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Volume 7B Proposed Development (Offshore) Appendices

Appendix 13-1 Major Accidents and Disasters

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Volume 7B Appendix 13-1 Major Accidents and Disasters

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Acronyms and Abbreviations

AIS	Automatic Identification System
ALARP	As low as reasonably practicable
ANO	Air Navigation Order
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CaP	Cable Plan
COMAH	Control of Major Accident Hazards
COSHH	Control of Substances Hazardous to Health
DGC	Defence Geographic Centre
DSLP	Development Specification and Layout Plan
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
ERCoP	Emergency Response Coordination Plan
HM	Her or His Majesty
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IEMA	Institute of Environmental Management and Assessment
IMO	International Maritime Organization
LMP	Lighting and Marking Plan
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate - Licensing Operations Team
MPCP	Marine Pollution Contingency Plan
MGN	Marine Guidance Note

MHWS	Mean High Water Springs
MoD	Ministry of Defence
MMO	Marine Management Organisation
MPS	Marine Policy Statement
NLB	Northern Lighthouse Board
NRA	Navigational Risk Assessment
NSP	Navigational Safety Plan
O&M	Operation and Maintenance
OECC	Offshore Export Cable Corridor
OREI	Offshore Renewable Energy Installations
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
RYA	Royal Yachting Association
SAR	Search and Rescue
SAC	Special Area of Conservation
SPA	Special Protection Area
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WTG	Wind Turbine Generator

1 Introduction

1.1 Background

1.1.1.1 This appendix outlines the Major Accidents and Disasters assessment for the Caledonia Offshore Wind Farm (OWF). It considers infrastructure and activities within the Caledonia North and Caledonia South Array Areas and their respective Offshore Export Cable Corridors (OECCs) up to Mean High Water Springs (MHWS) during the construction, operation and maintenance (O&M) and decommissioning stages, forming the "Proposed Development (Offshore)".

1.1.1.2 The Environmental Impact Assessment (EIA) process has been developed to ensure safeguarding during the consenting and the regulation of potential developments and infrastructure. It is therefore crucial that the vulnerability of the Proposed Development (Offshore) to the risk of Major Accidents and Disasters is thoroughly considered, to ensure that impacts to human, economic and environmental receptors are kept as low as reasonably practicable (ALARP).

1.1.1.3 As defined by the Institute of Environmental Management and Assessment (IEMA, 2020[1]):

- A Major Accident is an event that threatens immediate or delayed serious environmental effects to human health, welfare and/or the environment, for example a vessel collision or allision. Major accidents will require external resources beyond the client's or its appointed representative's capabilities to manage.
- A Disaster is a manmade (or external) hazard (e.g., an act of terrorism) or a natural hazard (e.g., extreme weather event or flooding). A disaster has the potential to cause an event that meets the definition of a major accident.

1.1.1.4 It is noted that a hazard is something with the potential to cause harm, while a risk is the potential to cause harm (and thus associated with exposure to hazards). There are two types of hazard applicable to the Proposed Development (Offshore):

- External hazards linked to the vulnerability of the Proposed Development (Offshore) to an (external) major accident and/or disaster; and
- Internal hazards whereby the Proposed Development (Offshore) causes a major accident and/or disaster.

1.1.1.5 This assessment has been developed in accordance with relevant policy and legislation; however, there is no defined official framework as to how this assessment is developed, and assessment methodologies can vary between applications. Therefore, the methodology has been informed by IEMA (2020[1]),

which provides recommendations on how to conduct a Major Accidents and Disasters assessment.

1.1.1.6 This appendix considers and assesses the significance of potential risks and impacts arising from the vulnerability of the Proposed Development (Offshore) to Major Accidents and Disasters. It also identifies the relevant embedded mitigation measures and plans that will reduce the significance of the risk. Risks have been identified using existing sources such as risk registers, but some have been assessed in other chapters of this Environmental Impact Assessment Report (EIAR). Where this is the case, the corresponding EIAR chapters have been signposted.

1.2 Scoping Opinion

1.2.1.1 Caledonia Offshore Wind Farm Ltd (the Applicant) submitted an Offshore Scoping Report for the Proposed Development (Offshore) to Marine Directorate - Licensing Operations Team (MD-LOT)[i] in September 2022 (Volume 7, Appendix 2). A Scoping Opinion was received from MD-LOT in January 2023 (Volume 7, Appendix 3).

