GREEN VOLT

Chapter 6
EIA Methodology

Offshore EIA Report: Volume 1

Revision history

Revision	Date	Description	Prepared	Checked	Approved
1	04/02/2022	First draft	CC (Royal HaskoningDHV)	JM (Royal HaskoningDHV)	VC (Flotation Energy)
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3	09/01/2023	Final for submission	CB (Royal HaskoningDHV)	CM (Royal HaskoningDHV)	VC (Flotation Energy)

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Acronyms

Acronym	Description
AfL	Agreement for Lease
BSI	British Standard Institute
CCS	Carbon Capture and Storage
CIA	Cumulative Impact Assessment
EIA	Environmental Impact Assessment
EMF	Electromagnetic fields
EU	European Union
GW	Gigawatts
ICES	International Council for the Exploration of the Seas
IEMA	Institute of Environmental Management and Assessment
MCA	Maritime and Coastguard Agency
MHWS	Mean High Water Springs
MS-LOT	Marine Scotland Licensing Operations Team
NLB	Northern Lighthouse Board
nm	Nautical Miles
NPS	National Policy Statement
PAC	Pre-application consultation
s.36	Section 36
SEPA	Scottish Environment Protection Agency
UK	United Kingdom
UXO	Unexploded Ordnance

Glossary

Term	Description
Applicant	Green Volt Offshore Windfarm Ltd.
Buzzard	Buzzard Platform Complex.
Buzzard Export Cable Corridor	The area in which the export cables will be laid, from the perimeter of the Windfarm Site to Buzzard Platform Complex.
Green Volt Offshore Windfarm	Offshore windfarm including associated onshore and offshore infrastructure development (Combined On and Offshore Green Volt Projects).
Horizontal Directional Drilling	Mechanism for installation of export cable at landfall.
Inter-array cables	Cables which link the wind turbines to each other and the offshore substation platform.
Landfall Export Cable Corridor	The area in which the export cables will be laid, from the perimeter of the Windfarm Site to landfall.
Mean High Water Springs	At its highest and 'Neaps' or 'Neap tides' when the tidal range is at its lowest. The height of Mean High Water Springs (MHWS) is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest (Spring tides).
Moorings	Mechanism by which wind turbine generators are fixed to the seabed.
NorthConnect Parallel Export Cable Corridor Option	Landfall Export Cable Corridor between NorthConnect Parallel Landfall and point of separation from St Fergus South Export Cable Corridor Option.
NorthConnect Parallel Landfall	Southern landfall option where the offshore export cables come ashore.
Offshore Development Area	Encompasses i) Windfarm Site, including offshore substation platform ii) Offshore Export Cable Corridor to Landfall, iii) Export Cable Corridor to Buzzard Platform Complex.
Offshore export cables	The cables which would bring electricity from the offshore substation platform to the Landfall or to the Buzzard Platform Complex.
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from offshore substation to landfall or to the Buzzard Platform Complex.
Offshore infrastructure	All of the offshore infrastructure, including wind turbine generators, offshore substation platform and all inter-array and export cables.
Offshore substation platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from landfall to the onshore substation.

Project	Green Volt Offshore Windfarm project as a whole, including associated onshore and offshore infrastructure development.
Safety zones	An area around a structure or vessel which must be avoided.
St Fergus South Export Cable Corridor Option	Landfall Export Cable Corridor between St Fergus South Landfall and point of separation from NorthConnect Parallel Export Cable Corridor Option.
St Fergus South Landfall	Northern landfall option where the offshore export cables come ashore.
Windfarm Site	The area within which the wind turbine generators, offshore substation platform and inter-array cables will be present.

CHAPTER 6: EIA METHODOLOGY

6.1 Introduction

1. This chapter describes the methodology and approach applied to the **Offshore Environmental Impact Assessment (EIA) Report** chapters for the Project (in this instance the Project refers to the offshore elements of the Green Volt Offshore Windfarm only, up to Mean High Water Springs (MHWS)) under the three general areas of physical environment, biological environment and human environment.

2. This EIA has been carried out in accordance with:

   - The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended by The Environmental Impact Assessment (Miscellaneous Amendments) (Scotland). (applies to all applications for Section 36 (s.36) consent in Scottish waters out to 200 nautical miles (nm));
   - The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (Scotland) (applies to applications that require an EIA for a marine licence from 0-12 nm); and
   - The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (applies to applications that require an EIA, for a marine licence from 12-200 nm).

3. Further information on the legal framework is presented in **Chapter 3: Policy and Legislative Context** of this **Offshore EIA Report**. The approach to the EIA also closely follows the requirements of guidance including:

   - Offshore wind, wave and tidal energy applications: consenting and licensing manual (Marine Scotland, 2018);
   - Environmental Impact Assessment Handbook; guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process for Scotland (NatureScot, 2018);
   - Assessment of the environmental impact of offshore wind farms (OSPAR Commission, 2008);
   - Environmental impact assessment for offshore renewable energy projects (British Standards Institute (BSI), 2015);
   - Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Shaping Quality Development (IEMA, 2015);
   - Relevant guidance issued by other government and non-governmental organisations; and
   - Receptor-specific guidance documents.

4. Where specific guidance has been used, these are identified within the relevant technical chapters of this **Offshore EIA Report**.

