee Water and within till superficial deposits	Hydrologically connected to the Drumtee Water, downstream of a watercourse crossing	Spring	There is a possible pathway and therefore a possible risk
P02	Lochgoin Farm	Deeper groundwater borehole	Located upgradient of Site and ~1.75 km from nearest Project infrastructure	Borehole	No pathway connection possible and no associated risk
P03	Best Friends Cottage	Deeper groundwater borehole	Located within same surface catchment and near watercourse, downgradient of solar PV farm	Borehole	There is a possible pathway and therefore a possible risk

Reference No.	PWS Name	PWS Details	Relationship to Site	PWS Type	Risk
P04	Kingswell	Catchment for supply located in spring situated in forest to the north of the B764	Located in separate surface water catchment from site	Spring, >1km north of nearest Project infrastructure	No pathway connection possible and no associated risk
P05	Cauldstanes	Deeper groundwater borehole	Located within same surface water catchment and downgradient of solar PV farm and access track	Borehole	There is a possible pathway and therefore a possible risk
P06	Moor	Shallow groundwater well	Located in separate surface water catchment from site	Well approximately 1km north of nearest Project infrastructure	No pathway connection possible and no associated risk
P07	Shieldhall	Deeper groundwater borehole	Located in separate surface water catchment from site	Borehole	No pathway connection possible and no associated risk

8.9 Potential Effects

8.9.1 The potential hydrological and hydrogeological effects that are to be taken forward for assessment are summarised in **Table 8.10**.

8.9.2 The main potential hydrological/hydrogeological impacts associated with the Project relate to the construction phase, in particular from building foundations, access tracks, cable laying and watercourses crossings. The assessment presented later identifies the location and the nature of the impact from these activities, in particular the potential for the generation of silt-laden runoff. It then prescribes measures to be adopted during construction to mitigate against negative impacts on the water environment.

8.9.3 Other activities of relevance include the construction of the electrolyser building and BESS building. The impacts from these activities, such as the leaching of concrete residues to the water environment and changes in the runoff/recharge characteristics, are also addressed in the assessment. Again, mitigation measures are outlined that would reduce negative impacts.

8.9.4 The electrolyser building and the BESS are to be located near the Drumtee Water and Rough Hill Burn, respectively, on sloping ground that drains towards the burns. Mitigation would be required during construction to protect these watercourses.

8.9.5 The possibility of stockpiling is being explored, and the potential impacts of this activity has therefore also been assessed. Appropriate mitigation measures are prescribed to reduce any negative impacts on the water environment from any deeper excavations.

8.9.6 Impacts during decommissioning would likely be less than those during construction. Mitigation similar to that implemented during the construction and operational phases (updated to reflect changes in legislation/guidance) would help ensure that the significance of such impacts is minimised, and it is therefore proposed that consideration of decommissioning effects is excluded from the assessment.

Table 8.10 Potential Hydrology and Hydrogeology Effects

Activity	Effects	Receptors
Land preparation (earthworks and excavation of foundations)	Ground disturbance leads to sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Excavation and fill leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Dewatering interception of groundwater leading to a loss of water resource and disruption of groundwater support (baseflow) to watercourses.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Soil compaction and temporary hardstanding	Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Reduced infiltration capacity results in increased runoff, and reduced recharge to groundwater, leading to loss of water resource and disruption of baseflow to watercourses.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Land clearance	Land clearance and ground disturbance leads to sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Land clearance leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Land clearance leads to breakdown of peat structure and disturbance of peat hydrology.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Peat working	Ground disturbance leads to sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Peat disturbance leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Peat disturbance leads to breakdown of peat structure and disturbance of peat hydrology.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)

Activity	Effects	Receptors
Material stockpiling/removal	Ground disturbance leads to sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Excavation and fill leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff. Dewatering interception of groundwater leading to a loss of water resource and disruption of groundwater support (baseflow) to watercourses.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Watercourse crossings	Bank and bed disturbance leads to sediment loading, changes in morphology and pollution of watercourses. Contamination of watercourses due to accidental release of pollutants during works.	Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Track and foundation placement	Ground disturbance leads to sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Track and foundation placement leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Electrolyser building and BESS placement	Ground disturbance leads to sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during works. Electrolyser building and BESS placement leads to disruption of surface and near-surface flow paths and changes to the drainage regime, most typically increased runoff.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05) Water conditions supporting conservation sites and GWDTEs (C03 - C05)
Operational facilities and activities	Exposed ground leads to continued sediment loading and pollution of watercourses. Contamination of soils, surface waters and groundwater due to accidental release of pollutants during maintenance activities.	Aquifer and associated WFD groundwater body (GW01) Watercourses, reservoirs and associated WFD surface water bodies (W01 – W03) Abstraction (A04 and A08) PWSs (P01, P03 and P05)

Activity	Effects	Receptors
	Contamination of soils, surface waters and groundwater due to Electrolyser building and BESS chemical leaks and concrete leaching. Continuation of flow disruption, reduced infiltration capacity and peat disruption effects.	Water conditions supporting conservation sites and GWDTEs (C03 - C05)

Note: For each activity an effect will often impact many different types of receptors. Effects and receptors have only been listed above due to the large number possible linkages involved.

8.10 Embedded Environmental Measures

8.10.1 Embedded mitigation proposals are those mitigation measures that are inherent to the Project. Embedded mitigation includes all mitigation usually assumed to be in place during construction, operation and decommissioning, and is generally regarded as industry standard or Best Practice. Construction Environmental Management Plans (CEMPs) are introduced in **Chapter 9**: Traffic and Transport, an overview of some of the general environmental management considerations is also included within all other supporting environmental information.

8.10.2 The water-specific embedded mitigation measures are presented and summarised below.

Design Evolution

8.10.3 A qualitative, preliminary screening assessment for the potential location of the Project's infrastructure was undertaken as part of a desk-based study. The purpose of this study was to identify constraints posed by the baseline conditions of the Site, so that the construction plan and layout of the Site could be refined to minimise the potential risks and impacts to receptors during construction and operation.

8.10.4 The preliminary constraints map generated as part of the screening process was used to identify potential locations for the Site infrastructure. To establish an indicative Site layout, buffer zones were placed around specific areas of the Site where significant constraints were identified to exclude these from the Project. The hydrological constraints showing the Site layout are presented in the **Figure 8.6** receptor map.

Avoidance of Deep Peat Deposits

8.10.5 Potential significant constraints were identified in areas of the Site where peat was shown to be deeper than 3m (see **Chapter 2**: Ecology and Ornithology). Excavation of this depth of peat could have significant local influences on hydrology and associated habitats and avoiding these areas would minimise the volume of peat excavated. As such, every effort was made to avoid siting infrastructure in areas with deep peat deposits.

Avoidance of Flood Zones

8.10.6 The study has not identified any potential material fluvial flood constraints within the Site. However, as a precaution, all areas identified as being located within a 1 in 10 year fluvial or pluvial (surface water) flooding zone were considered to be unsuitable for development. SPP (2020) states that developments should not be permitted in the 1 in 200-year flood zone unless it can be demonstrated that it would not affect the ability of the floodplain to store and convey water. The 1 in 200-year flood zones throughout the Site significantly overlap the 1 in 10 year flood zones.

Watercourse Buffer Zones

8.10.7 A 50m buffer zone was applied to the entire watercourse network inside the extent of the Site, except in the vicinity of the less intrusive solar PV panels and framework, when a 20m buffer was applied (i.e., along much of the Collorybog Burn until its confluence with the Drumtee Water, the tributary of Drumtee Burn south of Collorybog Burn, and the immediately downstream reach of the Kingswell Burn). As well as providing further reassurance regarding flood risk, this considers the risk of pollution to watercourses and any surface water abstraction from construction activities, and provides a buffer to reduce the risk of uncontrolled run-off to watercourses, reservoirs and lochans. The buffer zone is unsuitable for development, with the exception of watercourse crossings where appropriate mitigation is provided. The buffer zone was defined based on the surface water network included on the OS mapping.

Groundwater Abstraction Buffer Zones

8.10.8 Three PWSs (two boreholes and one spring) have been identified as potential receptors. The proposed site layout aimed to minimise incursions of SEPA (LUPS-GU31) 100m (shallow excavation, <1m deep) and 250m (deep excavation, >1m deep) buffer areas around groundwater abstractions. All PWSs lie outwith these buffer areas.

Conservation Site and Groundwater Dependent Terrestrial Ecosystem Buffer Zones

8.10.9 The proposed Site layout aimed to minimise incursions of SEPA (LUPS-GU31) 100m (shallow excavation, <1m deep) and 250m (deep excavation, >1m deep) buffer areas around the potential GWDTEs identified earlier. However, it was not possible to completely avoid these buffer areas.

Micro-Siting

8.10.10 High-level micro-siting of the proposed infrastructure has been considered to ensure that ecological, hydrological, hydrogeological and geotechnical aspects were optimised. However, no micro-siting has been necessary to infrastructure locations in relation to hydrological and hydrogeological reasons, and the final layout is shown in **Figure 8.1**. There is allowance for further micro-siting as an additional mitigation measure (see **Section 8.13**).

Construction Site Licence

8.10.11 Under CAR, a proposed construction site in Scotland may need to obtain a Construction Site Licence (CSL), prior to commencing work. A CSL for the Project is likely to be required since the construction site is greater than 4 hectares in area. This licence application requires the holder to adhere to a Pollution Prevention Plan (PPP) that SEPA has reviewed and must consider the potential impacts of construction on the water environment. Further details of SEPA's requirements for a PPP to accompany a CSL is provided in guidance document WAT-SG-75.

Track Design

8.10.12 On areas with peat depths greater than 1m, floating roads are proposed. In a floating road, the weight of the road is supported by the peat beneath, thereby avoiding the need to construct foundations extending through to the underlying solid stratum. The floating roads would be constructed in line with the good practice guidance produced by FCS and SNH (2010) and SR, et al. (2019), and would include the use of geogrids and geotextiles. The geotextile used would be selected to maintain load distribution, ensure separation of aggregate and peat, and prevent peat rutting, erosion and drainage. Aggregate choice would be sensitive to peat geochemistry and would be of sufficient grade to allow infiltration through to the geotextile.

8.10.13 Even with floating roads, some interruption of surface and near-surface flows can occur. The track layout has been designed to minimise the total track length, and to avoid, where possible, intersecting catchment areas in a manner that could significantly interrupt flow paths. Cross-drainage would be provided in areas where access tracks unavoidably intersect dominant flow pathways.

Drainage Design

8.10.14 The need for drainage on the access track network would be considered for all parts of the track network separately since slope and wetness vary considerably across the Site. In flat areas, drainage of floating roads is not required as it can be assumed that rainfall on to the access track would infiltrate to the ground beneath the access track or along the verges. Track-side drainage would be avoided where possible, to prevent any local reductions in the water table or influences on the access track structure and compression (the latter can occur where a lower water table reduces the ability of the peat to bear weight, increasing compression).

8.10.15 Where access tracks are to be placed on slopes, lateral drainage would be required on the upslope side of the access track. The length of drains would be minimised, to prevent either pooling on the upslope side or, at the other extreme, creating long flow paths along which rapid run-off could occur. Regular cross-drains would be required to allow flow to pass across the access track (as recommended in the Good Practice During Wind Farm Construction guidance), with a preference for subsequent re-infiltration on the downslope side, rather than direct discharge to the drainage network.

8.10.16 Check dams may be implemented in drainage ditches where necessary to reduce flow velocities to aid in the sedimentation of silt from suspension and to also direct water into the cross drains so that natural flow paths are maintained as far as possible.

8.10.17 The ditch design would be considered in line with the recommendations of the FCS and SNH (2010) guidance, including the use of flat-bottomed ditches to reduce the depth of disturbance.

8.10.18 Cross-drainage may be by culverts or pipes beneath the access track, in line with the FCS and SNH (2010) guidance. Drainage would be installed before or during access track construction, rather than afterwards, to ensure that the access track design is not compromised. The cross drainage would flow out into shallow drainage, which would allow diffuse re-infiltration to the peat on the downslope side. The cross drains would flow out at ground level and not be hanging culverts. The avoidance of steep gradients for the access tracks would also reduce the risk of erosion occurring at cross-drain outflows.

8.10.19 In instances of drainage close to surface watercourses, discharge from the drainage may be to surface water rather than re-infiltration. In these situations, good practice control measures including sediment settlement would be undertaken before the water is discharged into surface water systems. The discharges would be small and collected from only a limited area, rather than draining a large area to the same location. Sufficient attenuation storage would also be incorporated into site drainage systems to ensure that discharge rates to watercourses do not exceed pre-development rates.

8.10.20 Although drainage would be provided in areas of disturbance as required, areas of hardstanding would be minimised so that this need is reduced. This includes careful design of construction compounds.

8.10.21 The details of proposed site drainage measures would be set out in the Water Management Plan (WMP) that would sit within the CEMP. Site drainage may be covered by GBR10 (Discharge of surface water run-off from a surface water drainage system to the water environment from construction sites, buildings, roads, yards and any other built-up areas) or GBR21 (The discharge of

water run-off via a surface water drainage system to the water environment (rural land activities). However, this would be confirmed in consultation with SEPA.

Cable Trench Design

8.10.22 Cables would be run alongside existing access tracks where these are present. The cable trenches would be installed in accordance with Energy Networks Association technical specifications (ENA TS 09-02). They would be dug and left open for the minimum time possible to ensure that they do not create open drainage routes. The trenches would be backfilled as far as possible with excavated peat, to minimise the change to flow paths. Where other material is used to backfill the trenches, clay cut-off barriers would be installed across the trench to prevent them creating preferential flow paths, if necessary.

8.10.23 Cable laying methods that do not require a dug trench would be considered. FCS and SNH (2010) guidance suggests that it may be possible to inset the cable in peat flanks alongside the edges of the floating roads. This would mean that they are protected but do not need to be dug into the ground, which would disturb the peat and associated flow paths.

Watercourse Crossing Design

8.10.24 The number of watercourse crossings has been minimised, but due to the number of watercourses and preferential flow pathways on the Site, and limitations regarding access locations, it is not possible for the Project to take place without some crossings. The proposed locations and types of watercourse and flow path crossings are shown in **Figure 8.6** and summarised in **Table 8.11**.

Table 8.11 Types of Watercourse and Flow Path Crossings

Crossing no.	Location	Grid reference	Type	Comments
RX01	Collorybog Burn	NS 50369 47228	Culvert	New access track and culvert
RX02	Unnamed tributary of Drumtee Water	NS 50727 47221	Culvert	New access track and culvert
RX03	Drumtee Water	NS 51196 47036	Culvert	New access track and culvert
RX04	Howe Burn	NS 50537 46288	Culvert	Cable route, amend existing crossing
RX05	Unnamed tributary of Howe Burn	NS 50562 46087	Culvert	Cable route, amend existing crossing
RX06	Pochweer Burn	NS 51610 45635	Culvert	New access track and culvert
RX07	Dunton Water	NS 51761 45328	Culvert	Cable route, amend existing crossing

8.10.25 The proposed new cable runs in a southerly direction from the green hydrogen production facility and meets the existing cable at Rough Hill (NS 5199 4516). This route follows existing tracks where possible, meaning that only four new cable crossings of watercourses are required. At these locations (RX01, RX02, RX03 and RX06) a simple culvert type construction is proposed using a cross sectional area that would not impede flow of water. The design of the culverts would be to at least CIRIA Culvert Design and Operation Guide (RP901) standard and the culvert structure would not affect either the channel or banks. The existing alignment of the watercourses would remain unchanged.

8.10.26 Modifications of existing track culverts would be used at the three other new locations (RX04, RX05 and RX07). The new cable in the south connecting to the BESS does not require any watercourse crossings.