1.2.1.2 As part of the Offshore Scoping Report (Volume 7, Appendix 2), the Applicant had proposed to scope out the vulnerability of the works to risks of Major Accidents and Disasters from the EIA. However, MD-LOT communicated the need for an assessment of Major Accidents and Disasters in their Scoping Opinion (Volume 7, Appendix 3). This has been acknowledged by the Applicant and, therefore, an assessment on the topic has been included within this appendix. Comments received in the Scoping Opinion are presented in Table 1-1.

1.2.1.3 Additional consultation relevant to the individual receptors/topics that have informed the Major Accidents and Disasters assessment are available within the corresponding EIAR chapters.

[i] In 2023, Marine Scotland was renamed Marine Directorate, and thus the marine licensing and consents team is now referred to as Marine Directorate - Licensing Operations Team (MD-LOT).

Table 1-1: Comments from the Offshore Scoping Opinion of relevance to the Major Accidents and Disasters assessment.

Consultee	Comment	Response
MD-LOT	The EIA Report must include a description and assessment of the likely significant effects deriving from the vulnerability of the Proposed Development to major accidents and disasters. The Developer should make use of appropriate guidance, including the recent Institute of Environmental Management and Assessment ("IEMA") 'Major Accidents and Disasters in EIA: A Primer', to better understand the likelihood of an occurrence and the Proposed Development susceptibility to potential major accidents and hazards. The description and assessment should consider the vulnerability of the Proposed Development to a potential accident or disaster and also the Proposed Development potential to cause an accident or disaster.	This assessment has been prepared to consider the vulnerability of the Proposed Development (Offshore) to Major Accidents and Disasters. The risk assessment methodology has been informed by IEMA (2020[1]).
MD-LOT	The Scottish Ministers advise that existing sources of risk assessment or other relevant studies should be used to establish the baseline rather than collecting survey data and note the IEMA Primer provides further advice on this. This should include the review of the identified hazards from your baseline assessment, the level of risk attributed to the identified hazards and the relevant receptors to be considered.	This assessment has been informed by existing data sources. The risk assessment has been presented in Section 4, and includes a longlist of potential hazards, a shortlist of potential hazards, the risk assigned to the hazards and the relevant receptors at risk of potential impacts.
MD-LOT	The assessment must detail how significance has been defined and detail the inclusions and exclusions within the assessment. Any mitigation measures that will be employed to prevent, reduce or control significant effects should be included in the EIA Report.	The assessment methodology has been provided in Section 2, and has been informed by IEMA (2020[1]). The mitigation measures relevant to this assessment have been provided in Section 4.1.

1.3 Legislation, Policy and Guidance

1.3.1.1 There is limited overall formal guidance available on how to undertake a Major Accidents and Disasters assessment; however, there are several legislations and policies, alongside the IEMA (2020[1]) guidance that supports this assessment. The key legislation, policies and guidance are presented in Table 1-2.

Table 1-2: Key legislation, policies and guidance relevant to the Major Accidents and Disasters assessment.

Title	Relevance to Major Accidents and Disasters Assessment
Legislation	
The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (Scottish Parliament, 2017[2])	These Regulations require a developer to consider the risk of Major Accidents and Disasters, such as Regulation 5(2): "*The environmental impact assessment must identify, describe and assess in an appropriate manner, in light of the circumstances relating to the proposed works, the direct and indirect significant effects of the proposed works on the factors specified in paragraph (3) and the interaction between those factors*". In addition, Regulation 5(4) states: "*The effects to be identified, described and assessed under paragraph (2) include the expected effects deriving from the vulnerability of the works to risks, so far as relevant to the works, of major accidents and disasters*".
The Construction (Design and Management) 2015 Regulations (Scottish Parliament, 2015[3])	This instrument outlines the specific health and safety requirements applicable to construction projects. There are a number of key principles presented within that allow construction work to be carried out safely and without damaging the health of workers and other people. One of the key principles includes ensuring that there are arrangements in place for managing and organising the project, including the identification, management and reduction of risks.
The Health and Safety at Work etc. Act 1974 (Scottish Parliament, 1974[4])	This Act places duties on employers to ensure that risks to the health and safety of workers and other people are reduced as far as reasonably practical.
The Control of Major Accident Hazards Regulations (COMAH) 2015 (Scottish Parliament, 2015[5])	These Regulations aim to prevent and mitigate the effects of major accidents involving dangerous substances that can cause serious harm to people and/or the environment.
The Control of Substances Hazardous to Health Regulations (COSHH) 2002 (Scottish Parliament, 2002[6])	These Regulations require the control of exposure to hazardous materials in the workplace that may be a health risk.
Policy	
UK Marine Policy Statement (MPS) (Her Majesty's (HM) Government, 2011[7])	This framework relates to the development of Marine Plans in United Kingdom (UK) waters and the taking of decisions affecting the marine environment. One of the high-level objectives of this framework is that marine developments should be taking long-term strategic decisions and managing risks effectively.