6.2 Requirement for EIA

5. The EIA legislation relevant to Scotland's inshore and offshore waters, and applicable to the offshore scope of the Project are as follows:

   - The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 as amended by The Environmental Impact Assessment (Miscellaneous Amendments) (Scotland) (applies to all applications for s.36 consent in Scottish waters out to 200 nm);

- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (Scotland) (applies to applications that require an EIA for a marine licence from 0-12 nm), as amended by. The Marine Environment (EU Exit) (Scotland) (Amendment) Regulations 2019; and
- The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (applies to applications that require an EIA, for a marine licence from 12-200 nm).

6. Further details on the requirement for EIA are presented in **Chapter 3: Policy and Legislative Context**. The EIA process includes collation of data required to identify and assess the potential effects of a development on the environment, the identification of any significant adverse impacts and any mitigation measures envisaged to avoid, prevent or reduce and, if necessary, offset, such impacts to acceptable levels, prior to consent being granted. In addition, the EIA process provides the public early and effective opportunities to participate in the decision-making process.

7. The purpose of this **Offshore EIA Report** is to provide the decision-maker, stakeholders and all interested parties with the information required to develop an informed view of any likely significant effects that would result from the Project during its construction, operation, maintenance and decommissioning phases (where relevant).

6.3 Consultation

8. Consultation is a key component of the EIA process, and continues throughout the lifecycle of a project, from its initial stages through to consent and post-consent. This section details the consultation process undertaken during the preparation of this EIA Report submission. A list of consultees engaged with during the process of the EIA is provided in **Appendix 6.1**.

6.3.1 Scoping

9. A **Offshore Scoping Report** (**Appendix 1.2**) for the project was submitted to Marine Scotland Licensing and Operations Team (MS-LOT) on 15 November 2021 (Royal HaskoningDHV, 2021). A **Scoping Opinion** (**Appendix 1.1**) was received on 19th April 2022.

10. In agreement with MS-LOT, the following topics were scoped out entirely:

- Seascape, Landscape and Visual Resources;
- Air Quality; and
- Human Health.

11. Particular impacts within topics have been scoped out as detailed in the **Scoping Opinion** (**Appendix 1.1**) and summarised within each relevant topic chapter. Topic specific matters raised in the **Scoping Opinion** (**Appendix 1.1**) are referenced in the consultation summary tables within each of the topic chapters.

12. The EIA for the Project has been informed by the outcomes of formal scoping exercises, ongoing consultation with statutory bodies and other stakeholders and consultation with local communities. A list of all statutory and non-statutory stakeholders consulted during scoping and preparation of the **Offshore EIA Report** is provided in the **Offshore Pre-Application Report** (PAC) (**Appendix 6.2**).

13. The **Scoping Opinion** (with associated Scoping Responses) issued by MS-LOT in relation to the Project is provided in full in **Appendix 1.1**. A summary of key issued raised during consultation (both as part of the **Scoping Opinion** and in response to additional pre application consultation) and Green Volt Offshore Windfarm Ltd. (the Applicant) response to those issues, has also been included in each technical chapter of the **Offshore EIA Report** (**Chapters 7-20**) as applicable.

14. The Applicant has also submitted a completed gap analysis spreadsheet to MS-LOT. The gap analysis is a tool used by MS-LOT to track all consultation activities, issues raised during these activities and actions/steps taken to close out issue. The gap analysis (which has been submitted electronically as an additional supporting document to the application) will remain live for the duration of the determination period in order to track how all comments received on the application have been addressed and closed out.

6.3.2 Pre-Application Consultation Report

15. **Section 3.7.4** of **Chapter 3: Policy and Legislative Context** provides the legislative basis for undertaking PAC. The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013 (hereafter referred to as the PAC Regulations) require applicants for certain types of developments (of which the Project falls under the PAC Regulations) to notify, no less than 12 weeks in advance of submission of the application, the Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), NatureScot, Scottish Environment Protection Agency (SEPA), and any other relevant marine delegates.

16. Under the PAC Regulations, Applicants are also required to hold at least one event at which both the stakeholders listed above, and members of the public, may provide comments to the Applicant.

17. A PAC Statement was provided by MS-LOT on 30th March 2022 (see **Appendix 6.2**), detailing the requirements for the Project in the PAC Regulations. The PAC Statement specified the following:

18. *Regulation 4 (a) of The Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013 ("the Regulations") states "the deposit of a submarine cable within the Scottish marine area either in the sea or on or under the seabed from a vehicle, vessel, aircraft, marine structure or floating container" is a prescribed licensable marine activity. MS-LOT is of the opinion that the proposed export cable within 12nm is of a class or description prescribed in the Regulations and as such will require pre-application consultation. MS-LOT has reached this opinion as the proposed export cable exceeds 1853m in length and crosses the inter-tidal boundary. Therefore the proposed export cable within 12nm for Green Volt Offshore Windfarm requires pre-application consultation.*

19. *Regulation 4 (d) of the Regulations states "the construction of any works (with the exception of a renewable energy structure) within the Scottish marine area either in or over the sea or on or under the seabed" is a prescribed licensable marine activity. MS-LOT is of the opinion that the proposed rock dumping in trench to bury the export cable within 12nm is of a class or description prescribed in the Regulations and as such will require pre-application consultation. MS-LOT has reached this opinion as the total area in which the proposed rock dumping in trench to bury the export cable is proposed to be located exceeds 1000 square metres in extent. Therefore the proposed rock dumping in trench to bury the export cable within 12nm for Green Volt Offshore Windfarm requires pre-application consultation.*

20. In line with the PAC Statement provided by MS-LOT and the PAC Regulations, the Applicant held an online PAC exhibition on the 20th September 2022 for the activities undertaken with respect to components of the Landfall Export Cable Corridor located between MHWS and the 12 nm.