8.10.27 Adherence to the Engineering in the Water Environment Good Practice Guide - River Crossings: Second Edition (SEPA, 2010), River Crossings and Migratory Fish: Design Guidance (SGt, 2012) and CIRIA Culvert Design and Operation Guide (C689) helps to minimise potential hydrological (including morphological) effects. All watercourse crossings would be designed to convey a 1 in 200 year return period flood event with an allowance (+20%) for climate change, and each watercourse/flow pathway crossing has been considered individually with respect to topography and hydrology.

Excavations and Associated Drainage

8.10.28 Where possible, excavations required to facilitate the construction of foundations for the building and service trenches would be designed so that they can freely drain by gravity. Cut-off drains would be installed around the excavation areas to prevent surface run-off entering the excavations.

8.10.29 Measures based on Best Practice guidelines from SEPA would be adopted during construction to prevent pollution, with all contractors aware of the Pollution Incident Response Plan (PIRP) for the Project as detailed in PPG21. The foundation designs minimise excavation requirements in accordance with BS6031: 2009 Code of Practice for Earth Works.

8.10.30 Building foundation construction would need to adopt mitigation measures to prevent contaminants entering the shallow groundwater system. The main potential groundwater effect arising from the construction of the building foundations is the risk of leaching concrete residues into the water environment. Given the dominant soil type and areas of peat distribution, the near-surface groundwater at the Site is likely to be acidic. Therefore, to minimise the potential of concrete leaching and alkaline pollution of groundwater, suitable sulphate-resistant concrete would be used. The foundation design would be shared with SEPA, and if necessary, the foundation excavations would incorporate an adequate barrier to prevent the mitigation of any on-site pollutants to the underlying groundwater.

8.10.31 Should ground conditions occur during excavation where gravity drainage is not possible (i.e., where low permeability rock or superficial deposits are present), the excavations would be dammed and drained by pumping. These dewatering activities would be undertaken in accordance with Best Practice (including WAT-SG-29 on Temporary Construction Methods), which would be detailed in the CEMP to be agreed by SEPA and the Ecological Clark of Works (ECoW).

8.10.32 The design for the dewatering would ensure collection and settling of suspended sediment i.e., use of silt traps, fences, straw bales or lagoons. Any water removed from the excavation would be treated and pumped to a bunded and vegetated settlement and infiltration swale, downgradient of the excavation and away from watercourses, and there would be no discharge of water directly into a watercourse. Should local topography or ground conditions prove unsuitable for construction of either infiltration swales or settlement lagoons, the use of portable silt trap devices such as 'Siltbuster' type tanks could be considered for removal of elevated suspended solids from water pumped from excavations.

8.10.33 No borrow pits have been proposed within the Site, and all supply of crushed aggregate and rock during the construction phase would be imported onto the site. Within deeper excavations, any required dewatering during rock removal (if required), based on the status of the aquifer (low permeability), are anticipated to involve small volumes of water and limited impacts to groundwater resources. Similar controls to those detailed above would be employed to prevent contamination of surface waters with suspended sediment.

8.10.34 Based on the nature of the underlying geology it is assumed that groundwater flow in the solid geology is very limited and so, as no abstraction points have been identified in proximity to any excavation locations, dewatering would not have any impact on existing abstractions. However, the dewatering of excavations at greater than $10m^3/d$ would require CAR Registration, while over $50m^3/d$ would require a CAR licence. Abstractions smaller than $10m^3/d$ would comply with GBR3.

Peat Excavations and Storage

8.10.35 Policy NE15 of LDP2 states that developments proposed affecting peat deposits not already designated for habitat conservation reasons may be permitted provided renewable energy generating development is proposed and it can be demonstrated that the balance of advantage in terms of climate change mitigation lies with the energy generation proposal. In such a case appropriate site restoration measures to something other than functioning peat land would be required.

8.10.36 Surface run-off from stockpiles of excavated peat, whether temporarily stored prior to backfilling or permanently stored in peat storage areas, has the potential to affect surface water quality due to the transportation of suspended solids in surface water run-off. Therefore, Best Practice measures would be implemented to ensure that peat is appropriately stored.

8.10.37 During the design phase of the Project the selection of infrastructure locations has avoided areas, wherever possible, where substantial peat thicknesses have been identified. This helps to reduce the volumes of peat that are required to be excavated and therefore the need to manage materials. However, it has not been possible to avoid all areas where peat overlies the solid geology. Consequently, mitigation measures would be adopted to prevent changes which have the potential to influence water quality.

8.10.38 The storage of peat during construction would minimise slumping and maintain stratification, where possible using water derived from dewatering activities to keep the peat adequately saturated to prevent desiccation and degradation. It is anticipated that all excavated peat can be re-used on site. It is not therefore expected that any peat would need disposal or long-term storage, by way of a waste management licence. Neither is it expected that there would need to be storage of excavated peat for a period greater than three years (or where storage prior to disposal is greater than one year) and thus no requirement for a permit in accordance with the Landfill (Scotland) Regulations 2003.

8.10.39 The upper levels of the peat and turf excavated can be used for resurfacing following construction (in non-hardstanding areas), thus maintaining the hydrological and biological characteristics of the location. This resurfacing would aim to restore a flat surface, preventing mounding. This would help to re-establish hydraulic continuity of the replaced peat and turf with surrounding saturation levels, thereby reducing the possibility of peat drainage and desiccation.

Site Working Practices

8.10.40 Site activities during construction and operation have been identified to have potential effects on the water environment. These can be controlled by the implementation of pollution prevention and control measures and Best Practice, based on the guidance outlined earlier.

8.10.41 The site induction for contractors would include a specific session on good practice to prevent and control water pollution from construction activities. Contractors would be made aware of their statutory responsibility[51] not to cause or knowingly permit water pollution. As discussed in **Section 8.10**, a PPP and a PIRP would be prepared for the Project, and all contractors would be briefed on

[51] Water Resources Act, CAR

these plans, with copies made available on site. Equipment to contain and absorb spills would also be readily available.

8.10.42 Fuel and oil may enter the groundwater by migration vertically into the underlying groundwater or by run-off into nearby surface waters, if accidentally released or spilled during storage and refuelling. To minimise potential releases into the water environment, fuel would be stored in either a bunded area or a self-bunded above-ground storage tank (AST) kept on site during the construction phase in accordance with the Water Environment (Oil Storage) (Scotland) Regulations 2006, SEPA Pollution prevention guidelines, and GBR9. The bunded area would have a capacity of 110% of the fuel tank. All stores would be located at least 50m from any watercourses.

8.10.43 In areas where there is a potential for hydrocarbon residues from run-off or isolated leakages, such as in plant storage areas and around fuel storage tanks, surface water drainage would be directed to a hydrocarbon interceptor prior to discharge. The interceptor would filter out hydrocarbon residues from drainage water and retain hydrocarbon product in the event of a spillage, to prevent release into surface waters at the discharge point and deterioration of downstream water quality.

8.10.44 Plant and machinery used during the construction phase would be maintained to minimise the risks of oils leaks or similar. Maintenance and refuelling of machinery would be undertaken off-site or within designated areas of temporary hardstanding. In these designated areas contingency plans would be implemented to ensure that the risk of spillages is minimised. Placing a drip tray beneath a plant and machinery during refuelling and maintenance would contain small spillages.

8.10.45 The main potential hydrological effects during the operational phase of the Project relate to the servicing of the solar panels and storage of oils and lubricants involved in the process which may be accidentally released into the water environment.

8.10.46 The potential risks posed to surface water and groundwater quality, specifically related to operation, are likely to be limited and localised based on the planned works and the nature and volume of substances required. Any potential risk to the environment would be identified by the operator prior to servicing being undertaken. The operator would ensure a site-specific risk assessment is completed and that control measures are implemented to ensure all environmental risks are minimised. Oils would be stored, used, and disposed of in accordance with Best Practice and SEPA guidance (GPP 8).

8.10.47 Potential ongoing effects in relation to infrastructure remaining on the Site during operations were addressed during the discussion of construction mitigation within Paragraphs 4.10.40 – 4.10.46 above. Ongoing maintenance would be carried out, for example, to maintain drainage and settlement ponds.

Construction Environmental Management Plan

8.10.48 In accordance with Best Practice, engineering activities that would involve the construction of river crossings or drainage systems are avoided where possible to ensure that the Site and surface water system remain in a near as natural a state as possible. However, there are circumstances where this in not achievable due to the nature of the Project and restrictions on the number of options for access. Prior to the commencement of construction activities, a CEMP would be produced that would follow Best Practice guidance, as well as incorporating specific recommendations made in this HIA, and would therefore account for potential risks and ensure minimal effects on the Hydrology and Hydrogeology during construction. No works would be undertaken unless agreed in the CEMP.

8.10.49 The CEMP would set out the specific details of surface water drainage, management of dewatered groundwater from excavations and watercourse crossings. The CEMP would set out specific measures to protect Hydrology and Hydrogeology receptors from pollution arising from

construction activities and a programme for inspection and monitoring to ensure the effectiveness of these measures. It would describe the response plan for pollution incidents, should accidental spillages occur despite the control measures in place.

Summary

8.10.50 A range of environmental measures have been embedded into the development proposals as outlined above. A summary of how these embedded measures relate to each of the receptor groups in the assessment is presented in **Table 8.12**.

Table 8.12 Summary of the Embedded Environmental Measures

Receptor	Changes and effects	Embedded measures
Aquifer and associated WFD groundwater body	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to a loss of water resource	CEMP
	Dewatering during construction associated with the excavation of the building foundations leading to a decline in groundwater levels	CEMP Dewatering of excavations and associated drainage consistent with requirements of GBRs 3 and 15.
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater, leading to a loss of water resource	CEMP Site working practices
Watercourses, reservoirs and associated WFD surface water bodies	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading, leading to changes in watercourse flow, quality and morphology	Avoidance of flood zones Watercourse buffer zones Micro-siting CEMP Track design Drainage design Cable trench design Watercourse crossings design
	Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention, leading to changes in watercourse flow and morphology	Avoidance of flood zones Watercourse buffer zones Micro-siting CEMP Track design Drainage design Cable trench design Watercourse crossings design Peat excavation and storage
	Disruption of ground during construction leading to increased sediment loading, leading to changes in watercourse quality and morphology	Avoidance of flood zones Watercourse buffer zones Micro-siting CEMP Track design Drainage design Cable trench design Watercourse crossings design Peat excavation and storage

Receptor	Changes and effects	Embedded measures
	Dewatering and/or drainage during construction disrupting groundwater support (baseflow), leading to changes in watercourse flow	Avoidance of flood zones Watercourse buffer zones Micro-siting CEMP Excavations and associated drainage
	Discharge to surface water of groundwater intercepted during construction associated with the excavation of the building foundations, leading to changes in watercourse flow, quality and morphology	Avoidance of flood zones Watercourse buffer zones Micro-siting CEMP Excavations and associated drainage
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to changes in watercourse quality and morphology	Avoidance of flood zones Watercourse buffer zones Micro-siting CEMP Watercourse crossings design Site working practices
Abstractions (groundwater)	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to abstraction derogation	Groundwater abstraction buffer zones CEMP Distance from proposed infrastructure
	Dewatering during construction associated with the excavation of the building foundations leading to a decline in groundwater levels	Groundwater abstraction buffer zones CEMP Distance from proposed infrastructure
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater, leading to abstraction pollution	Groundwater abstraction buffer zones CEMP Site working practices Distance from proposed infrastructure
Abstractions (surface water)	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading, leading to abstraction pollution	Avoidance of flood zones Watercourse buffer zones CEMP Watercourse crossings design Distance from proposed infrastructure and intervening dilution
	Disruption of ground during construction leading to increased sediment loading and abstraction pollution	Avoidance of flood zones Watercourse buffer zones CEMP Watercourse crossings design Distance from proposed infrastructure and intervening dilution
	Dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses, leading to abstraction derogation	Avoidance of flood zones Watercourse buffer zones CEMP Distance from proposed infrastructure and intervening dilution
	Discharge to surface water of groundwater intercepted during construction associated with the excavation of the building foundations	Avoidance of flood zones Watercourse buffer zones CEMP

Receptor	Changes and effects	Embedded measures
	increasing flows and sediment loading, leading to abstraction pollution	Distance from proposed infrastructure and intervening dilution
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters, leading to abstraction pollution	Avoidance of flood zones Watercourse buffer zones CEMP Watercourse crossings design Site working practices Distance from proposed infrastructure and intervening dilution
Conditions supporting conservation sites and GWDTEs (groundwater)	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, leading to reduced groundwater support	Avoidance of deep peat deposits Conservation site buffer zones CEMP
	Dewatering during construction associated with the excavation of the building foundations leading to a decline in groundwater levels	Avoidance of deep peat deposits Conservation site buffer zones CEMP Excavations and associated drainage
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater	Avoidance of deep peat deposits Conservation site buffer zones CEMP Site working practices
	Physical disturbance of the peat and groundwater throughflow could occur as a result of excavation works and peat stockpiling/removal, and result in reduced groundwater support for peatlands	Avoidance of deep peat deposits Conservation site buffer zones CEMP Peat excavation and storage
Conditions supporting conservation sites and GWDTEs (surface water)	Soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading, leading to changed/polluted surface water support	Avoidance of deep peat deposits Conservation site buffer zones Micro-siting CEMP Track design Drainage design Cable trench design Watercourse crossings design
	Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention, leading to reduced surface water support	Avoidance of deep peat deposits Conservation site buffer zones Micro-siting CEMP Track design Drainage design Cable trench design Watercourse crossings design Peat excavation and storage
	Disruption of ground during construction leading to increased sediment loading leading to polluted surface water support	Avoidance of deep peat deposits Conservation site buffer zones Micro-siting CEMP Track design Drainage design Cable trench design

Receptor	Changes and effects	Embedded measures
		Watercourse crossings design Peat excavation and storage
	Dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses leading to reduced surface water support	Avoidance of deep peat deposits Conservation site buffer zones Micro-siting CEMP Excavations and associated drainage
	Discharge to surface water of groundwater intercepted during construction associated with the excavation of the building foundations increasing flows and sediment loading, leading to changed and polluted surface water support	Avoidance of deep peat deposits Conservation site buffer zones Micro-siting CEMP Excavations and associated drainage
	Site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters and polluted surface water support	Avoidance of deep peat deposits Conservation site buffer zones Micro-siting CEMP Watercourse crossings design Site working practices

8.11 Assessment Methodology

8.11.1 This Section describes how an EIA-based methodology is applied and adapted as appropriate to address the specific needs of the water environment assessment. The approach is described, with the assessment criteria tables presented below.

Assessment Approach

8.11.2 The current and future baseline presented in **Section 8.6** provides the benchmark against which the potential impact of the Project is assessed.

8.11.3 The significance of the effects resulting from the Project is primarily determined by reference to the value of a given water feature and the magnitude of change. In terms of the Hydrology and Hydrogeology, the key types of effects relate to water quantity (level and flow) and quality. However, depending on the effects on surface water flows, there may also be effects on immediate and downstream morphology, sediment dynamics and flood risk.

8.11.4 Therefore, the assessment presented in **Section 8.12** is based on both receptor value and the nature and magnitude of the impact as a result of the Project. All mitigation considered necessary is identified and residual effects with this mitigation in place determined. It is intended that no residual significant effects remain following adoption of the proposed mitigation.

Assessment Criteria

8.11.5 **Table 8.13** provides a summary of the criteria that is used in the assessment of the water feature value and introduces the concept of receptor type (groups of receptors whose value is assessed using the same criteria). The criteria are semi-quantitative and professional judgement is required in the assessment.