Title	Relevance to Major Accidents and Disasters Assessment
Scottish National Marine Plan (The Scottish Government, 2015[8])	This policy was prepared according to the UK MPS[7] and is compatible with this and other existing marine plans across the UK. Scotland's National Marine Plan includes a number of strategic policies which inform management decisions across the primary marine sectors. A number of these policies are applicable to marine renewable energy and offshore wind. The Scottish National Marine Plan includes a number of General Planning Principles. The General Planning Principles relevant to this assessment include: ▪ GEN 4 Co-existence; ▪ GEN 5 Climate Change; and ▪ GEN 9 Natural Heritage
Guidelines	
Major Accidents and Disasters in EIA: A Primer IEMA (2020[1])	This primer outlines the Major Accidents and Disasters topic, including key definitions and an outline assessment methodology.
Marine Pollution Contingency Plan (Marine Management Organisation (MMO), 2023[9])	This plan contains information on the MMO's support to response to major marine pollution incidents and their statutory role regarding the use of oil spill treatment products in responding to oil spills.

2 Methodology

2.1 Overview

2.1.1.1 This Major Accidents and Disasters assessment follows the same methodology structure as set out in IEMA (2020[1]). The assessment is broken down into the following stages:

- Stage 1: Screening
  - The screening stage aims to identify whether the Proposed Development (Offshore) falls within the definition of an EIA development under the EIA Regulations[2] when considering the likelihood of significant environmental effects from Major Accidents and/or Disasters.
- Stage 2: Scoping
  - The scoping stage involves deciding whether a Major Accidents and/or Disasters assessment should be scoped in or out of the EIA. If the assessment is scoped into the EIA, a methodology should be proposed.
- Stage 3: Assessment
  - The Proposed Development (Offshore) is subjected to an assessment where potential significant effects will be examined in more detail and further mitigation can be presented.

2.2 Stage 1: Screening

2.2.1.1 The process of screening requires the high-level identification of whether a development has a vulnerability to Major Accidents and/or Disasters and whether the development could lead to a significant effect. The screening stage also considers the following:

- Is the development a source of hazard itself that could result in a Major Accident and/or Disaster occurring?
- Does the development interact with any sources of external hazards that may make it vulnerable to a Major Accident and/or Disaster?
- If an external Major Accident and/or Disaster occurred, would the existence of the development increase the risk of a significant effect to an environmental receptor occurring?

2.2.1.2 When accounting for the above criteria, it has been determined that the Proposed Development (Offshore) has the potential to be vulnerable to Major Accidents and/or Disasters, and requires scoping and further assessment as presented within this appendix.

2.3 Stage 2: Scoping

2.3.1.1 According to IEMA (2020[1]), the assessment should remain proportionate by defining the level of risk, as not all potential events will fall into the scope of a Major Accidents and Disasters assessment. This assessment will focus on low likelihood, high consequence events.

2.3.1.2 High likelihood, high consequence events would be deemed unacceptable for any development and have been designed-out by the Proposed Development (Offshore). Therefore, these impacts have been scoped out of the Major Accidents and Disasters assessment.

2.3.1.3 Low consequence events with any likelihood have also been scoped out of the assessment as they are not associated with a serious immediate or delayed impact upon any receptor. Where the impact is relevant, the risks to the environment have been addressed in the relevant EIAR chapters.

2.3.1.4 Any hazards with no defined source-pathway-receptor linkage have also been scoped out of the assessment.

2.3.1.5 The external and internal hazards that have been either scoped in to or out of the Major Accidents and Disasters assessment are presented in Table 4-5.

2.4 Stage 3: Assessment

2.4.1.1 The current baseline has been included within Section 3.1 as suggested in IEMA (2020[1]), in addition to a summary of the future baseline relevant to Major Accidents and Disasters.