21. Stakeholders with potential interest in the Project as identified by the Applicant were invited to attend the event via a series of emails, as provided in the **Offshore PAC Report** (**Appendix 6.2**). The online PAC event was also advertised six weeks in advance of the live question and answer session in two local newspapers, on the Marine Scotland website and attached to notice boards in the Peterhead library.

22. The PAC event for the sections of the Offshore Export Cables located within 12 nm was held virtually via the Green Volt Offshore Windfarm website (accessed via link https://greenvolt-exhibition.com/exhibition/). A dedicated page on the Green Volt Offshore Windfarm website was developed, hosting an interactive virtual exhibition with ten display boards providing detail on the

Project, the marine planning and policy strategy, the offshore infrastructure and works, the marine consents, licences and EIA process, the surveys, studies and assessments undertaken to understand the human, physical and biological environment, the engagement process and the Project timeline. The exhibition site also provided a link to an interactive map to allow stakeholders to explore the offshore elements of the Project. Two live question and answer sessions were held between 1 and 2 pm, and 6 and 7 pm on 20th September 2022. Stakeholders were invited to ask live questions via chatbox, and questions were answered live by the Applicant and Project team.

23. In addition to the live events, the online exhibition which formed part of the live question and answer session has been available on the Green Volt Offshore Windfarm website (https://greenvolt-exhibition.com/exhibition/) since the 1st August 2022 and will be available indefinitely in pdf-format.

24. It should be noted that, despite the PAC process formally applying to the works within 12 nm, stakeholders were also invited to comment on all offshore aspects of the project during the PAC process. In addition, any comments raised on the onshore works have been shared with the onshore Project team.

25. The **Offshore PAC Report** (**Appendix 6.2**) details a full overview of the PAC activities undertaken by the Applicant, including a list of consultees and information/feedback received from stakeholders during the process.

6.4 Requirement for Competent Experts

26. Royal HaskoningDHV is the UK's leading EIA consultant working in the offshore wind sector. The company has successfully directed the EIA and consent process for over 12 Gigawatts (GW) of renewable energy projects across the UK offshore wind sector. Royal HaskoningDHV hold the EIA quality mark from the IEMA for EIA activities and Environmental Statements. Within the Scottish market, Royal HaskoningDHV has successfully managed the EIA process for several consented renewable energy projects including Seagreen Offshore Windfarm, North West Lewis Wave Array, Sound of Islay Demonstration Tidal Array, and Kincardine floating offshore wind farm. In addition to these projects, Royal HaskoningDHV has played a significant role in the post-consenting phase of other offshore windfarm projects in Scotland, including Moray East, Moray West, and the Beatrice Offshore Windfarm.

27. All of the Royal HaskoningDHV lead authors are senior and chartered professionals with a significant track record in undertaking technical assessment and EIA in their discipline. The team undertaking the EIA for the Project are predominantly Royal HaskoningDHV professional consultants. The team is comprised of a dedicated core of EIA professionals who take the lead role in the co-ordination and management of the EIA. The core team is supported by a wider team of technical specialists taking responsibility of the data collection, data analysis and technical impact assessment.

28. The technical assessments are led by a lead technical author who is a recognised expert in their field, is a chartered member of a relevant professional body and has significant experience in the preparation of impact assessments. The lead author takes responsibility for the quality of the data gathered; the assessment methodology to be undertaken, the impact assessments made and any proposed mitigation measures. The lead author is usually supported by a team of consultants and their work is subject to both technical and consistency review by a Technical Director and the EIA core team.

29. Some of the technical assessments and/or associated EIA chapters are undertaken by specialist technical consultancies outside of Royal HaskoningDHV. Authorship of each chapter is detailed in **Section 1.6** of **Chapter 1: Introduction**, with technical support and chapters being originated by external authors being summarised below;

- APEM – Author: **Chapter 12: Offshore and Intertidal Ornithology** and Benthic Analysis (**Appendix 7.2** of this **Offshore EIA Report**).
- Anatec – Author: **Chapter 14: Shipping and Navigation** and Navigation Risk Assessment (**Appendix 14.1** of this **Offshore EIA Report**).
- MSDS Marine –Archaeological Assessment of Hydrographic Data (**Appendix 15.1** of this **Offshore EIA Report**).
- Wind Business Support Ltd – Technical Support for **Chapter 17: Aviation and Radar** and author of Aviation Impacts Review (**Appendix 16.1** of this **Offshore EIA Report**).
- **National Grid –** Electromagnetic Fields (EMF) Assessment (**Appendix 9.2** of this **Offshore EIA Report**).
- **Seiche Ltd –** Underwater Noise Technical Report (**Appendix 9.1** of this **Offshore EIA Report**).