Table 8.13 Summary of Value of Hydrology and Hydrogeology Receptors

Value	Criteria	Receptor type*	Examples
High	Features with a high yield, quality or rarity with little potential for substitution.	Aquatic environment	Conditions supporting a site with an international conservation designation (Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar), where the designation is based specifically on aquatic features. WFD surface water body (or part thereof) with overall High status, also any associated upstream non-reportable WFD surface water body or non-WFD surface water body. WFD surface water body (or part thereof) with High status for morphology.
	Water use supporting human health and economic activity at a regional scale.	Water use	CAR-licensed public surface water or groundwater supply (and associated catchment) or permitted discharge.
Medium	Features with a medium yield, quality or rarity, with a limited potential for substitution.	Aquatic environment	Conditions supporting a site with a national conservation designation (e.g., Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR)), where the designation is based specifically on aquatic features. WFD surface water body (or part thereof) with overall Good status/potential, also any associated upstream non-reportable WFD surface water body or non-WFD surface water body. WFD groundwater body (or part thereof) with overall Good status.
	Water use supporting human health and economic activity at a local scale.	Water use	Local public surface water and groundwater supply (and associated catchment) or permitted discharge. CAR-licensed non-public surface water and groundwater supply abstraction (and associated groundwater catchment) which is relatively large relative to available resource, or where raw water quality is a critical issue, e.g., industrial process water, or permitted discharge. Unregistered potable surface water and groundwater abstraction (and associated catchment) where alternative supply can't be easily provided e.g., private domestic water supply, well, spring or permitted discharge.
Low	Features with a low yield, quality or rarity, with some potential for substitution.	Aquatic environment	Conditions supporting a site with a local conservation designation (e.g., Local Nature Reserve (LNR)), where the designation is based specifically on aquatic features, or an undesignated but highly/moderately water-dependent ecosystem, including a LNCS and a GWDTE. WFD surface water body (or part thereof) with overall Moderate or lower status/potential, also any associated upstream non-reportable WFD surface water body or non-WFD surface water body.

Value	Criteria	Receptor type*	Examples
			Groundwater body (or part thereof) with overall Poor status.
	Water use supporting human health and economic activity at household/individual business scale.	Water use	CAR-registered non-public surface water and groundwater supply abstraction (and associated catchment), which is relatively small relative to available resource, or where raw water quality is not critical, e.g., cooling water, spray irrigation, mineral washing or permitted discharge. Unregistered potable surface water and groundwater abstraction (and associated catchment) where alternative supply can be relatively easily provided e.g., private domestic water supply, well, spring or permitted discharge.
Very Low	Commonplace features with very low yield or quality with good potential for substitution.	Aquatic environment	Conditions supporting an undesignated and low water-dependent ecosystem, including a LNCS, GWDTE and pond. Non-reportable WFD surface water body (or part thereof), or non-WFD surface water body, not associated with any downstream WFD surface water body. Non-reportable WFD groundwater body (or part thereof), or non-WFD groundwater body.
	Water use does not support human health, and of only limited economic benefit.	Water use	Unregistered non-potable surface water and groundwater abstraction (and associated catchment) e.g., livestock supply.

*Receptor types map onto the receptor lists as follows:

- Aquatic environment – aquifers and WFD groundwater bodies, watercourses and WFD surface water bodies, conditions supporting GWDTEs and conservation sites; and
- Water use – springs, abstractions

8.11.6 The magnitude of change on water receptors is independent of the value of the receptor, and its assessment is semi-quantitative and again reliant in part on professional judgement. **Table 8.14** provides examples of how various levels of change have been determined with respect to water features.

Table 8.14 Summary of Hydrology and Hydrogeology Magnitude of Change

Magnitude	Criteria	Receptor type	Example*
High	Results in major change to feature, of sufficient magnitude to affect its use/integrity.	Aquatic environment	Deterioration in river flow regime, morphology or water quality, leading to sustained, permanent or long-term breach of relevant conservation objectives (COs) or non-temporary downgrading (deterioration) of WFD surface water body status (including downgrading of individual WFD elements) or dependent receptors, or resulting in the inability of the surface water body to attain Good status in line with the measures identified in the RBMP. Deterioration in groundwater levels, flows or water quality, leading to non-temporary

Magnitude	Criteria	Receptor type	Example*
			downgrading of status of WFD groundwater body or dependent receptors, or the inability of the groundwater body to attain Good status in line with the measures identified in the RBMP.
		Water use	Complete or severely reduced water availability and/or quality, compromising the ability of water users to abstract.
Medium	Results in noticeable change to feature, of sufficient magnitude to affect its use/integrity in some circumstances.	Aquatic environment	Deterioration in river flow regime, morphology or water quality, leading to periodic, short-term and reversible breaches of relevant COs, or potential temporary downgrading of surface water body status (including potential temporary downgrading of individual WFD elements), or dependent receptors, although not affecting the ability of the surface water body to achieve future WFD objectives. Deterioration in groundwater levels, flows or water quality, leading to potential temporary downgrading of status of WFD groundwater body or dependent receptors, although not affecting the ability of the groundwater body to achieve future WFD objectives.
		Water use	Moderate reduction in water availability and/or quality, which may compromise the ability of the water user to abstract on a temporary basis or for limited periods, with no longer-term impact on the purpose for which the water is used.
Low	Results in minor change to feature, with insufficient magnitude to affect its use/integrity in most circumstances.	Aquatic environment	Slight change in river flow regime or water quality, but remaining generally within COs, and with no short-term or permanent change to WFD surface water body status (of overall status or element status) or dependent receptors. Slight deterioration in groundwater levels, flows or water quality, but with no short-term or permanent downgrading of status of WFD groundwater body or dependent receptors.
		Water use	Minor reduction in water availability and/or quality, but unlikely to affect the ability of a water user to abstract.
Very Low	Results in little or no change to feature, with insufficient magnitude to affect its use/integrity	Aquatic environment	None or very slight change in river flow regime or water quality, and no consequences in terms of COs or surface water body status or dependent receptors. No or very slight change in groundwater levels or quality, and no consequences in terms of status of WFD groundwater body or dependent receptors.

Magnitude	Criteria	Receptor type	Example*
		Water use	No or very slight change in water availability or quality and no change in ability of the water user to exercise licensed rights or continue with small private abstraction.

*For the purposes of this assessment of change, relevant WFD elements for surface water body classification include:

- all biological quality elements e.g., fish, macrophytes, invertebrates.
- all physico-chemical quality elements e.g., dissolved oxygen, phosphate.
- hydromorphological supporting elements.
- Priority Hazardous Substances.
- Priority Substances.
- Specific Pollutants; and, for Artificial and Heavily Modified Water Bodies.
- the mitigation measures assessment.

For the purposes of this assessment of change, relevant WFD characteristics for groundwater body classification are quantity (groundwater level regime) and chemistry (conductivity and source of pollutants), as determined by the following tests:

- Water balance (quantitative).
- DWPAs (chemical).
- General Quality Assessment (chemical).
- Saline and other intrusions (quantitative and chemical).
- Surface water (quantitative and chemical).
- GWDTEs (quantitative and chemical).

8.11.7 The significance of water-related effects is derived by considering both the value of the feature and the magnitude of change. In this assessment, effects are significant or not significant according to the matrix in **Table 8.15**, with 'major' and 'moderate' effects taken to be 'significant' in EIA terms. Significance can be 'beneficial', 'adverse' or 'neutral'.

Table 8.15 Significance Evaluation Matrix Relating to Hydrology and Hydrogeology

Value	Magnitude of change			
	High	**Medium**	**Low**	**Very Low**
High	Major (Significant)	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)
Medium	Major (Significant)	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)
Low	Moderate (Probably significant)	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)
Very Low	Minor (Not significant)	Negligible (Not significant)	Negligible (Not significant)	Negligible (Not significant)

Note: 'Significant' effects are those identified as 'Major'. 'Moderate' effects would normally be deemed to be 'significant'. However, there may be some exceptions, depending on the environmental topic and the application of professional judgment.

8.11.8 It is important to recognise that 'significant' effects on Hydrology and Hydrogeology receptors in the water environment do not necessarily mean that the same outcomes would occur in respect of the same receptors that may also be ecology receptors. Indeed, because of the different value and magnitude criteria used by the two assessments, it is possible that effects assessed as 'not significant' in one environmental topic assessment, e.g., Hydrology and Hydrogeology, can still sit

alongside effects assessed as 'significant' in another environmental topic assessment, e.g. ecology, and vice-versa.

8.12 Assessment of Hydrology and Hydrogeology Effects

8.12.1 This Section presents an assessment of the effects on each identified 'scoped in' receptor, covering aquifers, watercourses, licensed abstractions, PWSs and conservation sites. The assessment findings are then summarised.

Aquifer and Associated WFD Groundwater Body (GW01)

8.12.2 Based on the water environment baseline presented in **Section 8.6**, **Section 8.8** identified that the potential effects due to the Project on the bedrock aquifer and the associated Whitelee WFD groundwater body (GW01) within the Study Area required consideration as part of the assessment. **Section 8.9** observed that loss or contamination of the groundwater resource could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels; dewatering during construction associated with the excavation of building foundations leading to a decline in groundwater levels; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater.

8.12.3 The local bedrock aquifer is of low productivity and its associated WFD groundwater body is of Good overall status, and therefore it is considered to be of medium value (**Table 8.13**).

8.12.4 Mitigation that looks to protect the aquifers and WFD groundwater bodies includes adherence to the CEMP, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements (**Section 8.10**). The limited extent of the proposed works compared to the area of both the Site and the aquifer, the low permeability of the aquifer, and the anticipated effectiveness of the embedded environmental measures combine to limit the magnitude of change to the aquifer and WFD groundwater bodies baseline condition.

8.12.5 The magnitude of change to this aquifer and WFD groundwater body (GW01) with respect to the soil compaction and hardstanding (groundwater levels), building foundation and any dewatering works (groundwater levels), and site activities (groundwater quality) is therefore very low (**Table 8.14**). On this basis, the level of effect of the entire Project on the aquifers and WFD groundwater bodies is negligible adverse and not significant (**Table 8.15**). The effect is therefore also not significant for the two Proposed Developments in isolation.

Watercourses, Reservoirs and Associated WFD Surface Water Bodies (W01 – W03)

8.12.6 Based on the water environment baseline presented in **Section 8.6**, **Section 8.8** identified that potential effects due to the Project on two watercourses and associated WFD surface water bodies and one reservoir within the Study Area required consideration as part of the assessment. These comprise Drumtee Water (W01), Craufurdland Water/Dunton Water (W02) and Craigendunton Reservoir and catchment, including Birk Burn (W03). **Section 8.9** observed that changes in flow and morphology and also sediment loading and pollution of watercourses and WFD surface water bodies could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading; disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention; disruption of ground during construction leading to increased sediment loading; dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses; discharge to surface

water of groundwater intercepted during construction associated with the excavation of building foundations and increasing flows and sediment loading; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of surface waters.

8.12.7 Drumtee Water lies within a WFD surface water body at Moderate status but is classified as a HMWB associated with public water supply abstraction, and is considered to be of low value (**Table 8.13**). Craufurdland Water/Dunton Water lies within a WFD surface water body at Good status but is again a HMWB, and is considered to be of medium value. Craigendunton Reservoir and catchment supports Dunton Water and is therefore considered to also be of medium value.

8.12.8 Mitigation that looks to protect surface watercourses is extensive (**Section 8.10**). It includes a 20m or 50m buffer zone applied to the entire river network, micro-siting of tracks and other infrastructure, careful access track drainage and watercourse crossing design and adherence to numerous relevant protocols, including the CEMP, SEPA's good practice guidance regarding wind farm construction (2015) and the construction of river crossings, the FCS and SNH (2010) guidance, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements. Any dewatering would necessitate the use of silt traps, fences, straw bales, settlement lagoons, swales and SUDS, and any discharge to surface water would require consent from SEPA and would be subject to conditions attached to the consent. Other pollution prevention and emergency response planning are also relevant. The magnitude and level/significance of the effects are considered on a watercourse-by-watercourse basis below.

8.12.9 There are five crossings in the Drumtee Water catchment (W01), namely three new access track culverts (RX01 – RX03) and two modified existing track culverts (RX04 and RX05). Other proposed infrastructure in the wider catchment include some new access track, the electrolyser building and laydown area, and new cable. The anticipated effectiveness of the embedded environmental measures means that the magnitude of change on the watercourses with respect to the disruption and/or pollution of their flow (surface water flow and quality) and geomorphology is low (**Table 8.14**). On this basis, the level of effect of the entire Project on this WFD surface water body is negligible adverse and not significant (**Table 8.15**). The effect is therefore also not significant for the two Proposed Developments in isolation.

8.12.10 There are a further two crossings in the Craufurdland Water/Dunton Water catchment (W02) (RX06 and RX07), the former being a new access track culvert and the latter being a modified existing track culvert. Other proposed infrastructure in the wider catchment include the BESS compound and new cable. The anticipated effectiveness of the embedded environmental measures means that the magnitude of change on the watercourses with respect to the disruption and/or pollution of their flow (surface water flow and quality) and geomorphology is very low (**Table 8.14**). On this basis, the level of effect of the Project (in this instance just the Proposed Development (S36)) on this WFD surface water body is negligible adverse and not significant (**Table 8.15**).

8.12.11 There are no crossings or other infrastructure proposed upgradient of Craigendunton Reservoir (W03), meaning that the magnitude of change on the watercourses with respect to the disruption and/or pollution of their flow (surface water flow and quality) and geomorphology is very low (**Table 8.14**). On this basis, the level of effect of the Project (in this instance just the Proposed Development (S36)) on the reservoir and its catchment is negligible adverse and not significant (**Table 8.15**).

Licenced Abstractions (A04 and A08)

8.12.12 Based on the water environment baseline presented in **Section 8.6**, **Section 8.8** identified that the potential effects due to the Project on two CAR licensed abstractions, namely Croilburn Farm,

Waterside (A04) and Craigendunton Reservoir (A08), required consideration as part of the assessment. In terms of surface water abstraction such as that most probably at Croilburn Farm and also that at Craigendunton Reservoir, **Section 8.9** identified that derogation or contamination could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading; disruption of ground during construction leading to increased sediment loading and abstraction pollution; dewatering during construction associated with the excavation of the building foundations disrupting groundwater support (baseflow) to watercourses; discharge to surface water of groundwater intercepted during construction associated with the excavation of the building foundations increasing flows and sediment loading; and site activities during construction and operation resulting in the release of pollutants.

8.12.13 The Croilburn Farm abstraction is a relatively small non-public water supply CAR licensed abstraction and is of low value (**Table 8.13**). The abstraction from Craigendunton Reservoir is a public water supply abstraction and is of high value.

8.12.14 Mitigation that would serve to help protect these sources includes restricting the Proposed Development in their vicinity by way of the 20 or 50m watercourse buffer zones, and adherence to the CEMP, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements (**Section 8.10**). The absence of any proposed works within or near the abstractions and the anticipated effectiveness of the embedded environmental measures combine to limit the magnitude of change at these abstractions.

8.12.15 The magnitude of change to the abstractions with respect to the soil compaction and the introduction of areas of hardstanding (surface water quality), disruption of ground during construction (surface water quality), dewatering during construction associated with the excavation of the building foundations disrupting groundwater support to watercourses (surface water flow); discharge to surface water of groundwater intercepted during construction (surface water quality), and polluting site activities (surface water quality) is therefore very low (**Table 8.14**). On this basis, the level of effect of the Project (in this instance just the Proposed Development (S36)) on the abstractions is minor (Craigendunton Reservoir, A08) to negligible (Croilburn Farm, Waterside, A04) adverse and not significant (**Table 8.15**).

Private Water Supplies (P01, P03 and P05)

8.12.16 Based on the water environment baseline presented in **Section 8.8** identified that the potential effects due to the Project on three groundwater PWSs, namely a spring at Drumtee (P01) and a borehole at Best Friends Cottage (P03) and Cauldstanes (P05), required consideration as part of the assessment. **Section 8.9** observed that derogation or contamination of groundwater abstraction such as that at the three PWSs could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels; dewatering during construction associated with the excavation of the building foundations leading to a decline in groundwater levels; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater.