2.4.1.2 The assessment process can be described by the following steps:

- Step 1: Identification of hazards informed by the relevant risk register sources identified in Section 4.2.2;
- Step 2: Identifying the severity of the risk and the likelihood of a risk occurring when assuming the worst-case scenario, using the criteria included in Section 4.2.1;
- Step 3: In the case that existing embedded mitigation is not significant enough to reduce the risk to ALARP, then secondary mitigation will be proposed; and
- Step 4: If the risk is still significant after the application of secondary mitigation, then a detailed assessment of the residual risk is required to reduce it to an acceptable level.

3 Baseline Characterisation

3.1 Current Baseline

3.1.1.1 Table 3-1 provides a summary of key baseline aspects of receptors/topics assessed within the EIAR to this Major Accidents and Disasters assessment. The existing baseline environment for each receptor/topic has been characterised in the corresponding chapters, and/or supporting appendices, of the EIAR.

Table 3-1: Baseline aspects of relevance for EIAR receptors/topics to the Major Accidents and Disasters assessment.

Receptor/Topic	Signpost Within EIAR	Relevance to Major Accidents and Disasters
Marine and Coastal Processes	Volumes 2, 3 and 4, Chapter 2: Marine and Coastal Processes	Hydrodynamic conditions (e.g., waves and currents).
Marine Water and Sediment Quality	Volumes 2, 3 and 4, Chapter 3: Marine Water and Sediment Quality	Bathing Waters in the vicinity of the Proposed Development (Offshore).
Benthic Subtidal and Intertidal Ecology	Volumes 2, 3 and 4, Chapter 4: Benthic Subtidal and Intertidal Ecology	Designated sites of relevance (e.g., Special Areas of Conservation (SACs) including benthic habitats as protected features).
Fish and Shellfish Ecology	Volumes 2, 3 and 4, Chapter 5: Fish and Shellfish Ecology	Designated sites of relevance (e.g., SACs including fish as protected features) and spawning/ nursery habitats.
Offshore Ornithology	Volumes 2, 3 and 4, Chapter 6: Offshore Ornithology	Designated sites of relevance (e.g., Special Protection Areas (SPAs) including birds as protected features).
Marine Mammals	Volumes 2, 3 and 4, Chapter 7: Marine Mammals	Designated sites of relevance (e.g., SACs including marine mammals as protected features) and haul out sites.
Shipping and Navigation	Volumes 2, 3 and 4, Chapter 9: Shipping and Navigation	Historic vessel transits based on Automatic Identification System (AIS) data.
Military and Civil Aviation	Volumes 2, 3 and 4, Chapter 11: Military and Civil Aviation	Airports and approaches, radar and activities associated with military danger areas.

3.2 Future Baseline

3.2.1.1 The future baseline environment applicable to Major Accidents and Disasters is likely to evolve over the lifetime of the Proposed Development (Offshore), currently anticipated to be 35 years, due to multiple influencing factors.

3.2.1.2 Volumes 2, 3 and 4, Chapter 8: Commercial Fisheries describe the expected changes in future baseline regarding fisheries and fisheries activities in the vicinity of the Proposed Development (Offshore). Commercial fisheries patterns are anticipated to fluctuate over time based on a number of factors, with relevant factors including response to existing OWF developments, fisheries management and improved efficiency and gear technology.

3.2.1.3 Volumes 2, 3 and 4, Chapter 9: Shipping and Navigation describe the expected changes in future baseline regarding shipping and related navigational activities in the vicinity of the Proposed Development (Offshore).

3.2.1.4 Volumes 2, 3 and 4, Chapter 11: Military and Civil Aviation describe the expected changes in future baseline regarding aviation activities in the vicinity of the Proposed Development (Offshore). In the Military and Civil Aviation study area it is expected that the decommissioning of oil and gas infrastructure will result in a decrease in helicopter traffic to and from offshore platforms; however, this may be offset by the increase in helicopter traffic associated with offshore wind development.

3.2.1.5 Volumes 2, 3 and 4, Chapter 13: Other Human Activities describe the expected changes in future baseline regarding other users in the vicinity of the Proposed Development (Offshore). Other Human Activities in the area are subject to change over time, with the development of various assets in the area, particularly in the offshore wind sector. As a result, it is anticipated that levels of baseline vessel activity will increase with the development of other assets.