6.5 Design Envelope

30. The Design Envelope approach has been adopted for the Project's EIA, in accordance with current best practice and the National Policy Statement (NPS EN-3 (paragraph 2.6.42)) which recognises that: *"Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application, possibly including:*

- precise location and configuration of turbines and associated development;
- floating substructure (foundation) type;
- exact turbine tip height;
- cable type and cable route; and
- exact locations of offshore and/or onshore substations."

31. Planning Advice Note 1/2013: Environmental Impact Assessment (paragraph 4.4) states that: "*Where an application for planning permission in principle is used to establish the acceptability of a proposal without having first developed detailed proposals, the requirements of the EIA regulations must still be met in full. Generally speaking, the more detailed an application is, the easier it will be to ensure compliance with the EIA Regulations. However, by applying the principles of an approach commonly known as the 'Design Envelope[1]' it is possible to undertake an environmental assessment which takes account of the need for flexibility in the future evolution of the detailed project proposal, within clearly defined parameters. In such cases, the level of detail of the proposals must be sufficient to enable a proper assessment of the likely environmental effects, and any resultant mitigation measures – if necessary considering a range of possibilities. Assumptions should also be clearly stated*."

32. Although Planning Advice Note 1/2013 is primarily directed towards onshore developments, guidance on design envelopes outlined within it can also be used as best practice for the development of an offshore wind farm.

33. Where necessary, a range of parameters for each aspect of the Project have been defined and the worst case scenario associated with each parameter and receptor has been used in each impact assessment. This helps to ensure that the EIA process has considered the maximum effects the Project, whilst also allowing for further optimisation and refinement at the time of construction and flexibility in key commercial project decisions, noting that this may be several years after the

[1] *The term 'Design Envelope is used in the English planning system. In Scotland the 'Rochdale Envelope' is termed the 'Design Envelope'*

application is made. This provides confidence that the EIA process is robustly considering the likely impact of the Project, whilst also allowing the Project to be optimised and refined at the time of construction, noting that this may be several years after the applications are made. The project design envelope, therefore, provides the maximum extent of the consent sought. The detailed design of the Project can then be developed, refined and procured within this consented envelope prior to construction. This process also allows the decision maker to confidently reach a decision as it ensures that the worst case scenario has been assessed.

34. The general principle of the EIA assessment is that for each receptor and potential impact, the impact assessment will be based on assessing a range of project design parameters. If a combination of design parameters leads to a scenario that cannot realistically occur then the worst case scenario will be reconsidered, and a realistic set of worst case parameters will be assessed. The end result will be an EIA based on clearly defined environmental parameters that will define the range of development possibilities and hence the likely environmental impacts that could result from the project

6.6 Characterisation of the Existing Environment

35. A review of the existing environment has been undertaken to determine, and agree, the existing environmental conditions in the study area in question. This characterisation of the existing environment provides a robust baseline to inform understanding of the existing environmental conditions, how different processes link together and how they evolve in response to applied forces. The characterisation has followed the steps listed below with the details provided in each technical chapter.

- study areas defined for each receptor based on the relevant characteristics of the receptor (e.g., mobility/range);

  review available information;
- review likely or potential impacts that might be expected to arise from the Project;
- determine if sufficient data are available to make the EIA judgements with sufficient confidence;
- if further data is required, ensure data gathered are targeted and directed at answering the key question and filling key data gaps; and
- review information gathered to ensure the environment can be characterised in sufficient detail and the data are suitable to make the EIA judgements with sufficient confidence.

36. Site-specific survey data collected for the project has also been used to inform the technical chapters where relevant and data sources are detailed in each technical chapter.

37. The specific approach to establishing the characteristics of the existing environment (upon which impacts can be assessed) is set out in each technical chapter of this EIA Report. Study areas have been defined for each topic at the relevant scale and are described within the technical chapters. These have been determined by a number of factors such as the distribution of receptors, footprint of potential impacts, or administrative / management boundaries (e.g., territorial waters, International Council for the Exploration of the Seas (ICES) rectangles) and where possible these have been agreed with regulators or advisors.

6.7 Assessment of Impacts

38. This chapter sets out the framework methodology for the assessment with each technical chapter providing details of how the methodology has been applied for that topic. To provide a consistent framework and system of common tools and terms, a matrix approach has been used to frame and present the judgements made. For each topic considered in the EIA, the most relevant and latest

guidance or best practice has been used and, therefore, definitions of sensitivity and magnitude are tailored to each topic and receptor. These definitions are detailed fully in each technical chapter.

39. The impact assessment considers the potential for impacts during the construction, operation and maintenance, and decommissioning phases of the Project. As required by the EIA Regulations, only effects that are likely to be significant require detailed assessment.

40. Impacts can be classified as follows:

- Direct impacts: occurring at the same time and place as the action or activity.
- Indirect impacts: experienced by a receptor that is removed (e.g., in space or time) from the direct impact (e.g., noise impacts upon fish which are a prey resource for fish or mammals).
- Inter-relationships between impacts (where different impacts interact to affect a single receptor, which may need to be brought together from assessments presented in separate chapters) and interactions between impacts (where impacts assessed in each chapter have the potential to interact with one another).
- Cumulative impacts: these may occur as a result of the Project in conjunction with other existing or planned projects within the study area for each receptor, including other offshore wind farms.