8.12.17 The three PWSs are assumed to be for potable use and difficult to replace, so are therefore of medium value (**Table 8.13**).

8.12.18 Mitigation that would serve to help protect these sources includes restricting the Proposed Development in their vicinity by way of the 100m/250m groundwater buffer zones, and adherence to the CEMP, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements (**Section 8.10**). The absence of any proposed works within or near the abstractions, the presence of the low

permeability of the local aquifer, and the anticipated effectiveness of the embedded environmental measures combine to limit the magnitude of change at these abstractions.

8.12.19 The magnitude of change to the abstractions with respect to the soil compaction and the introduction of areas of hardstanding (groundwater levels), dewatering during construction associated with the excavation of the building foundations lowering groundwater levels groundwater levels); and polluting site activities (groundwater quality) is therefore very low (**Table 8.14**). On this basis, the level of effect of the Project (in this instance just the Proposed Development (S36)) on the abstractions is negligible (Drumtee PWS, P01; Best Friend's Cottage PWS, P03; and Cauldstanes PWS, P05) adverse and not significant (**Table 8.15**).

Conservation Sites (C03 and C05) and GWDTEs (C04)

8.12.20 Based on the water environment baseline presented in **Section 8.6**, **Section 8.8** identified that potential effects on two conservations sites (both designated PrWSs) required consideration as part of the assessment, namely Fenwick Moor (C03) and Craigendunton Reservoir (C05), together with the mosaic of on-site potential GWDTEs (C04). **Section 8.9** observed that derogation or contamination of these sites could occur as a result of soil compaction and the introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and/or increasing runoff and sediment loading; disruption of ground and flow paths and changes in drainage regime during construction and throughout operation increasing runoff and sediment loading; dewatering and/or drainage during construction associated with the excavation of building foundations leading to a decline in groundwater levels and baseflow; discharge to surface water of groundwater intercepted during construction leading to increased flows and sediment loading; and site activities during construction and operation resulting in the release of pollutants and the subsequent contamination of groundwater and surface water. In addition, the on-site potential GWDTEs could also be affected by physical disturbance of the peat and associated groundwater throughflow as a result of excavation works and peat stockpiling/removal.

8.12.21 Both Fenwick Moor and Craigendunton Reservoir are PrWSs and are considered to be of low value (**Table 8.13**). A detailed assessment of the on-site potential GWDTEs has not been undertaken and so they have been assessed on a precautionary basis as supporting a highly/moderately water-dependent ecosystem and assigned a low value.

8.12.22 Mitigation that looks to protect the conservation sites and GWDTEs is listed in **Section 8.10**. It includes a 20 or 50m buffer zone applied to the entire river network, micro-siting of tracks and other infrastructure, careful access track drainage and watercourse crossing design, and adherence to numerous relevant protocols, including the CEMP, SEPA's good practice guidance regarding wind farm construction (2015) and the construction of river crossings, the FCS and SNH (2010) guidance, BS6031: 2009 Code of Practice for Earth Works, WAT-SG-29 on Temporary Construction Methods and any dewatering CAR registration or licence requirements.

8.12.23 The magnitude of change on Fenwick Moor (C03) and Craigendunton Reservoir (C05) that lie predominantly upstream of the Site is very low (**Table 8.14**). On this basis, the level of effect of the entire Project on these PrWSs is negligible adverse and not significant (**Table 8.15**). The effect is therefore also not significant for the two Proposed Developments in isolation at Fenwick Moor and just the Proposed Development (S36) at Craigendunton Reservoir.

8.12.24 A portion of the potential GWDTEs (C04) sit within the infrastructure buffers (see **Figure 8.6**). However, the majority of the mitigation presented in **Section 8.10** is relevant to the protection of the quantity and quality of the surface water support and maintaining the peat structure, in particular the avoidance of development within deep peat deposits where possible, adherence to the CEMP, and careful infrastructure design.

8.12.25 The uncertainty around the hydrological dependency of the GWDTEs and the overlap of the buffer areas with some infrastructure means that a precautionary approach has been taken to the magnitude of change, which has been assessed as medium (**Table 8.14**) as there could be some localised change to the condition of the GWDTEs if they are very water dependant. On this basis, the level of effect of the entire Project is minor adverse and not significant (**Table 8.15**). The effect is therefore also not significant for the two Proposed Developments in isolation.

Summary

8.12.26 A summary of the results of the assessment of the Hydrology and Hydrogeology is provided in **Table 8.16**, with an indication of which parts of the assessment are relevant to the two Proposed Developments in isolation or both (the Project).

Table 8.16 Summary of Significance of Adverse Effects

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Bedrock aquifer and Whitelee WFD groundwater body (GW01) – relevant to both green hydrogen production facility and solar PV farm / BESS /ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, and resulting in loss of water resource	Medium	Very low	Negligible (NS)	Limited extent of proposed works compared to area of both Site and aquifer, low permeability of aquifer, and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to baseline condition
Dewatering during construction associated with excavation of building foundations leading to a decline in groundwater levels and possibly and resulting in loss of water resource	Medium	Very low	Negligible (NS)	Limited extent of proposed works compared to area of both Site and aquifer, low permeability of aquifer, and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to baseline condition
Site activities during construction, operation and decommissioning resulting in release of pollutants and subsequent contamination of groundwater, and resulting in loss of water resource	Medium	Very low	Negligible (NS)	Limited extent of proposed works compared to area of both Site and aquifer, low permeability of aquifer, and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to baseline condition
Drumtee Water, tributaries and associated WFD surface water body (W01) – relevant to both green hydrogen production facility and solar PV farm / BESS / ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation increasing runoff and	Low	Low	Negligible (NS)	Some proposed works in catchment but anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
sediment loading, and changing watercourse flow and morphology				
Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention, and changing watercourse flow and morphology	Low	Low	Negligible (NS)	Some proposed works in catchment but anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Disruption of ground during construction leading to increased sediment loading, and changing watercourse morphology	Low	Low	Negligible (NS)	Some proposed works in catchment but anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses, and changing watercourse flow	Low	Low	Negligible (NS)	Some proposed works in catchment but anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Discharge to surface water of groundwater intercepted during construction associated with excavation of the building foundations, and increasing flows and sediment loading	Low	Low	Negligible (NS)	Some proposed works in catchment but anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Site activities during construction and operation resulting in release of pollutants and the subsequent contamination of surface waters	Low	Low	Negligible (NS)	Some proposed works in catchment but anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Craufurdland Water/Dunton Water, tributaries and associated WFD surface water body (W02) – relevant to solar PV farm / BESS / ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading, and changing watercourse flow and morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention, and changing watercourse flow and morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Disruption of ground during construction leading to increased sediment loading, and changing watercourse morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses, and changing watercourse flow	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Discharge to surface water of groundwater intercepted during construction associated with excavation of the building foundations and increasing flows and sediment loading	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Site activities during construction and operation resulting in release of pollutants and the subsequent contamination of surface waters	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Craigendunton Reservoir and catchment, including Birk Burn (W03) – relevant to solar PV farm / BESS / ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading, and changing watercourse flow and morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Disruption of flow paths and changes to drainage regime during construction and throughout operation can be associated with increases in runoff and less on-site water retention, and changing watercourse flow and morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Disruption of ground during construction leading to increased sediment loading, and changing watercourse morphology	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Dewatering and/or drainage during construction disrupting groundwater support (baseflow) to watercourses, and changing watercourse flow	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Discharge to surface water of groundwater intercepted during construction associated with excavation of the building foundations and increasing flows and sediment loading	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Site activities during construction and operation resulting in release of pollutants and the subsequent contamination of surface waters	Medium	Very Low	Negligible (NS)	Limited extent of proposed works, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to WFD surface water body
Croilburn Farm and Craigendunton Reservoir licensed abstractions (A04 and A08 respectively) – relevant to solar PV farm / BESS / ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation increasing runoff and sediment loading, and leading to pollution of abstractions	Low (A04) High (A08)	Very Low	Negligible (NS, A04) Minor (NS, A08)	Absence of any proposed works near the sources, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to abstractions

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Disruption of ground during construction leading to increased sediment loading and abstraction pollution	Low (A04) High (A08)	Very Low	Negligible (NS, A04) Minor (NS, A08)	Absence of any proposed works near the sources, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to abstractions
Dewatering during construction disrupting groundwater support (baseflow) to watercourses, and leading to derogation of abstractions	Low (A04) High (A08)	Very Low	Negligible (NS, A04) Minor (NS, A08)	Absence of any proposed works near the sources, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to abstractions
Discharge to surface water of groundwater intercepted during construction associated with excavation of the building foundations and increasing flows and sediment loading and pollution of abstractions	Low (A04) High (A08)	Very Low	Negligible (NS, A04) Minor (NS, A08)	Absence of any proposed works near the sources, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to abstractions
Site activities during construction and operation resulting in release of pollutants and the subsequent contamination of abstractions	Low (A04) High (A08)	Very Low	Negligible (NS, A04) Minor (NS, A08)	Absence of any proposed works near the sources, anticipated effectiveness of embedded environmental measures and dilution combine to limit magnitude of change to abstractions
Drumtee, Best Friend's Cottage and Cauldstanes PWSs (P01, P03 and P05 respectively) – relevant to solar PV farm / BESS / ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels, and leading to derogation of abstractions	Medium	Very Low	Negligible (NS)	Absence of any proposed works near the sources, the low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to the abstractions
Dewatering during construction associated with excavation of building foundations leading to decline in groundwater levels and derogation of abstractions	Medium	Very Low	Negligible (NS)	Absence of any proposed works near the sources, the low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to the abstractions
Site activities during construction, operation and decommissioning resulting in release of pollutants and subsequent contamination of groundwater, and leading to pollution of abstractions	Medium	Very Low	Negligible (NS)	Absence of any proposed works near the sources, the low permeability of aquifer and anticipated effectiveness of embedded environmental measures combine to limit magnitude of change to the abstractions

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Fenwick Moor (C03) and conservation sites and on-site GWDTEs (C04) – relevant to both green hydrogen production facility and solar PV farm / BESS /ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and/or increasing runoff and sediment loading, and resulting in changed water support and increased sediment loading for sites	Low	Very Low (C03) Medium (C04)	Negligible (NS, C03) Minor (NS, C04)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change (C03). Some infrastructure lies within potential GWDTE catchments/buffer zones (C04), but anticipated effectiveness of embedded environmental measures limit magnitude of change to potential GWDTEs. Additional mitigation (**Section 8.13**) is suggested to facilitate micro-siting around these areas as required.
Disruption of ground and flow paths and changes to drainage regime during construction and throughout operation increasing runoff and sediment loading, and resulting in changed surface water support and increased sediment loading for sites	Low	Very Low (C03) Medium (C04)	Negligible (NS, C03) Minor (NS, C04)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change (C03). Some infrastructure lies within potential GWDTE catchments/buffer zones (C04), but anticipated effectiveness of embedded environmental measures limit magnitude of change to potential GWDTEs. Additional mitigation (**Section 8.13**) is suggested to facilitate micro-siting around these areas as required.
Dewatering and/or drainage during construction leading to a decline in groundwater levels and baseflow, and resulting in changed water support for sites	Low	Very Low (C03) Medium (C04)	Negligible (NS, C03) Minor (NS, C04)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change (C03). Some infrastructure lies within potential GWDTE catchments/buffer zones (C04), but anticipated effectiveness of embedded environmental measures limit magnitude of change to potential GWDTEs. Additional mitigation (**Section 8.13**) is suggested to facilitate micro-siting around these areas as required.
Discharge to surface water of groundwater intercepted during construction associated with excavation of foundations increasing flows and sediment loading, and resulting in changed surface water support and increased sediment loading for sites	Low	Very Low (C03) Medium (C04)	Negligible (NS, C03) Minor (NS, C04)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change (C03). Some infrastructure lies within potential GWDTE catchments/buffer zones (C04), but anticipated effectiveness of embedded environmental measures limit magnitude of change to potential GWDTEs. Additional mitigation (**Section 8.13**) is suggested to facilitate micro-siting around these areas as required.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Site activities during construction and operation resulting in release of pollutants and subsequent contamination of groundwater and surface waters, and leading to polluted water support for sites	Low	Very Low (C03) Medium (C04)	Negligible (NS, C03) Minor (NS, C04)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change (C03). Some infrastructure lies within potential GWDTE catchments/buffer zones (C04), but anticipated effectiveness of embedded environmental measures limit magnitude of change to potential GWDTEs. Additional mitigation (**Section 8.13**) is suggested to facilitate micro-siting around these areas as required.
Craigendunton Reservoir (C05) – relevant to solar PV farm / BESS / ancillary infrastructure				
Soil compaction and introduction of areas of hardstanding during construction and throughout operation reducing recharge and groundwater levels and/or increasing runoff and sediment loading, and resulting in changed water support and increased sediment loading for sites	Low	Very Low	Negligible (NS)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change.
Disruption of ground and flow paths and changes to drainage regime during construction and throughout operation increasing runoff and sediment loading, and resulting in changed surface water support and increased sediment loading for sites	Low	Very Low	Negligible (NS)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change.
Dewatering and/or drainage during construction leading to a decline in groundwater levels and baseflow, and resulting in changed water support for sites	Low	Very Low	Negligible (NS)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change.
Discharge to surface water of groundwater intercepted during construction associated with excavation of foundations increasing flows and sediment loading, and resulting in changed surface water support and increased sediment loading for sites	Low	Very Low	Negligible (NS)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change.

Receptor and summary of predicted effects	Sensitivity/ importance/ value of receptor[1]	Magnitude of change[2]	Significance[3]	Summary rationale
Site activities during construction and operation resulting in release of pollutants and subsequent contamination of groundwater and surface waters, and leading to polluted water support for sites	Low	Very Low	Negligible (NS)	Distance, gradient, intervening dilution and the anticipated effectiveness of the embedded environmental measures combine to limit magnitude of change.

1. The value of a receptor is defined using the criteria set out in **Section 8.11** above and is defined as very low, low, medium and high.
2. The magnitude of change on a receptor resulting from activities relating to the development is defined using the criteria set out in **Section 8.11** above and is defined as very low, low, medium and high.
3. The significance of the environmental effects is based on the combination of the sensitivity/importance/value of a receptor and the magnitude of change and is expressed as major (significant), moderate (probably significant) or minor/negligible (not significant), subject to the evaluation methodology outlined in **Section 8.11**.

8.13 Consideration of Optional Additional Mitigation

8.13.1 It would be precautionary to implement some further mitigation. This has been identified through the iterative process of scheme design and would be in addition to those outlined in **Section 8.10**. The additional measures outlined below have not been included in the significance assessment presented in **Section 8.12**.

Micro-Siting

8.13.2 As noted earlier, the Site layout has been informed by micro-siting of infrastructure around hydrological and hydrogeological constraints, but in some cases new infrastructure does impede on buffer zones around receptors. In addition, the baseline information on abstractions and GWDTEs is preliminary. Further micro-siting may be required to avoid abstractions, GWDTEs and peat deposits. This would be undertaken as a result of further site surveys and baseline analysis prior to, and during, construction.

Water Quality Monitoring

8.13.3 To establish whether there are any effects on surface water quality, both in the immediate vicinity of the control building and compound and elsewhere on the Proposed Development and further downstream, a Water Quality Monitoring Plan (WQMP) would be developed and included with the CEMP if consent was granted in consultation with SEPA. Additional remedial action would be taken if pollution relating to the construction and operation of the Proposed Development was identified.