3.2.1.6 Volume 6, Chapter 3: Climate Change Resilience describes the expected changes in future baseline regarding climate and carbon in the vicinity of the Proposed Development (Offshore). The expected climate change scenario will result in an increase in extreme weather events such as increasing near shore wind speeds during the winter season, an increase in the frequency of more intense winter storms and an increase in spatially averaged lightning frequency in the UK during summer in the near future.

4 Risk Assessment

4.1 Embedded Mitigation

4.1.1.1 In an effort to reduce the potential for impacts to arise from Major Accidents and Disasters, the Proposed Development (Offshore) has incorporated an embedded mitigation register (Volume 7, Appendix 8: Caledonia North Offshore Schedule of Mitigation and Volume 7, Appendix 9: Caledonia South Offshore Schedule of Mitigation). The mitigation relevant to this Major Accidents and Disasters assessment is presented in Table 4-1.

Table 4-1: Embedded mitigation relevant to the Major Accidents and Disasters assessment.

Reference	Embedded Mitigation Description	Securing Mechanism
M-1	Development of and adherence to a Cable Plan (CaP). The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-2	Development of and adherence to a Development Specification and Layout Plan (DSLP). The DSLP will confirm the layout and design parameters of the Proposed Development (Offshore).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-3	Development of and adherence to a Construction Method Statement (CMS). The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-5	Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the CaP.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-7	Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified via risk assessment is not feasible), as detailed within the CaP.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-8	Development of and adherence to an Offshore Environmental Management Plan (EMP). The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-9	Development of and adherence to a Marine Pollution Contingency Plan (MPCP). The MPCP will identify potential sources of pollution and associated spill response and reporting procedures.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

Reference	Embedded Mitigation Description	Securing Mechanism
M-13	Development of and adherence to a Vessel Management Plan (VMP). The VMP will confirm the types and numbers of vessels that will be engaged on the Proposed Development (Offshore), and consider vessel coordination including indicative transit route planning.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-14	Development of and adherence to a Lighting and Marking Plan (LMP). The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-19	Development of and adherence to a Navigational Safety Plan (NSP). The NSP will describe measures put in place by the Proposed Development (Offshore) related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Project activity to other sea users (e.g., via Notice to Mariners).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-21	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-23	Application for and use of Safety Zones of up to 500m during construction, major maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-24	Any objects dropped on the seabed during works associated with the Proposed Development (Offshore) will be reported and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

Reference	Embedded Mitigation Description	Securing Mechanism
M-25	Development of and adherence to an Emergency Response Cooperation Plan (ERCoP). The ERCoP will be prepared in line with Maritime and Coastguard Agency (MCA) guidance and confirms what measures the Proposed Development (Offshore) has in place to support any emergency response.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-26	Marine coordination and communication to manage project vessel movements.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-27	Compliance with MCA Marine Guidance Note (MGN) 654 (MCA, 2021[10]) and its annexes where applicable.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-28	Appropriate marking of the Proposed Development (Offshore) on Admiralty and aeronautical charts. This will include provision of the positions and heights of structures to the UK Hydrographic Office (UKHO), Civil Aviation Authority (CAA), Ministry of Defence (MoD) and Defence Geographic Centre (DGC).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-29	The construction area will be buoyed, as described in the NSP. Buoyage will be defined in consultation with the Northern Lighthouse Board (NLB).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-30	Marine navigation marking and lighting of the Proposed Development (Offshore), as described in the LMP, will be defined in agreement with NLB and in line with International Association of Lighthouse Authorities (IALA)[ii] Recommendation O-139 (IALA, 2013[11]).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-31	Compliance with regulatory expectations on moorings for floating wind and marine devices (Health and Safety Executive and MCA, 2017[12]).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for Caledonia South.

[ii] The full name is the International Association of Marine Aids to Navigation and Lighthouse Authorities.