6.7.1 Impact Identification

41. Where appropriate to do so, the assessment has used the conceptual 'source-pathway-receptor' model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it. This process provides an easy-to-follow assessment route between impact sources and potentially sensitive receptors ensuring a transparent impact assessment. The aspects of this model are defined as follows:

- Source – the origin of a potential impact (i.e., an activity such as piling and a resultant effect e.g. noise resulting from the piling works).
- Pathway – the means by which the effect of the activity could impact a receptor (e.g., for the example above, disturbance/injury to nearby species).
- Receptor – the element of the receiving environment that is impacted (this could either be a component of the physical, ecological or human environment, e.g., for the above example, species susceptible to noise impacts).

42. Where a different approach has been necessary to reflect the specific assessment requirements of a particular topic, this is described in the corresponding technical chapter.

6.7.2 Determining Receptor Value and Sensitivity

43. The sensitivity of a receptor is determined through its ability to accommodate change and on its ability to recover if it is affected. Receptor sensitivity will be assigned on the basis of species-specific adaptability, tolerance, and recoverability, when exposed to a potential impact. The following parameters will be taken into account:

- Timing of the impact: whether impacts overlap with critical periods of the receptor, e.g., life-stages or seasons for ecological receptors; and
- Probability of the receptor-effect interaction occurring (e.g., vulnerability).

44. The 'value' of the receptor forms an important element within the assessment, for instance, if the receptor is a protected species or habitat or has an economic value. It is important to understand that high value and high sensitivity are not necessarily linked within a particular impact. A receptor could

be of high value but have a low or negligible physical/ecological sensitivity to an effect. Similarly, low value does not equate to low sensitivity and is judged on a receptor-by-receptor basis.

45. Receptor value considers whether, for example, the receptor is rare, has protected or threatened status, importance at local, regional, national or international scale, and in the case of biological receptors whether the receptor has a key role in the ecosystem function.

46. The overall receptor sensitivity is, therefore, determined by considering a combination of value, adaptability, tolerance and recoverability as well as applying professional judgement and/or past experience. Expert judgement is particularly important when determining the sensitivity of receptors. For instance, a protected species would have a high value, but if it was highly tolerant of an effect or had high recoverability it would follow that the sensitivity in this instance should reflect this.

6.7.3 Determining the Magnitude of Impact

47. The impact magnitude is determined by the interaction between the scale of the impact in time, area, intensity and the probability of an impact occurring. It is important to note that a change resulting from a proposed development can be positive or negative and this is reflected in **Table 6.1** which sets out the criteria used to determine the magnitude of change.

48. Consideration is given to:

- scale or spatial extent (small scale to large scale or a few individuals to most of the population);
- duration (short term to long term);
- likelihood of impact occurring;
- frequency; and
- nature of change relative to the baseline.

49. With respect to duration of potential impacts, those associated with construction will be considered to be short term, occurring over a maximum of two years following construction unless otherwise stated in technical chapters. Impacts associated with operation will be considered longer term, occurring over the operational lifetime of the Project.

6.7.4 Evaluation of Significance

50. The significance of potential effects has been defined by considering receptor sensitivity in combination with the magnitude of a given impact. Where there is a lack of suitable data to quantitatively assess impacts for the species under consideration, the assessment has been informed by professional experience and judgement (see **Section 6.7.5** for further details on confidence levels assigned to assessments undertaken).

51. After establishing the receptor sensitivity and magnitude of impact, the significance of effect has been predicted by using quantitative or qualitative criteria, as appropriate, to ensure a robust assessment. Where possible, a matrix such as the one presented in **Table 6.1** has been used to inform the assessment of effect significance, which is based on expert judgement, latest guidance (whether from professional guidance or Scottish government publications or bespoke definitions agreed with stakeholders) and any specific input from consultation to facilitate a consistent approach throughout the EIA. The matrix is seen as a framework to aid understanding of how a judgement has been reached from the narrative of each impact assessment and it is not a prescriptive formulaic method. To some extent, defining significance is qualitative and reliant on professional experience, interpretation and judgement.

52. For each topic within the EIA, best practice methodology (based on the latest available guidance) has been followed and hence, when more appropriate, an alternative approach to the use of a matrix may be used. A description of the approach to impact assessment and the interpretation of significance levels has been provided within each technical chapter of the **Offshore EIA Report**. This approach will ensure that the definition of impacts is transparent and relevant to each topic under consideration.

53. For the purposes of the EIA, major and moderate adverse effects are deemed to be significant, and, as such, may require mitigation. Whilst minor effects are not significant in their own right, these may contribute to significant effects cumulatively or through interactions.

Table 6.1: Matrix for evaluating the significance of an effect

		Negative Magnitude				**Beneficial Magnitude**			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

54. Through use of this matrix, an assessment of the significance of an effect has been made in accordance with the definitions in **Table 6.2**. Any exceptions to these definitions are due to the application of best practice methodologies for a particular topic, as described above. In general, effects which are of major or moderate significance are considered to be significant under the EIA Regulations. It is possible that a moderate effect may not be considered significant under the EIA Regulations; however, in these cases a justification and rationale is provided in the impact assessment text.