8.14 Conclusions of Significance Evaluation

8.14.1 The summary of the significance of predicted hydrological and hydrogeological effects presented in **Table 8.16** indicates that, based on the environmental baseline and embedded mitigation described in **Sections 8.6** and **8.10** respectively, there are no likely significant adverse effects related to the Project or the two Proposed Developments in isolation.

8.14.2 Nevertheless, additional mitigation over that embedded in the design is always advisable. The additional mitigation presented in **Section 8.13**, namely further micro-siting and an agreed water quality 'monitoring and respond' programme, would be suitably precautionary.

8.14.3 On this basis, with both embedded and additional mitigation in place, standalone effects of the Project and two Proposed Developments in isolation on all water receptors are not significant.

8.15 Implementation of Environmental Measures

8.15.1 **Table 8.17** summarises the environmental measures embedded within the Project and the means by which they would be implemented.

Table 8.17 Summary of Environmental Measures to be Implemented Relating to Hydrology and Hydrogeology

Environmental measure	Responsibility for implementation	Compliance mechanism	HIA Section reference
Pre-construction works: detailed design of watercourse crossings and cable trenching	Geotechnical and design teams	Approval of watercourse crossing design through CAR authorisation process.	8.10
Construction and maintenance of bunding and other works	Site management	Agreed construction method statements followed on site	8.10
Construction and maintenance of watercourse crossings	Site management	Agreed construction method statements followed on site	8.10
Micro-siting of tracks and other infrastructure during construction	ECoW	Agreed construction method statements followed on site, secured by planning condition.	8.12 and 8.13
Implementation of best practice in construction in relation to drainage, soil handling and other potential sources of pollution (e.g., oil)	Site management	Agreed construction method statements and best practice guidance followed on site, secured by planning condition and CAR authorisation process.	8.10
Implementation of best practice in operation, including preventing spills and maintenance of infrastructure	Site management	Ongoing monitoring (see below).	8.12 and 8.13
Design and implementation of water quality monitoring programme	ECoW	Secured by planning condition.	8.13
Updated assessment of GWDTE impacts following further surveys to identify the groundwater connectivity of the M23 habitat.	Geotechnical and design teams	Secured by planning condition.	8.8 and 8.12

8.16 References

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9. Traffic and transport

9.1 Introduction

Background

9.1.1 This Chapter of the EIA Report evaluates the effects of the Project on the Traffic and Transport Resource. This assessment was undertaken by Wood Group (UK) Limited (Wood).

9.1.2 It is supported by the following Technical Appendix documents provided in **Volume 6**:

- Appendix A – Abnormal Indivisible Load (AIL) Dataset.
- Appendix B – Traffic Generation.

9.1.3 This Chapter of the EIA Report is supported by the following figures provided in Volume 6:

- Figure 9.1 – Proposed Development.
- Figure 9.2 – Site Access Design.
- Figure 9.3 – Construction Vehicle Routes.
- Figure 9.4 – Development and Surrounding Transport Infrastructure.
- Figure 9.5 – Local Rail Network.
- Figure 9.6 – Core Path Network.
- Figure 9.7 – Receptors.

9.1.4 A plan of the Project as considered in respect of Traffic and Transport Resource is shown in **Figure 9.1**.

9.1.5 The Project has two key phases when traffic will be generated which are set out below.

- The construction phase will last for an extended period (50 weeks) and will present the worst-case traffic generation for HGVs and light vehicles.
- The operational phase will generate minor traffic movements associated with site maintenance; as well as regular HGV movements to and from the Green Hydrogen Production and Storage Facility to collect hydrogen gas.

9.1.6 Full details of the Project description can be found within Chapter 3 above.

The Project - construction

9.1.7 The Site has good access to the surrounding road network. It is envisaged that all development related vehicles would access the Site from the wider transport network via the M77/A77 corridor. Traffic to and from the north (of the Site) would leave the strategic road network at Junction 6, and traffic to and from the south (of the Site) would leave at Junction 7 and 8 of the M77, route along the A77 to the B764, and then east to the Site.

9.1.8 The construction assumptions that relate to traffic and transport are as follows:

- Construction will take approximately 12 months over a 50-week programme with the bulk of work anticipated in 2022.

- Differing elements of the project will be constructed at differing times as set out in the proposed construction programme, these are as follows:
  - Up to 30MW solar PV farm with access tracks and laydown area.
  - A green hydrogen production facility with associated hardstanding and laydown area.
  - A 50MW BESS with associated hardstanding and laydown area.
  - A new internal permanent access road from the B764 to the Hydrogen Facility.
  - An 8km HV cable connection linking the BESS to the other elements of the scheme as well as providing grid connection opportunities via the existing Whitelee Windfarm Extension substation.
- Permitted core working hours for construction work, shall be between the hours of 07:00 – 19:00 on Monday to Friday inclusive, 08:00 – 16:00 at weekends.
- Deliveries to Site (excluding abnormal loads) during construction will be limited to 07:00 – 19:00 Monday to Friday and 08:00 – 16:00 at weekends.
- The anticipated number of on-site staff varies across the construction programme as various elements of the Development are constructed at differing times. At the peak of construction, approximately 200 staff may be required on site per day.

The Project - operational

9.1.9 There will not be a requirement for a large number of permanent staff at the site as most of the assets can be managed remotely. The solar PV Farm and BESS elements will only require occasional maintenance trips. The solar PV farm and BESS are likely to result in minor light vehicle movements on an occasional basis to a degree where the resultant impact would be classed as negligible;

9.1.10 The green hydrogen production facility will require permanent staffing; this is anticipated to be 8 staff per day to manage hydrogen export activity and associated HGV movements. It is assumed that this would result in 16 light vehicle movements to/from the green hydrogen production facility per 24-hour period depending on shift patterns. It is unlikely there will be anything but a minor impact in the peak traffic periods locally.

9.1.11 The green hydrogen production facility will generate additional HGV movements in the operational phase as the hydrogen is exported across a 24-hour operational period. It is currently estimated that 20 tube trailer tankers are required over each 24-hour period, resulting in 40 HGV movements per day. These movements require to be staggered to allow for concurrent loading – which takes 4 – 6 hours per vehicle - and as such it is anticipated that as a worst case scenario the impact would be limited to a predicted two HGV movements per hour.

9.1.12 Due to the proposed 24-hour nature of the green hydrogen production facility operations and the staggered nature of loading activities, HGV movements would also result in a negligible impact on local traffic flows.

9.1.13 The Chapter does not require further focus on operational activities due to these low anticipated traffic flows and therefore the appraisal hereafter is limited to impacts arising from the construction period.

Site context

9.1.14 The immediate surroundings of the northern area of the Site where the solar PV farm and green Hydrogen facility is proposed comprises coniferous forestry plantation to the immediate north of

the Site boundary between the Site at the B764, plateau moorland and felled coniferous plantation to the south and west which comprises the area of land identified for the Site and the Eaglesham Moor area of the existing Whitelee Windfarm immediately to the east nearby the Lochgoin circuit, Lochgoin reservoir, Lochgoin farmhouse and monument. Within this area, peat bog underlies a significant proportion of the Site at varying depths. The Site layout of the solar PV farm has been selected to avoid areas of deeper peat and concentrate development in areas where peat bog has been identified as being 1m or less in depth.

9.1.15 The immediate surroundings of the southern area of the Site where the BESS is proposed comprises sections of commercial forestry to the north, west and south interspersed with areas of moorland combined with existing access tracks between the existing wind turbines of the Whitelee Windfarm. To the east is situated the existing Rough Hill substation (c. 800m). Distant to the northwest of the BESS is Craigendunton Reservoir (2km).

9.2 Key traffic and transport elements of the Project

Site access

9.2.1 It is proposed that a new Site access in the form of a priority junction will be constructed off the B764. The proposed vehicular access is centred on Grid Reference: NS 49870 47450. As illustrated in **Figure 9.2**, the access has been designed to Design Manual for Roads and Bridges (DMRB) standards with 15m junction radii (17m radii southern side) and 1:10 taper over 25m. This junction has been designed to accommodate the largest construction vehicles required for the Project but this would also be large enough to accommodate the secondary purpose of the operational tube tanker trailers for the green hydrogen production facility.

9.2.2 In accordance with DMRB standards and signed road speed on the B764, visibility splays must adhere to 2.4m by 215m. Splays of this distance can be achieved from the proposed access and are illustrated in the general access arrangement figure.

9.2.3 **Figure 9.2** illustrates the vehicle tracking for the largest construction vehicle required on the Project which is a 17.5m Steel Beam, 5 Axle Doll Transporter. The specifications of this vehicle are as follows;

- Overall Length 20.710m.
- Overall Width 2.550m.
- Overall Body Hight 3.417m.

9.2.4 Whilst deliveries of this nature are unlikely and low in frequency, the swept path analysis illustrates that the largest anticipated construction vehicle entering the bellmouth from the south and also departing to the south can be accommodated within the design parameters. With scheduled timing of deliveries, it is unlikely that two-way passing will occur and no conflicts have been identified. It should be noted that this vehicle is below the threshold for being an Abnormal Load.

9.2.5 The proposed access is subject to discussion and approval from EAC. It is noted that the access will be applied for under the S36 application and that in this regard EAC will be consultee for this application and may choose to provide comments and recommendations to the Energy Consents Unit (ECU) on this, and other traffic and transport matters. It is likely that a condition relating to the access would be contained in the deemed planning conditions associated the deemed grant of planning The proposed access is subject to further discussion and final approval from EAC.

Core Path management

9.2.6 Core Path IV12 runs through the Site. This core path crosses the proposed cable route from the existing substation to the solar PV farm. To minimise the conflict with path users during installation of the underground cable, it is proposed that this area would be managed to allow for the continued use of the route during the construction works.

9.2.7 Works at the core path location (installing cable) will be very brief and only last around one week. During this time the work areas will be securely fenced off and appropriate signage will be in place and a small offline diversion created around the work area to allow safe passage.

9.2.8 As well as the cable works there will also be signage to warn core path users of construction traffic associated with the works All construction operatives will be notified of this important intersection during site induction and the usual site speed limits will apply (20mph).

9.2.9 The formal process to agree a methodology for the path management would be carried out before construction commences and agreed with East Ayrshire Council.

Haul/link road

9.2.10 The access will be approximately 1.5 km long and 7m to provide permeant access to the solar PV farm and to allow for the secondary purpose of allowing for the final operational conveyance of the hydrogen HGVs.

Traffic distribution

9.2.11 In the construction period it is assumed all vehicles will route from the A77/M77 corridor to and from the Development via the A77 and B764.

9.2.12 No vehicles are proposed to route to, or from, the Site via the B764 to the East. The village of Eaglesham is a key constraint on the network and this route would be identified as restricted within the Construction Traffic Management Plan (CTMP) for the Development.

9.2.13 **Figure 9.3** shows the proposed route of the construction vehicles.

9.2.14 In the operational period all (hydrogen) tube trailer tankers will need to route north to Glasgow and as such will follow the B764 and A77 to join the M77 a short distance from the Site access at Junction 6.

9.2.15 Operational staff may route to the Site from home from any route as the numbers are minimal and the local road network can accommodate these movements.

Abnormal loads

9.2.16 There is a requirement for an abnormal load to allow for the conveyance of equipment to the BESS. It is proposed that the vehicle will be a 15.5m, 4 axle Doll Transporter with the following dimensions;

- Overall Length - 20.710m.
- Overall Width – 2.550m.
- Overall Body Hight – 3.417m.
- Minimum Body Ground Clearance – 0.341m.
- Track Width – 2.550m.

- Kerb to Kerb Turning Radius – 6.530m.

9.2.17 **Appendix 6A** of Volume 6 sets out the vehicle design and layout for the conveyance of the abnormal loads.

9.2.18 It is proposed that the abnormal loads would not use the proposed Site access and as such this access has not been designed to accommodate abnormal loads.

9.2.19 To facilitate the AIL to the BESS it is it proposed that the AIL movements would route further to the east and access the Whitelee Windfarm Extension access to Lochgoyn. This route already has an access through to the proposed BESS location. This access has been designed to accommodate AIL movements from the highway with an extension to the road surface on the north side of the carriageway and a large bell mouth.

9.2.20 It is anticipated that the AIL movements would access the Site from the M77 via the A77 and B764. It should be noted that this route was used for the construction of the Whitelee Wind Farm to the east of the Site and this route was able to accommodate turbine blade AIL movements.

9.2.21 To accommodate the Whitelee Windfarm AILs there were changes made to the highways infrastructure that are still in place on the local highways network. These comprise the following:

- On the Southbound off slip of Junction 6 M77, a large road surfaced over run area was constructed.
- There is also a smaller area of hardstanding for AIL movements on the north side of the B764 at the junction with the A77.

9.2.22 It is concluded that the proposed AIL movements can be accommodated on the local highways network and would use a Site access which has been designed to accommodate AILs.

9.2.23 No other elements of the Project require AILs.

Sustainable travel opportunities and travel plan

9.2.24 It is likely that the intended activities at the Site would be vehicular based, with construction a vehicular activity and future maintenance a vehicular activity.

9.2.25 Given the rural location of the Site in relation to the public transport network (the nearest bus stops being some 5.5km away), encouraging construction workers to travel by public transport is not viable. The distance of the Site access from local establishments and lack of footway connection to local amenities also means that travel by alternative sustainable modes is unlikely to be chosen by workers.

9.2.26 An assumption has been made that vehicle sharing may be implemented by the construction contractor(s) during the construction period, with work gangs being housed locally and arriving at and departing from the Site in light vehicles and vans in groups of 2/3/4. This however cannot be guaranteed at application stage and full detail of the management of construction staff movements will be further clarified within the CTMP.

9.2.27 Operationally, as a low number of permanent staff are required and the green hydrogen production facility will be staffed 24-hours per day, modal share would be difficult to achieve. However, to identify and support travel choice initiatives a Travel Information Pack will be developed and distributed to staff. The Travel Information Pack will provide information on travel by sustainable means (e.g., cycling) and will promote car sharing amongst employees where possible. Relevant Policy, Legislation and other Documentation

9.3 Policy and legislation

National 0olicy

National Transport Strategy (NTS2) – February 2020

9.3.1 NTS2 is the Scottish Government's national transport strategy for the next 20 years. The Strategy sets out a framework from which decisions can be made about future investment into Scotland's Transport infrastructure. The Strategy has four overarching themes; reduce inequality, climate action, deliver economic growth, and improve health and wellbeing.

9.3.2 NTS2 identifies that efficient movement of freight is key to the Scottish economy. The strategy states that most freight is moved by HGVs on the road network and highlights that forecasts show freight HGV traffic will increase by 44% from 2014 to 2037.

Scotland's third National Planning Framework (NPF3) – 2014

9.3.3 NPF3 is the spatial expression of The Government Economic Strategy, and of plans for infrastructure investment. It is about the ambition to create great places that support sustainable economic growth across the country.

Scottish Planning Policy (SPP) – 2014

9.3.4 The purpose of the SPP is to set out national planning policies which reflect Scottish Ministers' priorities for operation of the planning system and for the development and use of land.

The Scottish Energy Strategy: The Future of Energy in Scotland – 2017

9.3.5 The Scottish Energy Strategy sets out the Scottish Government's vision for the future national energy system to 2050. It describes the priorities for an integrated approach that considers both the use and supply of energy for heat, power and transport.

Transport Scotland Transport Assessment Guidance – 2012

9.3.6 The Transport Scotland Transport Assessment Guidance aims to assist in the preparation of Transport Assessments for development proposals in Scotland such that the likely transport impacts can be identified and dealt with as early as possible in the planning process. The Guidance sets out requirements according to the scale of development being proposed.

9.3.7 The document notes that a Transport Assessment will be required where a development is likely to have significant transport impacts but that the specific scope and contents of a Transport Assessment will vary for developments, depending on location, scale and type of development.