Reference	Embedded Mitigation Description	Securing Mechanism
M-34	Aviation lighting and marking, as described in the LMP, will be installed in accordance with Article 223 of Civil Aviation Publication (CAP) 393, the UK Air Navigation Order (ANO) 2016 which sets out the mandatory requirements to be followed for lighting of offshore Wind Turbine Generators (WTGs).	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-35	The layout of the Proposed Development (Offshore), as presented in the DSLP, will be finalised in discussion with the MCA and the NLB in order to ensure the specific WTG layout is compatible with potential Search and Rescue activity.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-36	Failures to Proposed Development (Offshore) lighting and marking will be appropriately reported and rectified as soon as practicable. Interim hazard warnings will be put in place as required.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-38	Crossing and proximity agreements with known existing pipeline and cables operators will be sought.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.
M-74	Pre-construction surveys will identify potential UXO hazards within the boundaries of the Proposed Development (Offshore), with UXO removal/clearance activities, and/or construction micro-siting and cable re-routing, undertaken as required.	To be secured as a condition of the Generation Asset and Transmission Asset Marine Licences for both Caledonia North and Caledonia South.

4.2 Risk Assessment

4.2.1 Assessment Criteria

Likelihood

4.2.1.1 The likelihood of the worst-case consequence of a risk occurring includes the likelihood of the risk event and the likelihood of a receptor being affected. Embedded mitigation is taken into account in both instances.

4.2.1.2 The criteria for the likelihood of an impact on a receptor used in this assessment have been informed by the International Maritime Organization (IMO) Guidelines for Formal Safety Assessment (IMO, 2018[13]), and is presented in Table 4-2.

Table 4-2: Criteria for likelihood of an impact on a receptor.

Likelihood	Frequency
Negligible	One occurrence less than every 10,000 years
Extremely remote	One occurrence every 100-10,000 years
Remote	One occurrence every 10-100 years
Reasonably probable	One occurrence every 1-10 years
Frequent	Likely to occur every year

Severity

4.2.1.3 The severity of risks has been assessed assuming the worst-case impact on a receptor. The criteria for the severity of an impact upon a receptor used in this assessment have also been informed by IMO (2018[13]) guidelines, and is presented in Table 4-3.

Table 4-3: The criteria for the severity of an impact upon a receptor.

	Population and Human Health	Tangible Assets	Environment
Minor	Single or minor injuries	Isolated damage to infrastructure	Isolated damage, on-site assistance required
Significant	Multiple or severe injuries	Non-severe damage to infrastructure	Local damage, potential requirement for third-party assistance
Severe	Single fatality or multiple severe injuries	Severe damage to infrastructure and/or partial loss	Regional assistance required
Catastrophic	Multiple fatalities	Total loss of infrastructure	National assistance required

Significance

4.2.1.4 Following the assessment of likelihood and severity, the significance of the risk can then be determined using the acceptability matrix presented in Table 4-4. The risks are considered to be either high (unacceptable), intermediate (acceptable with mitigation) and low (acceptable).

Table 4-4: The criteria for the significance of an impact upon a receptor.

		Severity				
		Negligible	Minor	Significant	Severe	Catastrophic
Likelihood	Negligible	Acceptable	Acceptable	Acceptable	Acceptable	Acceptable with mitigation
	Extremely Remote	Acceptable	Acceptable	Acceptable	Acceptable with mitigation	Acceptable with mitigation
	Remote	Acceptable	Acceptable	Acceptable with mitigation	Acceptable with mitigation	Unacceptable
	Reasonably Probable	Acceptable	Acceptable with mitigation	Acceptable with mitigation	Unacceptable	Unacceptable
	Frequent	Acceptable with mitigation	Acceptable with mitigation	Unacceptable	Unacceptable	Unacceptable

4.2.2 Longlist

4.2.2.1 The initial long list of potential hazards was compiled from a number of existing sources of risk assessment, including the National Risk Register (HM Government, 2023[14]), the North of Scotland Community Risk Register (North of Scotland Regional Resilience Partnership, 2022[15]) and professional judgement. Hazards and risks have also been identified during a Navigational Risk Assessment (NRA) Hazard Workshop (see Volume 7B, Appendix 9-1: Navigational Risk Assessment (NRA) Technical Report), held in May 2024, which included the following stakeholders:

- Green Marine;
- MCA;
- NLB;
- Nigg Energy Park;
- Royal Yachting Association (RYA);
- Scottish Fishermen's Federation;
- Scottish White Fish Producers Association;
- Serco Northlink Ferries;
- Smyril Line; and
- UK Chamber of Shipping.

4.2.2.2 An initial list of hazards includes both internal and external hazards. Though some hazards do have an existing impact pathway, they have been sufficiently explained in other chapters of the EIAR, which have been signposted where relevant. The long list is presented in Table 4-5, and includes justifications for why an impact was scoped in or out of the assessment.