55. A description of the approach to impact assessment and the interpretation of significance levels are provided within each chapter of this **Offshore EIA Report**. This approach ensures that the definition of effects is transparent and relevant to each topic under consideration.

Table 6.2: Definitions of effect significance

Effect Significance	**Definition**
Major adverse	Very large or large changes in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level as they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and/or breaches of legislation.
Moderate adverse	Intermediate changes in receptor condition, which are likely to be important considerations at a local level.
Minor adverse	Small changes in receptor condition, which may be raised as local issues but are unlikely to be important in the decision making process.
Negligible	No discernible change in receptor condition.
Minor beneficial	The effect is of minor significance but has been assessed as having some environmental benefit.
Moderate beneficial	The effect is assessed as providing a moderate gain to the environment.
Major beneficial	The effect is assessed as providing a significant positive gain to the environment.

6.7.5 Confidence

56. Once an assessment of a potential impact has been made, a confidence rating may be assigned to the assessment to assist in the understanding of the judgement. This is undertaken on a simple scale of high-medium-low, where high confidence assessments are made on the basis of robust evidence, medium confidence assessment being based, for example, on academic or scientific studies / papers, and lower confidence assessments being based, for example, on extrapolation and use of proxies.

6.7.6 Mitigation

57. Where an impact assessment has identified that an aspect of the project is likely to give rise to significant adverse environmental effects, mitigation measures have been proposed and discussed with the statutory consultees, in order to avoid impacts or reduce the effects of them to acceptable levels and, if possible, to enhance the environment. For the purposes of the EIA, two types of mitigation have been defined:

    1. Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and are included and assessed in the EIA; and
    2. Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant impacts. Additional mitigation is therefore subsequently adopted by the Project as project commitments.

58. Mitigation measures have taken place in the following hierarchy, where if the first is not feasible due to constraints, including, engineering, technology or geology, the next measure will be engaged.

    1. The proposed Project design has aimed to avoid placing permanent infrastructure or having temporary working areas within protected sites, where possible.
    2. If avoidance of protected sites is not possible, best endeavours have been made to design the proposed Project to avoid direct impact on the specified features of interest within protected sites via specific construction and decommissioning methods, where possible.
    3. Where the feature is not static, the design of the infrastructure of the proposed Project, where practicable, minimises the impact on mobile species, therefore reducing the interaction and harm.
    4. Where avoidance of features of interest are not possible, mitigation measures have been developed for construction, operation and decommissioning to minimise effects, such as work schedule, techniques and working areas, offsetting or enhancement measures.

59. It is important to note that the mitigation measures applied should be proportionate to the scale of the impact predicted.

60. In some instances, in order to ensure that the mitigation measures are successful or where there is significant uncertainty with respect to important receptors, monitoring may be appropriate. Monitoring programmes are most commonly required during and shortly after construction but can also be prior to and during operations. The nature of any monitoring will be dependent on the nature of the effect or mitigation measure under inspection.

6.7.7 Assessing Residual Impacts

61. Following initial assessment, if the impact does not require additional mitigation (or where none is possible) the residual effects will remain the same. However, if additional mitigation measures are identified, impacts are re-assessed, and all residual effects clearly described.

6.7.8 Inter-Relationships and Interactions

62. As described above, the assessment also considers the potential for:

- Inter-relationships between impacts – where different impacts interact to affect a single receptor, which may need to be brought together from assessments presented in separate chapters. The offshore assessments are largely receptor based (e.g., marine mammals, fish ecology etc.) and as such inter-relationships are covered as an integral part of the assessment. In this case, a signposting section is provided to demonstrate that relevant inter-relationships have been taken into account. There is the potential for these separate impacts to interact, spatially and temporally, to create inter-related effects on a receptor and where this is the case this is identified and assessed.
- Interactions between impacts – where impacts assessed in each chapter have the potential to interact with one another. Impacts are assessed relative to each development phase (a 'phase assessment' i.e., construction, operation or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the level of effect upon that receptor. Following this, a 'lifetime assessment' is undertaken which considers the potential for impacts to affect receptors across all development phases.

6.8 Cumulative Impact Assessment

63. The Cumulative Impact Assessment (CIA) is a key component of the overall EIA process. The aim of the CIA for the Project is to assess whether impacts on a receptor may occur on a cumulative basis between the Project and other projects, activities and plans. The CIA is undertaken as part of each topic impact assessment, with specific methodology and outcomes presented within each technical chapter.

64. The EIA Regulations state that cumulative effects should be addressed within an EIA. MS-LOT guidance states projects for consideration will include those that are:

- already constructed;
- under construction;
- permitted application(s), but not yet implemented;
- submitted application(s) not yet determined; and
- plans and projects which are "reasonably foreseeable" (i.e., developments that are being planned, including, for example, offshore renewable energy projects which have a Crown Estate Scotland Agreement for Lease (AfL), offshore renewable energy projects that have been scoped).

65. It was agreed with MS-LOT that any potential project that had submitted minimum a Scoping Report up to 3 months prior to submission of the Project's application submission date would be considered within the CIA. As such, all projects which had submitted Scoping Report or more up to 18th October 2022 have been considered within the CIA in this **Offshore EIA Report**.