Local policy

East Ayrshire Local Development Plan 2017 (LDP2017)

9.3.8 EAC are in the early stages of the preparation of Local Development Plan 2 (LDP2). Therefore, the LDP2017 remains a valid document and will continue to do so until such time as it is superseded. LDP2017 sets out the development framework of the EAC area over the next 10-20 years. LDP2017 identifies rural areas as valuable assets in terms of renewable energy potential. The area around the junction 6 of M77 is one of the development corridors which have been identified in Map 1 (settlement hierarchy) of LDP2017.

9.3.9 The following are the LDP2017 transport policies which are relevant to the Project.

- Policy T1: Transport Requirements for New Development states that all new developments should embrace active travel by incorporating new footpaths, cycle routes and public transport routes, and providing links to existing ones.
- Policy T2: Transport Requirements for New Significant Traffic Generating Uses promotes sustainable transport and sets out the requirements to produce a detailed Transport Assessment alongside a Travel Plan (if required).
- Policy T3: Transportation of Freight encourages the transportation of freight by rail rather than by road. However, where appropriate this policy supports the development of 'off road' haulage routes designed to avoid the transportation of bulk freight through area settlements.
- Policy T4: Development and Protection of Core Paths and Natural Routes aims to protects core paths and natural routes. The policy emphasises that a suitable measure should be provided for all core paths affected by development.

9.3.10 A review of the key transport policies indicates that due to the isolated nature of the Project achieving Policy T1 would not be appropriate or relevant. Policy T3 also cannot be achieved due to the absence of a direct rail line near the Site; however, the Project is proposing to use off road haulage routes during construction to avoid the need for a longer routing of HGVs on the local highways network. Policy T4 has been considered in this TS as there are core paths affected by the proposals.

Other relevant and information and guidance

9.3.11 Current guidance for assessing potentially significant environmental effects is the Institute of Environmental Assessment (IEA) publication Guidance Notes No. 1: Guidelines for the Environmental Assessment of Road Traffic (hereafter referred to as GEART). This has been utilised within this assessment.

9.4 Data gathering methodology

9.4.1 The following section sets out the data gathering methodology that has been used to inform the assessments within this Chapter.

Desk study

9.4.2 The desk study included a review of the overall network, public transport and accident data. Further detail is set out in the following sections.

Network review

9.4.3 A detailed review of the local highways network and local Core Paths was undertaken to give an understanding of study area, including sensitive locations such as schools, areas with high pedestrian flows and congested sections of the road network. This review was undertaken using street mapping, aerial photography and Google traffic.

9.4.4 For Core Paths, the details of the local routes and nature of these routes has been taken from the "Core Paths Plan[52]"online mapping provided by EAC.

[52] http://webgis.east-ayrshire.gov.uk/webgis2016/

Accident data

9.4.5 Records of the personal injury accidents (PIAs) have been obtained from the CrashMap[53] database for the five-year period from 2015 to 2019 for the local road network.

Baseline traffic data surveys

9.4.6 In order to understand the existing traffic conditions on the road network surrounding the Site, traffic count data available from Department of Transport (DfT) was interrogated.

9.5 Traffic and transport baseline

Existing site

9.5.1 The Site is located to the southwest of the operational Whitelee Windfarm in East Ayrshire, approximately 25 km southwest of Glasgow city centre. =

9.5.2 The Development is in an isolated location to the west of the windfarm, with the nearest element of the highways network (B764) the North. At present, there are several accesses in the form of informal farm accesses including a standard track which serves Whitelee Windfarm.

9.5.3 The M77 is the closest strategic road to the Development and runs along its north western boundary, providing a direct link to other strategic roads. The M77 can be accessed via both the B764 and A77 at Junction 6. The distance from the nearest edge of the Development to the M77 is 3.2km away.

9.5.4 **Figure 9.4** shows the Development location and the surrounding transport infrastructure.

Sustainable transport

Rail

9.5.5 The nearest railway line is at Stewarton railway station which is located some 11km west of the Development. The station is well served with regular services to major settlements including Glasgow Central and Kilmarnock railway stations. **Figure 9.5** shows the location of Stewarton railway station.

Bus

9.5.6 There is no bus service in the vicinity of the Site. The nearest bus stops are located in Fenwick village which ~5.5 km southwest of the Development. The distance between the Site and Fenwick village exceeds recognised walking distances to bus stops (400m – 600m). Therefore, the Development is not considered to be within walking distance of local bus stops and services.

Walking and Core Path

9.5.7 Core Path 'IV12' runs across the Site between Whitelee Windfarm and Core Path 'IV10' near Hareshaw Hill (Cunninghame). A shared cycle and pedestrian route runs along the northern side of the A77. The local roads around the Site are rural in nature without footways. **Figure 9.6** shows the existing core path through the study area. Cycling

[53] https://www.crashmap.co.uk/

9.5.8 The National Cycle Networks (NCN) Route 73 is located ~12 km south west of the Site in Kilmarnock. NCN 73 is a ~14 km route which runs between Kilmarnock and Irvine, where it then connects to NCN 7.

9.5.9 As outlined above, there is a shared route along the A77. There are on-street cycle lane markings on the B764 between the Whitelee Windfarm access track and Eaglesham to the east.

Summary of sustainable transport

9.5.10 Based on the assessment presented above there are presently very limited opportunities for sustainable transport, due in large part to the remoteness of the Site from surrounding settlements. Access to the Site by sustainable modes of transport would be unlikely due to the nature of the vehicles required to be used during the main traffic generation period, throughout the construction phase.

Local transport network

9.5.11 The local road network is maintained by EAC. The closest strategic road is the M77 which the site is liked to via the B764 and A77. The existing local road network near to the Site is considered to be of a good standard with both the A77 and B764 being well maintained two-lane carriageways.

9.5.12 **Figure 9.4** illustrates the existing road network local to the Project which is summarised below.

- B764 – This road is a two-way single carriageway system running along the northern boundary of the Development. This road runs between the A77 and A726 (East Kilbride). The road is subject to national speed limit (NSL) restrictions apart from the residential areas where it is subject to 30mph maximum. It connects the Project Site to the M77 via the A77. There are no streetlights and footways along this road.
- A77 – This road is a two-way single carriageway system and is subject to NSL restrictions. It runs along the M77 between Junction 8 (near Fenwick) and the A814 (Glasgow city centre). It connects the Site to the M77 at Junction 6. This former trunk road was downgraded to the A77 general purpose road following completion of the M77 motorway. A shared cycle and pedestrian route runs along most sections of the A77 in the vicinity of the Site. There are streetlights along this road in the vicinity of the Project Site.
- M77 – This is a motorway connecting the A77 at Fenwick North to Glasgow. The M77 Junction 6, adjacent to the Development, has restricted access provisions with the following movements not being incorporated:
  - No off slip for northbound traffic on the M77.
  - No on slip for southbound traffic on the A77 all-purpose road.

9.5.13 Traffic wishing to route south must follow the A77 to Fenwick where Junctions 7 and 8 allow for the movements which are otherwise restricted at Junction 6.

Local road safety assessment

9.5.14 Records of the personal injury accidents (PIAs) have been obtained from the CrashMap[54] database for the five-year period from 2015 to 2019 for the local road network.

[54] https://www.crashmap.co.uk/

9.5.15 A total of nine accidents occurred within the assessment area, of which two were serious and seven were slight. One of these accidents involved a vulnerable road user. **Table 9.1** below summarises the number of accidents over the assessment period in the vicinity of the Site.

Table 9.1 Summary of accident record

Road/Junctions	Accident rate per annum	Total Records	Fatal	Serious	Slight	Vulnerable	HGV
B764	0.4	1	0	1	0	0	0
A77	0.4	1	0	0	1	1 (pedal cycle + motorcycle)	0
M77 Junction 8	1.4	7	0	1	6	0	3

9.5.16 The above information shows that there are negligible road accidents on B764 and A77 within the assessment area. The higher total number of accidents on the M77 Junction 8 should be treated with some caution given the nature of the junction and high daily traffic flow.

Base flow traffic data

9.5.17 To understand the existing traffic conditions on the road network surrounding the Site, traffic count data available from Department of Transport (DfT) was interrogated.

9.5.18 Given the ongoing situation with COVID-19, Wood was unable to gather representative baseline data (traffic counts) to inform the TS as flows are not representative of normal traffic conditions. In the absence of the new traffic survey data, available historic data were used and growthed, using DfT's Trip End Model Presentation Program (TEMPro) growth rates to form the basis for assessment of the Project.

9.5.19 The following is the historic traffic data which have been used to develop the 2020 Baseline traffic flow:

- B764 (west of High Dam Trout Fishery) – year 2019 Annual Average Daily Traffic (AADT) (DfT count location ID 950486).
- A77 (east of M77) – year 2019 AADT (DfT count location ID 90196).
- A77 (west of M77) – year 2019 AADT (DfT count location ID 90195).

9.5.20 The raw traffic count survey is available on the DfT website. It should be noted that no data was sought for the M77 as the proportional increase in traffic as a result of the Project is insignificant.

9.5.21 **Table 9.2** below shows the 2019 two-way AADT traffic which were obtained from DfT website.

Table 9.2 2019 two-way (AADT)

Road	All Vehicles	HGV
B764	1525	20
A77 (East of M77)	4392	155
A77 (West of M77)	3427	160

9.5.22 Levels of background traffic growth are variable, dependent upon the predicted increase in economic activity within the area. The background daily traffic growth expected between 2019 and 2020 in East Ayrshire has been calculated as 1.0103. The growth rate has been developed based on the National Trip End Model (NTEM) growth rates extracted from the DfTs Trip End Model Presentation Program (TEMPro) 7.2 software for the East Ayrshire area.

9.5.23 The current 2020 base traffic flow calculated based on the TEMPro rate has been shown below in **Table 9.3** below.

Table 9.3 2020 baseline traffic

Road	All Vehicles	HGV
B764	1541	20
A77 (East of M77)	4437	157
A77 (West of M77)	3462	162

Background traffic growth

9.5.24 To inform the assessment in this Chapter predictions of future year traffic are also required. The project is anticipated to have a construction traffic peak in 2022, details of which are set out later in this Chapter.

9.5.25 Levels of background traffic growth are variable, dependent upon the predicted increase in economic activity within the area. The background traffic growth expected between 2019 and 2022 in East Ayrshire has been calculated as 1.0281. The growth rate is based on National Trip End Model (NTEM) growth rates extracted from the DfTS TEMPro 7.2 software for the East Ayrshire area.

9.5.26 **Table 9.4** below shows the 2022 future base AADT (two-way) on the local road network.

Table 9.4 2022 future base AADT

Road	All Vehicles	HGV
B764	1568	21
A77 (East of M77)	4515	159
A77 (West of M77)	3523	164

9.5.27 Near the Site, a planning register check has indicated that there are no significant committed developments which will have impact on the road network within the assessment area. Therefore,

committed development traffic has not been considered in the calculation of the future background traffic.

9.6 Scope of the assessment

9.6.1 This Section sets out information on the process whereby receptors are identified, the potential receptors that could be affected by the Project and the potential effects on receptors that could be caused by the Project and its individual components.

9.6.2 The scope of assessment has been informed by GEART and Wood's Traffic and Transport consultants experience.

Approach to identifying receptors

9.6.3 The identification of receptors is based on the guidance set out in GEART. Receptors are:

- Local roads and the users of those roads, including public transport users, pedestrians, cyclists and equestrians.
- Land uses and environmental resources fronting those roads, including the relevant occupiers and users.

Spatial and temporal scope

9.6.4 The spatial scope of this assessment includes local highways network taking between the proposed site access and the M77. Once traffic reaches the M77 it is considered that the impact of the development traffic is negligible.

9.6.5 The temporal scope of this assessment has been established above as 2022, the peak year of the construction traffic.

Potentially significant effects

9.6.6 The types of effect that could be expected during the construction and operational phases of the Project are taken from the GEART and are presented in **Table 9.5**. Those effects of relevance to this Chapter are highlighted in bold text. The remaining issues are considered within the other Chapters of this assessment.

Table 9.5 Traffic related environmental effects identified in GEART

Types of Traffic Related Environmental Effects		
Noise	**Fear and Intimidation**	Heritage and Conservation
Vibration	**Accidents and Safety**	**Pedestrian** Delay
Visual Effects	**Hazardous Loads**	Ecological Effects
Severance	Air Pollution	**Pedestrian Amenity**
Driver Delay	Dust and Dirt	

9.6.7 The potentially significant effects from the Project, which are subject to further discussion in this Chapter, are summarised below. All other effects in **Table 9.5** are discussed within the corresponding Technical Assessment Chapters of this EIA Report.

Severance

9.6.8 Severance is the perceived division that can occur within a community when it becomes separated by an increase in traffic on a route that separates people from other people and places. For example, severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to locations where even low increase in traffic flows impede pedestrian access to essential facilities.

9.6.9 The effects of severance can be applied to motorists, pedestrians or residents, but it is recognised that there are no predictive formulae which give simple relationships between traffic factors and levels of severance.

9.6.10 The GEART state that marginal changes in traffic flow are unlikely to create or remove severance, but that consideration in determining whether severance is likely to be an important issue should be given to factors such as road width, traffic flow and composition, traffic speeds, the availability of crossing facilities and the number of movements that are likely to cross the affected route. Consideration should also be given to different groups such as the elderly and young children.

Driver delay

9.6.11 Delays to non-development traffic can occur at several points on the local highway network as a result of the additional traffic that would be generated by a development. The GEART state that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.

Pedestrian delay

9.6.12 Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads and therefore, increases in traffic levels are likely to lead to greater increases in delay. Delays will also depend upon the general level of pedestrian activity, visibility and general physical conditions of the crossing location.

9.6.13 Given the range of local factors and conditions which can influence pedestrian delay, the GEART do not recommend that thresholds be used as a means to establish the significance of pedestrian delay, but recommend that reasoned judgements be made instead.

Pedestrian amenity

9.6.14 Pedestrian amenity is broadly defined as the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width/separation from traffic.

Fear and intimidation

9.6.15 The scale of fear and intimidation experienced by pedestrians is dependent on the volume of traffic, its HGV composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths, as well as factors such as the speed and size of vehicles.

9.6.16 The GEART also note that special consideration should be given to areas where there are likely to be particular problems, such as high-speed sections of road, locations of turning points and accesses. Consideration should also be given to areas frequented by school children, the elderly and other vulnerable groups.

Accident and safety

9.6.17 Where a development is expected to produce a change in the character of the traffic on the local road network, as a result of increased HGV movements for example, the GEART state the implications of local circumstances or factors which may elevate or lessen risks of accidents, such as junction conflicts, would require assessment in order to determine the potential significance of accident risk.

Hazardous loads

9.6.18 Some developments may involve the transportation of dangerous or hazardous loads by road and this should be recognized within the assessment. The GEART note that the number of movements should be calculated and if it is considered to be significant then a risk analysis should be undertaken.

9.6.19 The transport of dangerous goods by road must adhere to package and transport according to international regulations. The United Nations (UN) Model Regulations put the rules on the different transportation methods into a classification system. This system assigns each dangerous substance or article a class that defines the type of danger the substance presents. The packing group (PG) then further classifies the level of danger according to PG I, PG II or PG III.

9.6.20 For the operational period of the Hydrogen Facility there will be a need to transport the gas Hydrogen out of the site. A review of Department for Transport guidance states that all flammable gas is considered as a UN2 classification and is considered a hazardous load.

9.6.21 It is currently estimated that 20 tube trailer tankers are required over each 24-hour period, resulting in 40 HGV movements per day, only 20 of which would be deemed as a hazardous load.

9.6.22 All Hydrogen will be transported by suitably qualified contractors, and all regulations for the transportation and storage of hazardous substances will be observed. The local road network has a good accident record the M77. Once on the M77 traveling north our southbound (final destinations of the Hydrogen are net yet confirmed) the tankers will pose the same risk as fuel tankers on the road network which are permitted in appropriate vehicles with transport specific transportation mitigation.