66. In line with the RenewableUK CIA Guidelines for offshore wind farms (RenewableUK, 2013), the approach to CIA attempts to incorporate an appropriate level of pragmatism. This is demonstrated in the confidence levels applied to the understanding of other projects (either their design or their likely impacts), particularly those that are known but currently lack detailed design documentation, such as those projects at the scoping stage only. Only projects which are well described and sufficiently advanced, with sufficient detail available with which to undertake a meaningful and robust assessment, have been included in the CIA.

67. The scope of the CIA has been established on a topic by topic basis with the relevant consultees as the EIA progresses, due to the differing geographic scales of each topic area not supporting a consistent scope between assessments.

68. This **Offshore EIA Report** has considered potential offshore cumulative impacts only. Offshore cumulative impacts may come from interactions with the following activities and industries:

- other offshore wind farms;
- aggregate extraction and dredging;
- licensed disposal sites;
- navigation and shipping;
- commercial fisheries;
- sub-sea cables and pipelines;
- potential port and harbour development;
- oil and gas activities;
- Carbon Capture and Storage (CCS); and
- unexploded ordnance (UXO) clearance.

69. A separate **Onshore EIA Report** will provide an assessment of the Project's onshore infrastructure. Where a technical topic is required to be assessed for both offshore and onshore, such as socioeconomics, a separate chapter is provided in the **Onshore EIA Report** for the Project's onshore infrastructure. It is recognised that the onshore EIA assessment will be undertaken later than the submission of the **Offshore EIA Report**. To enable consideration of the on and offshore elements of the Project as a whole, an additional document has been prepared. This additional document is called the **Summary of Offshore and Onshore Environmental Impact Assessments** and provides a summary of the **Offshore EIA Report** and the predicted summary of the onshore EIA. It will be submitted to the Scottish Ministers along with the offshore application documents and will be available on the Green Volt website[2]. If required, it will be updated upon completion of the **Onshore EIA Report**.

70. Definitions of the potential cumulative impact pathways are detailed in **Table 6.3** below.

Table 6.3: Cumulative Impact Pathways

Nature of Overlap	Definition
Conceptual Overlap	For a cumulative effect to occur it must be established that a cumulative impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms this is described as an impact-receptor-pathway, and is hereafter referred to as a conceptual overlap. An example of a conceptual overlap can be seen where increased suspended sediment concentrations from a nearby project (impact) affect fish and shellfish (receptor) that are also potentially affected by the Project. Conversely, a conceptual overlap cannot be demonstrated between activities such as the operation of a subsea cable and aircraft navigation. It is in cases such as this second example where projects, plans and activities have been screened out.
Physical overlap	The impacts on one receptor from the Project and one or more other plans, projects or activities overlap i.e. sediment plumes interact, or noise contours from piling, while not overlapping directly, effect on the general range of a mobile species such as harbour porpoise.
Temporal or sequential overlap	The specific impact on a receptor have to interact temporally, or sequentially, for there to be a cumulative effect. For those impacts only active during construction, e.g. piling noise, it is necessary to determine the potential overlap of construction, or sequential construction

[2] *https://greenvoltoffshorewind.com/*

Nature of Overlap	Definition
	periods, with other plans, projects and activities in order to assess the likelihood of any overlap of effects.

71. The full list of plans or projects to be included in the CIA has been developed as part of both a screening exercise and on-going consultation with technical consultees, and are detailed in **Appendix 20.1**.

72. The desk-based screening exercise identified a list of projects (and plans and activities where relevant) for consideration in CIA.

73. The CIA project list took account of the level of information available (data confidence) for projects where there is potential for cumulative impacts to occur (see **Table 6.4)**.

Table 6.4 Data confidence for CIA projects

Data Confidence	Information available on project
Low	Projects that are not currently in the planning system but are likely to enter the planning system in the near future (e.g., AfL or projects at feasibility / early design stages);
Medium	Projects currently within the marine planning system at scoping stage or for which an application has been submitted but which are not yet consented;
High	Projects that are consented and are yet to be constructed or under construction; and
	Projects that are currently operational but that were not operational when baseline data was collected, or operational projects that have an ongoing impact.

74. The long-list of options was developed based on various publicly available data sources, including (but not limited to):

- Marine Scotland Application database (https://marine.gov.scot/marine-licence-applications);
- Gov. UK Oil and Gas: environmental submissions and determinations (https://www.gov.uk/guidance/oil-and-gas-environmental-data); and
- publicly available EIA reports, scoping reports and other post-assessment documentation for relevant plans/projects.

6.9 Transboundary Impact Assessment

75. The United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention') requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

76. The procedures involve providing information to the Member State and for the Scottish Ministers to enter into consultation with that State regarding the significant impacts of the development and the associated mitigation measures.

77. Potential transboundary impacts have been considered as an integral part of the wider EIA process, with a clear audit trail provided to demonstrate why any potential effects on other countries have been screened in or out for assessment. As such, transboundary matters are addressed where relevant in each chapter of the EIA Report and in **Chapter 20: Transboundary Impacts and Cumulative Impacts** provides a summary of the transboundary assessment process and outcomes.

6.10 Compliance with the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017

78. Provisions 4 and 5 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 presents the information to be included within EIA Reports undertaken in accordance with the EIA Regulations.

79. In demonstrating compliance with the EIA Regulations, **Table 6.5** summarises each of the information requirements and signposts to where these can be found within the **Offshore EIA Report.**

Table 6.5: Compliance with the Electricity Works (EIA) (Scotland) Regulations 2017

Provision Information for Inclusion in EIA Reports	How/Where This Information Has Been Provided Within This EIA Report
Provision 4 (2) The environmental impact assessment must identify, describe and assess in an appropriate manner, in light of the circumstances relating to the proposed development, the direct and indirect significant effects of the proposed development (including, where the proposed development will have operational effects, such operational effects) on the factors specified in paragraph (3) and the interaction between those factors. (3) The factors are— (a)population and human health; (b)biodiversity, and in particular species and habitats protected under Council Directive 92/43/EEC on the conservation of natural habits and wild flora(1) and Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds(2); (c)land, soil, water, air and climate; and (d)material assets, cultural heritage and the landscape.	This requirement is fulfilled in the following chapters within the **Offshore EIA Report**: Population and Human Health • **Chapter 19: Socioeconomics, Tourism and Recreation** • **Chapter 13: Commercial Fisheries** • **Chapter 14 Shipping and Navigation** Biodiversity • **Chapter 9: Benthic Ecology** • **Chapter 10: Fish and Shellfish Ecology** • **Chapter 11: Marine Mammal Ecology** • **Chapter 12: Offshore and Intertidal Ornithology** Land, Soil, Air, Water and Climate • **Chapter 7: Marine Geology Oceanography and Physical Processes** • **Chapter 8: Marine Sediment and Water Quality** • **Chapter 18: Climate Change** Material Assets, Cultural Heritage, and Landscape • **Chapter 15: Offshore Archaeology and Cultural Heritage** • **Chapter 16: Aviation and Radar** • **Chapter 17: Infrastructure and Other Marine Users** Potential impacts on human health and landscape and visual impact assessment were scoped out during the Scoping Phase, as confirmed MS-LOT in the **Scoping Opinion** (**Appendix 1.1)**
Provision 4(4) The effects to be identified, described and assessed under paragraph (2) include the expected effects deriving from the vulnerability of the development to risks, so far as relevant to the development, of major accidents and disasters	Potential impacts from major accidents or disasters are discussed in **Chapter 5: Project Description** and **Appendix 5.1 Major Accidents and Disasters**.
Provision 5 (2) An EIA report is a report prepared in accordance with this regulation by the developer which includes (at least)— (a)a description of the development comprising information on the site, design, size and other relevant features of the development;	**Chapter 5: Project Description** provides a detailed description of the Project, including location and physical characteristics offshore. This chapter also describes the main characteristics of the tasks required during the construction, operation and decommissioning phases of the Project, setting out estimated durations of tasks, materials required and equipment likely to be used. The chapter also considers approaches to waste management and use of natural resources.
(b)a description of the likely significant effects of the development on the environment;	A description of likely significant impacts is provided in Technical **Chapters 7-20**

Provision Information for Inclusion in EIA Reports	How/Where This Information Has Been Provided Within This EIA Report
(c)a description of the features of the development and any measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;	Mitigation measures include embedded mitigation, which are design decisions taken to reduce environmental impact of the Project as part of the design development and additional mitigation measures which are proposed as ways of further reducing the assessed likely significant environmental effects. Where appropriate, each technical assessment chapter (**Chapter 7-20**) includes an explanation of the embedded mitigation measures and any additional mitigations proposed. Monitoring arrangements are proposed where relevant and discussed in outline within the relevant technical chapters.
(d)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;	The reasonable alternatives considered in the development of the proposed Project design are discussed and presented in **Chapter 4: Site Selection and Assessment of Alternatives**. The process of the design development for the Project, the consultation undertaken and how the views expressed during consultation have influenced the design development decisions and final project design are summarised within **Chapter 4: Site Selection and Assessment of Alternatives**. The comparative environmental effects of key design decisions and options considered are also presented as part of **Chapter 4: Site Selection and Assessment of Alternatives**.
(e)a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and	A **Non-Technical Summary** is provided as part of this **Offshore EIA Report**
(f)any other information specified in schedule 4 relevant to the specific characteristics of the development and to the environmental features likely to be affected.	Further information is presented within each technical **Chapters (7-20)** as applicable.
Provision 5(3) Where a scoping opinion is adopted, the EIA report must be based on that scoping opinion and must include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the development on the environment, taking into account current knowledge and methods of assessment.	A gap analysis has been undertaken to demonstrate how the **Scoping Opinion** (**Appendix 1.1**) had been taken account of in preparation of this **Offshore EIA Report**.
Provision 5 (4) With a view to avoiding duplication of assessments, account is to be taken of the available results of other relevant assessments in preparing the EIA report.	Other assessments are referenced within the **Offshore EIA Report** as applicable
Provision5 (5) In order to ensure the completeness and quality of the EIA report— (a)the developer must ensure that the EIA report is prepared by competent experts; and (b)the EIA report must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts.	This **Offshore EIA Report** has been prepared by competent experts, with further details on relevant expertise and qualifications provided in **Section 6.4**

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