9.6.23 All tankers will route on good standard two lane loads and the route from the site to the M77 only passes one priority and little in the way of pedestrian.

9.6.24 No other hazardous substances are expected to be transported to/from site. It is therefore considered that the effect of the transportation of hazardous substances is negligible and not significant as per the EIA Regulations and no further assessment is required.

9.7 Assessment methodology

Methodology for Screening

9.7.1 The guidance that is followed when assessing the potential significance of road traffic effects is summarised in GEART, which states that:

"The detailed assessment of impacts is…likely to concentrate on the period during which the absolute level of an impact is at its peak, as well as the hour at which the greatest level of change is likely to occur." (Paragraph 3.10).

9.7.2 To assess the impact at its peak, the likely percentage increase in traffic is determined by comparing estimates of traffic generated by the Project with future predicted baseline traffic flows on the road links in the study area.

9.7.3 In order to define the scale and extent of this assessment, the GEART guidelines identify the following rules by which to undertake an assessment of potentially significant traffic and transport related environmental effects:

- Rule 1: Include roads where traffic flows are predicted to increase by more than 30% (or where the number of HGVs are predicted to increase by more than 30%).
- Rule 2: Include any specifically 'sensitive' areas where traffic flows are predicted to increase by 10% or more.

9.7.4 The 10% threshold in rule two considers daily variations in traffic levels which are typically around 10%, meaning that an increase in traffic levels of less than 10% is not likely to have an undesirable effect and would not require assessment.

Receptor sensitivity

9.7.5 The sensitivity of each highway link included in the assessment has been assigned a sensitivity in accordance with GEART. This is based on the proximity of sensitive receptors to the highway link and the highway environment. **Table 9.6** summarises the rationale used to determine the sensitivity against the corresponding receptors as part of the assessment as contained in GEART. Professional judgement is also used to determine the sensitivity of the receptor.

Table 9.6 Receptor sensitivity

Sensitivity	Description/reason	Receptor
High	Receptors of greatest sensitivity to traffic flows: schools, colleges, playgrounds, accident blackspots, retirement homes and urban/residential homes without footways that are used by pedestrians and cyclists	Residents/workers travelling to and from work or home on foot and by bicycle, school children, leisure walkers and equestrians
Medium	Traffic flow sensitive receptors including: congested junctions, doctors' surgeries, hospitals, shopping areas with roadside frontage, roads with narrow footways, unsegregated cycle ways, community centres, parks, recreation facilities	Residents/workers travelling to and from work or home on foot and by bicycle, people visiting these land uses
Low	Receptors with some sensitivity to traffic flows: places of worship, public open space, nature conservation areas, listed buildings, tourist/visitor attractions and residential areas with adequate footway provision	Residents/workers travelling to and from work or home on foot or bicycle and people visiting these land uses

Sensitivity	Description/reason	Receptor
Negligible	Receptors with low sensitivity to traffic flows: Motorway and Dual Carriageways and/or land uses sufficiently distant from affected routes and junctions	Residents/workers travelling by foot or by bicycle

9.7.6 Sensitivity judged as High or Medium results in Rule 2 being considered for that highway link. Sensitivity judged as Low or Negligible results in Rule 1 being considered for that highway link.

9.7.7 Given the potential receptors described, **Table 9.7** identifies the sensitivity of highway link and the GEART Rule that applies.

9.7.8 In terms of defining 'sensitive' areas, according to the GEART, some highway links assessed are considered to be 'sensitive' due to the fact that they have residential properties fronting the link or pedestrian activity. Therefore, a change of 10% or more in the total traffic flows or a change of 30% in the number of HGVs would trigger a detailed evaluation of the effects.

9.7.9 To determine the sensitivity of each receptor, considerations taken from GEART, have been used as a basis for identification of sensitive receptors:

- People at home.
- People at work.
- Sensitive groups including children, elderly and disabled.
- Sensitive locations such as hospitals, churches, schools and historical buildings.
- People walking.
- People cycling.
- Open spaces, recreational areas, shopping areas.
- Sites of ecological/nature conservation value.
- Sites of tourist/visitor attractions.

9.7.10 All other receptors which are not considered sensitive, are predominantly non-residential in nature, have low pedestrian footfall, or have a road environment suited to the proposed activity and its associated traffic. These links are still assessed as part of this Chapter as it is these links that are proposed to experience the largest increase in total vehicles and HGVs and may trigger the 30% threshold.

9.7.11 **Table 9.7** summarises the receptors that have been identified for this assessment and the resultant sensitivity as identified by GEART and use of professional judgement. These receptors and the corresponding highway links are also presented in **Figure 9.7**.

Table 9.7 Sensitivity of highway links where receptors have been identified

ID	Highway Link	Comments	Receptor sensitivity	Assessment (Rule 1/Rule 2)
1	B764	Two-way B road with one properties adjacent to highway but no footways	Negligible	1
2	A77 (East of M77)	Two Way trunk road with no adjacent properties and footway on one side of road	Negligible	1
3	A77 (West of M77)	Two-way trunk road with some properties adjacent to carriageway and segregated footway	Negligible	1

9.7.12 **Table 9.8** provides details of thresholds used to determine the magnitude of levels of each transport effect based on guidance within GEART.

Table 9.8 Magnitude of effect

Transport effect	Magnitude of effect			
	Major	**Moderate**	**Minor**	**Negligible**
Severance	Change in total traffic or HGV flows over 90% And/or Where there will be a temporary maximum increase in pedestrian journey length of 500m or more along a road or other Public Right of Way for more than 6 months over a 12-month period	Change in total traffic or HGV flows of 60-90% And/or Where there will be a temporary maximum increase in pedestrian journey length of 250m – 500m along a road or other Public Right of Way for a 3-6-month period over 12 months	Change in total traffic or HGV flows of 30-60% And/or Where there will be a temporary increase in pedestrian journey length of up to 250m along a road or other Public Right of Way for between 4 weeks and 3 months over a 12 month period	Change in total traffic or HGV flows of less than 30% And/or Where there will be no temporary increase in pedestrian journey length.
Driver delay	Change in total traffic or HGV flows over 90%	Change in total traffic or HGV flows of 60-90%	Change in total traffic or HGV flows of 30-60%	Change in total traffic or HGV flows of less than 30%
Pedestrian amenity and delay, fear and intimidation	Change in total traffic or HGV flows over 90%	Change in total traffic or HGV flows of 60-90%	Change in total traffic or HGV flows of 30-60%	Change in total traffic or HGV flows of less than 30%
Accidents and road safety	Informed by a review of existing collision patterns and trends based upon the existing personal injury accident records and the forecast increase in traffic.			

Significance evaluation methodology

Effect evaluation

9.7.13 The classification of a likely traffic and transport effect is derived by considering the sensitivity of the receptor (derived from **Table 9.6**) against the magnitude of impact (derived from **Table 9.8**) as defined in **Table 9.9.**

Table 9.9 Significance matrix

Receptor sensitivity	Magnitude of effect				
		Major	**Moderate**	**Minor**	**Negligible**
	High	Major adverse – Significant	Major adverse – Significant	Moderate adverse – Significant	Negligible
	Medium	Major adverse – Significant	Moderate adverse – Significant	Minor to moderate adverse – Not significant	Negligible
	Low	Moderate adverse – Significant	Minor to moderate adverse – Not significant	Minor adverse – Not significant	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

9.7.14 The following terms have been used to classify the level of effects, where they are predicted to occur:

- Major adverse or Major beneficial – where the development would cause a significant deterioration (or improvement) to the existing environmental effect.
- Moderate adverse or Moderate beneficial – where the development would cause a noticeable deterioration (or improvement) to the existing environmental effect.
- Minor adverse or Minor beneficial – where the development would cause a small deterioration (or improvement) to the existing environmental effect.
- Neutral – no discernible deterioration or improvement to the existing environment.

9.7.15 Note that for the purposes of the ES, Major and Moderate adverse effects are considered to be significant, whilst Minor and Negligible adverse effects are considered 'neutral/not significant'.

9.7.16 Effects can also be described, for example, as:

- Beneficial, negligible or adverse.
- Temporary (short term, medium term, long term) or permanent.
- Local, district, regional or national.

Methodology for assessing environmental effects

9.7.17 In relation to traffic and transport, the significance of each effect identified in **Section 9.7** has been considered against the criteria within GEART , where possible. However, GEART states that:

'For many effects there are no simple rules or formulae which define thresholds of significance and there is, therefore, a need for interpretation and judgement on the part of the assessor, backed-up by data or quantified information wherever possible. Such judgements will include the assessment of the numbers of people experiencing a change in environmental impact as well as the assessment of the damage to various natural resources.' (Paragraph 4.5).

Severance

9.7.18 There are no predictive formulae which give simple relationships between traffic factors and levels of severance. GEART states that changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance. In general, marginal (slight) changes in traffic flow are, by themselves, unlikely to create or remove severance. The magnitude of

effect can also be assessed against increases in pedestrian journey length along roads and/ or PRoWs.

Driver Delay

9.7.19 GEART states that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system. The capacity of a road or a particular junction can be determined by establishing the ratio of flow to capacity (RFC).

9.7.20 For this assessment, criteria from GEART has been used to assess the effects on traffic levels and driver delay, which states the need for assessment where changes in traffic flows exceed 30%.

Pedestrian Delay

9.7.21 Given the range of local factors and conditions which can influence pedestrian delay, GEART does not recommend that thresholds be used as a means to establish the significance of pedestrian delay, but recommend that reasoned judgements be made instead. However, GEART suggests a lower threshold of 10 seconds delay and upper threshold of 40 seconds delay which, for a link with no crossing facilities, equates to the lower threshold of a two-way flow of 1,400 vehicles per hour.

Pedestrian Amenity

9.7.22 GEART notes that changes in pedestrian amenity may be considered significant where the traffic flow is halved or doubled, with the former leading to a positive effect and the latter a negative effect.

Accidents and Safety

9.7.23 Informed by a review of existing collision patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic.

9.8 Assessment of effects

9.8.1 To undertake the assessment of effects traffic generated by the Project, the Project traffic flows need to be estimated and trips need to be distributed on to the road network. The methodology that has been developed is provided in the TA provided to support the DCO.

9.8.2 In this Chapter, assessment will only be provided for the worst-case traffic flow scenario, which is for the construction traffic.

9.9 Development traffic generation

9.9.1 As set out earlier in this TS, the assessment of peak traffic related to the Project is based on the construction phase. To identify peak traffic generation associated with the Project, predictions of the traffic generation of all components of the Project have been made. **Appendix 6B** of Volume 6 sets out the summary of the proposed traffic generation set out below across the construction programme so that peak periods for HGVs and total vehicles can be identified.

Trip generation overview

9.9.2 The trip generation for the Project has been based on understanding the trip generation its separate components spread across the proposed 53-week construction period. The components considered are as follows:

- Site set up and construction compound.
- green hydrogen production facility.
- solar PV farm.
- BESS.
- HV cable.
- proposed permanent haul/link road and new junction to/from B764.

9.9.3 This Section will set out the traffic generation associated with Site components and conclude with a prediction of traffic across the whole construction programme, with a focus on the peak week for construction traffic.

Assumptions for traffic generation

9.9.4 The following assumptions have been used for the calculation of HGV traffic generation:

- 26 tonnes of concrete per HGV.
- 20 tonnes of stone per HGV.
- 20 tonnes of asphalt/Road Surface per HGV.
- 2.41 tonnes of concrete per m^3.
- 1.8 tonnes of stone per m^3.
- 2.4 tonnes of asphalt per m^3.
- A five day working week.
- Figures above have been rounded to nearest even number to account for two-way HGV traffic movements.

Construction compound

9.9.5 This element includes for the provision of an onsite construction compound, delivery of plant, and staff to undertake this work.

9.9.6 It is proposed this work is undertaken across Weeks 2 to 4 of the construction phase.

HGV traffic

9.9.7 In week two its predicted there will be 4 deliveries of material (8 two-way movements) as well as one delivery of plant (one two-way movement). In addition, HGVs will be required to deliver stone for the hard-standing area and parking areas. The construction compound requires 2100m^2 of space. The construction compound will be 0.3m deep, so a total of 630m^3 of stone is required. Based on our assumptions, this is 1,134 tonnes of stone, which equates to 57 HGV deliveries or 114 two-way movements.

9.9.8 These movements will be spread across all three weeks of the initial compound setup.

Light vehicles traffic

9.9.9 Works at the construction compound in Week 2 will require 10 staff on site per day, arriving and departing in teams of 2 in 5 LVs (10 two-way LV movements per day, or 50 per week).

9.9.10 Works in Weeks 3 and 4 will require 6 staff on site per day, arriving and departing in teams of 2 in 3 LVs (6 two-way LV movements per day, or 30 per week).

Green hydrogen production facility

9.9.11 This element includes for the construction of the green hydrogen production facility, including the import of stone, concrete, and ancillary deliveries. It also includes for the onsite roads and other elements of equipment.

9.9.12 It is proposed that the green hydrogen production facility is constructed across Weeks 1 to 50, with initial civils works and platform construction in Weeks 1 to 10 and the remaining plant works in Weeks 11 to 50.

HGV traffic

9.9.13 HGV traffic generation for this element of the construction programme includes for;

- Stone deliveries.
- Concrete deliveries.
- Deliveries of poly membrane and fabric reinforcement mesh.
- Deliveries of gravel.
- Deliveries of equipment, piping, and plant.
- Deliveries of material for a bonded road surface.

9.9.14 4,754.23m^2 of concrete is required for the foundations of all buildings needed as part of the green hydrogen production facility. With a large depth needed for a solid foundation, 1.5m of peat will be excavated and replaced with stone and concrete. The peat will be removed and used elsewhere on site.

9.9.15 Estimating a depth of 1.2m of stone and 0.3m of concrete for the foundation, 3,437 tonnes of concrete and 10,269 tonnes of stone is required. This equates to 132 HGVs undertaking concrete deliveries and 513 HGVs undertaking stone deliveries. This totals 646 deliveries, or 1,292 two-way HGV movements.

9.9.16 There is also the need to construct internal roads and parking area with a combined surface area of 2,290m^2. It is anticipated that this will require a fill depth of 1.3m of stone and 0.2m for a bonded road surface, which is 5,359 tonnes of stone and 458 tonnes of road surface material. This equates to 268 HGVs undertaking stone deliveries and 55 HGVs undertaking asphalt deliveries, which is 323 deliveries or 646 two-way HGV movements.

9.9.17 There is also a need for 30 HGV deliveries or 60 two-way HGV movements for other road elements such as kerbs and drainage elements.

9.9.18 The remaining site area also requires stone to fill a void of 1.5mleft by peat that will be removed, which will require another 17,571 tonnes of stone across 1,758 two-way HGV movements.

9.9.19 In addition, other materials will be delivered by HGVs as follows:

- Poly Membrane – 1 delivery, or 2 two-way HGV movements.

- Fabric Reinforcement – 6 deliveries, or 12 two-way HGV movements.
- Gravel – 37 deliveries, or 74 two-way HGV movements.
- Equipment, Piping and other facility materials – 150 deliveries, or 300 two-way HGV movements.
- Additional Construction Plant – 38 deliveries, or 76 two-way movements.

9.9.20 In total, there will be 1,378 two-way HGV movements in Weeks 1 to 10, and 2,749 in Weeks 11 to 50.

Light vehicle traffic

9.9.21 Construction of the green hydrogen production facility in Weeks 1 to 10 will require 30 staff on site per day, arriving and departing in teams of 4 in 8 LVs (16 two-way LV movements per day, or 80 per week).

9.9.22 Construction in Weeks 11 to 52 will require 50 staff on site per day, arriving and departing in teams of 4 in 13 LVs (26 two-way LV movements per day, or 130 per week).

Solar PV farm

9.9.23 This includes for the construction of the solar PV farm including the import of stone for access tracks, solar PV farm and cable and other ancillary equipment.

9.9.24 It is proposed that this facility is constructed across Weeks 1 to 28. Mobilisation and initial civils works would occur in weeks 1 to 4 and access tracks will be constructed across weeks 5 to 20. The initial Site access would be established in weeks 1-10. The solar PV farm frames would be constructed across Weeks 5 to 15, the panels erected across Weeks 9 to 20 and the cabling installed across Weeks 17 to 28.

HGVs

9.9.25 There is a requirement for various deliveries across the differing stages of the construction of the solar PV farm as follows:

- The initial civils works for the solar PV farm in Weeks 1 to 4 will result in 108 two-way HGV movements in total, or 28 per week.
- The delivery and construction of the solar panel frames in Weeks 5 to 15 will result in 270 two-way HGV movements in total, or 26 per week.
- The delivery and installation of the solar panels in Weeks 9 to 20 will result in 528 two-way HGV movements in total, or 44 per week.
- The delivery and installation of the cabling in Weeks 17 to 28 will result in 738 two-way HGV movements in total, or 62 per week.
- The construction of access tracks and delivery of materials for this work in Weeks 5 to 20 will result in 216 two-way HGV movements in total, or 14 per week.

Light vehicle traffic

9.9.26 There is a requirement for staff across the different stages of the construction of the solar PV farm as follows:

- The initial civils works in Weeks 1 to 4 will require 5 staff on site, arriving and departing in one LV per day (2 two-way LV movements per day, or 10 two way movements per week).
- The delivery and construction of the solar panel frames in weeks 5 to 15 will require 10 staff on site, arriving and departing in teams of 2 in 5 LVs per day (10 two-way movements per day, or 50 per week).
- The delivery and installation of the solar panels in Weeks 9 to 20 will require 10 staff on site, arriving and departing in teams of 2in 5 LVs per day (10 two-way movements per day, or 50 per week).
- The delivery and installation of the cabling in Weeks 17 to 28 will require 10 staff on site, arriving and departing in teams of 2 in 5 LVs per day (10 two-way movements per day, or 50 per week).
- The construction of the access tracks in Weeks 5 to 20 will require 5 staff on site, arriving and departing in 1 LV per day (2 two-way LV movements per day, or 10 two way movements per week).

BESS

9.9.27 This element includes for the construction of the BESS including stone imports, equipment required for the BESS and cable and other ancillary equipment.

9.9.28 It is proposed that this facility is constructed across Weeks 17 to 53. A smaller compound near the BESS will be set up in Weeks 17 to 21 and the BESS constructed Weeks 23 to 53.

HGVs

9.9.29 In Weeks 17 to 21 the existing hard standing area near the proposed BESS will be extended which will result in 200 two-way HGV movements in total, or an average of 40 two-way movements per week.

9.9.30 In Weeks 22 to 53 the remainder of the Site will be constructed. This would result in the following:

- Concrete – 556 two-way movements.
- Steelworks, Fencing, Ducting, Earthing, cabling – 120 two-way movements.
- TX - 32 two-way movements.
- Battery Module Deliveries (Racks and Low Voltage) – 132 two-way movements.
- Inverters – 16 two-way movements.
- Water Tank, HVAC Condensers, grid equipment – 20 two-way movements.
- Road Stone – 78 two-way movements.

This results in a total of 954 HGV movements across the 32 weeks of the programme, or an average of 20 two-way movements per week and 6 two way movements per day.

Light vehicle traffic

9.9.31 The BESS construction in Weeks 17 to 53 will require 10 staff on site, arriving and departing in teams of 2 in 5 LVs per day (10 two-way LV movements per day, or 50 per week).

Grid connection

9.9.32 This element includes for the connection of the solar PV farm, and BESS component to the Grid, which includes installation of 5km of new underground HV cable.

HGVs

9.9.33 It is proposed that this HV cable is installed between Weeks 9 to 24. Across these weeks there is the need for the following HGV movements:

- Cable Ducts – 14 two-way movements.
- Limestone Dust/Sand – 352 two-way movements.
- HV Cable - 30 two-way movements.
- Plant requirements – 80 two-way movements.

9.9.34 This results in a total of 554 two-way HGVs across the 16 weeks of the programme, or 34 two-way movements per week.

9.9.35 It should be noted that this calculation includes for the removal of the stone roads at the end of the construction of the new cable. This has been assumed as a worst case as it is likely this road will remain in situ and form part of the network of access tracks in the area for forestry works.

Light vehicle traffic

9.9.36 The cable installation in Weeks 9 to 24 will require 15 staff on site, arriving and departing in teams of 3 in 5 LVs per day (10 two-way LV movements per day, or 50 per week).

Site access

9.9.37 This element includes for the construction of a new permanent access in two stages. The access will be approximately 1.5 km long and 7m to provide permeant access to the solar PV farm and to allow for the secondary purpose of allowing for the final operational conveyance of the hydrogen HGVs. The first stage in Weeks 1 to 10 will create a stone-based road of 7.5m width suitable for construction traffic during the following period. A second stage from Weeks 43 to 47 would then be used to finish the road and surface the highway.

HGVs

9.9.38 In the first stage in weeks 1 to 10 there will be a requirement for 3,600 tonnes of stone/cement strengthened sand for the base of the road, resulting in the need for 360 two-way HGV movements in total, or an average of 36 two-way movements per week.

9.9.39 In the second stage in Weeks 43 to 47 a road surface will be provided resulting in the need for 480 two-way HGV movements in total, or an average of 96 two-way movements per week.

Light vehicle traffic

9.9.40 Works in Weeks 1 to 10 and also in weeks 43 to 47 will require 15 staff on site per day, arriving and departing in teams of mixed size in 5 LVs (10 two-way LV movements per day, or 50 per week).

Proposed total traffic generation per week

9.9.41 **Appendix 6B** of Volume 6 sets out the total traffic generation per day across the programme for HGVs, LVS and total vehicles based on a five-day working week for a robust assessment for the solar PV farm, Hydrogen Facility, BESS, Grid Connection and site mobilisation and reinstatement.

9.9.42 This indicates a peak of 128 two-way HGV movements per day (64 HGV deliveries per day, or approximately 5 HGV two-way movements per hour) in Week 10, and a peak of light vehicles of 66 two-way vehicle movements per day (33 arrivals and 33 departures) in Weeks 11 to 20.

9.9.43 The overall traffic generation peak is expected in Week 10, when the Project construction is predicted to have 122 two-way vehicle movements per day.

Trip distribution

9.9.44 During the construction phase of the Project its assumed that 80% of vehicles will route to or from the north via the M77, leaving the M77 at Junction 6 and routing to site via the A77 and B764.

9.9.45 The remaining 20% are anticipated to route from the south via the A77. With the restricted junction movement at Junction 8, these movements are anticipated to route along the A77 west and use Junctions 7 or 8 of the M77.

9.10 Impact of development traffic on the local highways network

Local road network

9.10.1 'Future Year 2022' and a 'Future Year 2022 + Development' scenarios have been developed to understand the change in traffic flow on the local road network associated with the Project. **Table 9.10** sets out the changes in daily traffic between the two scenarios for Week 10 (2022), which is the traffic generation peak during the construction period.

Table 9.10 2022 future year traffic comparison – daily traffic

Link No	Link	2022 Future Year		2022 Future Year+ Development		Difference			
		Total Veh	HGV	Total Veh	HGV	Total Veh	Total Veh %	HGV	HGV%
1	B764	1568	21	1689	84	121	8%	64	311%
2	A77 (East of M77)	4515	159	4636	223	121	3%	64	40%
3	A77 (West of M77)	3523	164	3547	177	24	1%	13	8%

9.11 Assessment of effects on highways links

9.11.1 There are two locations where the volume of traffic exceeds the impact threshold percentages require further assessment. All three locations were to be assessed to rule 1 from GEART a 30%

threshold for the increase in total traffic or HGVS. The two locations which have triggered the need for detailed assessment are;

- B764 – 311% increase in HGVs.
- A77 (East of the M77) – 40% increase in HGVs

9.11.2 The implications of effects on receptors are considered in the following Sections.

B764

9.11.3 As set out in **Table 9.10** the total HGV flows are predicted to increase by 311% over the 24 hour period (and increase of 64 HGVs). Based on **Table 9.6** the sensitivity of the receptor has been identified as negligible and based on **Table 9.8**, as the change in HGVs is more than 90% the magnitude of effect is considered to be major. The overall significance is therefore considered to be negligible as set out in **Table 9.9**, and there is no need for an assessment of the environmental effects.

A77 (east of M77)

9.11.4 As set out in **Table 9.10** the total HGV flows are predicted to increase by 40% over the 24 hour period (and increase of 64 HGVs). Based on **Table 9.6** the sensitivity of the receptor has been identified as negligible and based on **Table 9.8**, as the change in HGVs is in the 30-60% bracket the magnitude of effect is considered to be minor. The overall significance is therefore considered to be negligible as set out in **Table 9.9**, and there is no need for an assessment of the environmental effects.

9.11.5 For further context the HGV movements at both locations would be spread out across the working day, resulting in an average of 6 additional HGVs per hour or one HGV every 10 minutes during the traffic generation peak in Week 10.

9.11.6 Outside of Weeks 9 and 10, there would be less than 60 HGV movements per day, and for a significant majority of the weeks there would be less than 40 HGV movements per day. The temporary nature of this peak in Weeks 9 and 10 needs to be considered when understanding the level of impact, as set out in **Appendix 6B** of Volume 6.

9.11.7 With respect to LV and other small vehicle movements, in Week 10 this would result in 58 (rounded) two-way movements per day, or 29 arrivals and 29 departures. With the variety of work ongoing in Week 10, shift times would be staggered to be earlier and later than the background traffic peak hours. Construction work typically starts at 7am, and staff would need to arrive before this.

9.11.8 In summary, it is anticipated that there would be an additional 6 HGVs during AM and PM peak hours. As a worst-case scenario, if all staff were to arrive and depart during the respective peaks, this would be a total of 35 additional vehicles during AM and PM peak hours or 41 vehicle movements in both peak hours.

9.11.9 Taking into account the above the impact of the development during the construction phase of the development is considered to be negligible,

Local road network capacity assessment

9.11.10 In addition to the environmental assessment above The '2022 Future Year with Development - Cumulative' traffic flows on the local highways network have been assessed against the traffic capacity threshold recommendations for rural roads (as applicable to all three links), in Table 5/3/1

of DMRB Volume 15[55] (Economic Assessment of Rod Schemes in Scotland, October 2015) to understand the impact of Project traffic on the capacity of the local road network.

9.11.11 Whilst this guidance has been withdrawn recently (March 2020), it is still a point of reference as it has not been replaced by alternative guidance.

9.11.12 For a robust assessment this looks at a scenario in Week 10 where all light vehicles for staff arrive at the Site in the morning peak and leave in the evening peak and includes 6 two-way HGV movements resulting in 41 total trips in the AM and PM peak hours.

9.11.13 **Table 9.11** shows the summary of link capacity.

Table 9.11 Link capacity – 2022 future year with development traffic – Week 10 peak - cumulative

Link No	Link	2022 Future Year + Development (hourly two way)		Recommended Hourly Traffic Flow Based on DMRB Volume 15 (hourly two-way)	
		All Veh (AM)	All Veh (PM)	All Veh	Category
1	B764	163	170	2400	Rural – typical single (7.3m)
2	A77	391	412	2400	Rural – typical single (7.3m)
3	A77	281	298	2400	Rural – typical single (7.3m)

9.12 Conclusions of significance evaluation

9.12.1 **Table 9.12** summarises the significance of road traffic effects on receptors as a result of changes in traffic flows on the local road network that would arise from the Project.

Table 9.12 Summary of significance

Link	Sensitivity of Receptor	Magnitude of Effect	Level of Significance	Environmental Effect	Significance
1	**Negligible**	**Major**	**Negligible**	**N/A**	N/A
3	Negligible	**Minor**	**Negligible**	**N/A**	N/A

[55] http://www.sias.co.uk/2013/TS/The%20NESA%20Manual%20-%20October%202015.pdf

Appendix 1A
List of competent experts

Competent experts involved in the preparation of this EIA Report are listed in the table below. The second column of this table includes three categories of staff, with different levels of responsibility:

a. Technical reviewer

b. Main author

c. Sub-author/contributor

Topic	Responsibility	Name of company	Qualifications / competencies of author
Introduction and Exec summary	a. Neil Marlborough	Wood	BA (Hons), DipTP, Chartered member RTPI. Over 20 years of experience as an environmental planner.
Introduction and Exec summary	b. Chris Pepper	Wood	BA (Hons), Chartered member RTPI. Over 15 years of experience as an environmental planner.
Policy	a. Neil Marlborough	Wood	BA (Hons), DipTP, Chartered member RTPI. Over 20 years of experience as an environmental planner.
Policy	b. Chris Pepper	Wood	BA (Hons), Chartered member RTPI. Over 15 years of experience as an environmental planner.
The Project	a. Neil Marlborough	Wood	BA (Hons), DipTP, Chartered member RTPI. Over 20 years of experience as an environmental planner.
The Project	b. Chris Pepper	Wood	BA (Hons), Chartered member RTPI. Over 15 years of experience as an environmental planner.
Approach to assessment	a. Neil Marlborough	Wood	BA (Hons), DipTP, Chartered member RTPI. Over 20 years of experience as an environmental planner.
Approach to assessment	b. Chris Pepper	Wood	BA (Hons), Chartered member RTPI. Over 15 years of experience as an environmental planner.
Planning and Energy Policy	a. Neil Marlborough	Wood	BA (Hons), DipTP, Chartered member RTPI. Over 20 years of experience as an environmental planner.
Planning and Energy Policy	b. Chris Pepper	Wood	BA (Hons), Chartered member RTPI. Over 15 years of experience as an environmental planner.
Planning and Energy Policy	c. Adam Mealing	Wood	MSTP, Chartered member RTPI. Five years of experience as an environmental planner.
Ecology and Ornithology	a. Dr Graham Burt-Smith	Wood	BSc (Hons), PhD, CEnv, MCIEEM. Over 20 years of experience in ecological consultancy including Ecological Impact Assessment and Habitats Regulations Appraisal.
Ecology and Ornithology	b. Alastair Miller	Wood	BSc (Hons), MEnvS, CIEEM. Over 16 years of experience in ecological consultancy including Ecological Impact Assessment and Habitats Regulations Assessment.

Topic	Responsibility	Name of company	Qualifications / competencies of author
Landscape and Visual	a. Rohan Sinha	Wood	B.Arch (Hons) and MLA (Masters of Landscape Architecture), Chartered Member of Landscape Institute, Over 16 years of experience as a landscape architect.
Landscape and Visual	b. Mark Swithenbank	Wood	BA (Hons), MA, MSc, MLA. Charted member CMLI Over 15 years of experience as a landscape architect.
Geology, Hydrology and Hydrogeology	a. Dr Shaun Salmon	Wood	BSc (Hons), MSc, PhD Over 30 years of experience in hydrogeological consultancy including Environmental Impact Assessment and expert witness services.
Geology, Hydrology and Hydrogeology	b. Liz Buchanan	Wood	MSci, MSc. Over 19 years of experience in water EIA and supporting assessments.
Geology, Hydrology and Hydrogeology	c. Paul McSorley	Wood	BSc (Hons) Over 15 years of experience as a hydrogeological consultant.
Traffic and Transport	a. Glyn Price	Wood	BA (Hons) Geography and Planning, Over 16 years of experience as a transport planner.
Traffic and Transport	a. Adam Guy	Wood	BSc (Hons). 7 years' experience in transport planning.