Table 4-5: Longlist of potential hazards that have either been scoped in (✓) or scoped out (X) of the Major Accidents and Disasters assessment with justification.

Potential Hazard	Scoped In (✓)/Out (X) of Shortlist		Justification
	External	Internal	
Terrorism and Malicious Attacks			
Malicious maritime incident	X	X	Existing policy, legislation and protocol are considered to be adequate mitigation for the risk of a regional, national or international-scale attack. Therefore, there is no impact pathway.
Strategic hostage taking	X	X	Existing policy, legislation and protocol are considered to be adequate mitigation for the risk of a regional, national or international-scale attack. Therefore, there is no impact pathway.
Chemical, biological, radiological and nuclear attacks	X	X	Existing policy, legislation and protocol are considered to be adequate mitigation for the risk of a regional, national or international-scale attack. Therefore, there is no impact pathway.
Cyber attack on electricity infrastructure control systems	X	X	Existing policy, legislation and protocol are considered to be adequate mitigation for the risk of a regional, national or international-scale attack. Therefore, there is no impact pathway.
Conventional attack on electricity infrastructure	X	X	Existing policy, legislation and protocol are considered to be adequate mitigation for the risk of a regional, national or international-scale attack. Therefore, there is no impact pathway. In addition, the Proposed Development (Offshore) will not be accessible without specialist equipment and vehicles. Therefore, there is no impact pathway.
Accidents and System Failures			
Major maritime pollution incident	X	✓	The Proposed Development (Offshore) contains a variety of chemicals and hazardous substances which have the potential to result in major marine pollution events if released from infrastructure or vessels. The risk of the Proposed Development (Offshore) causing a major maritime pollution incident has been scoped in to this assessment.

Potential Hazard	Scoped In (✓)/Out (X) of Shortlist		Justification
	External	Internal	
Major fire	X	✓	Major fires can start for a number of reasons, including infrastructure accidents involving electricity, ignition sources such as chemicals or fuels and malicious attacks. Fires may also start as a result of lightning strikes. Due to the nature of the Proposed Development (Offshore), it has been concluded that there is a potential risk to a major fire event, and it has been scoped in to this assessment.
Natural and Environmental Hazards			
Volcanic activity	X	X	Volcanic activity of most concern to the Proposed Development (Offshore) is located in Iceland. Severe volcanic eruptions in Iceland have the potential to interrupt air traffic across Europe, including the UK. It is not expected that there will be any impact to the Proposed Development (Offshore) and this risk has been considered as insignificant. It has been scoped out of the assessment.
Seismic activity (earthquake)	X	X	The Proposed Development (Offshore) is not within a seismically active area. Therefore, there is no impact pathway.
Severe space weather (solar flares)	X	X	The probability of a solar flare strong enough to cause major damage to infrastructure of the Proposed Development (Offshore) is extremely low. Therefore, there is no impact pathway.
Severe weather	X	X	The Proposed Development (Offshore) has the potential to be affected by severe weather events, including high winds and storm surges. These events will potentially be exacerbated by climate change, which has been covered in Volume 6, Chapter 4: Climate. Therefore, severe weather has been scoped out of this assessment.
High temperatures (heat waves)	X	X	High temperatures would have minimal interaction with infrastructure of the Proposed Development (Offshore), but extreme temperatures will be considered in the project design.

Potential Hazard	Scoped In (✓)/Out (X) of Shortlist		Justification
	External	Internal	
Low temperatures	X	X	High temperatures would have minimal interaction with infrastructure of the Proposed Development (Offshore), but extreme temperatures will be considered in the project design.
Disaster response in an overseas country	X	X	This event would have little effect on the Proposed Development (Offshore). Therefore, there will be no impact pathways.
Coastal flooding	X	X	Major construction works will be carried out in the marine environment, and there will be no impact pathways involving coastal flooding for the Proposed Development (Offshore).
Fluvial flooding	X	X	Major construction works will be carried out in the marine environment, and there will be no impact pathways involving fluvial flooding for the Proposed Development (Offshore).
Surface water flooding	X	X	Major construction works will be carried out in the marine environment, and there will be no impact pathways involving flood risk or defences for the Proposed Development (Offshore).
Drought	X	X	This event would have little effect on the Proposed Development (Offshore), and there will be no impact pathways.
Human, Plant and Animal Health			
Pandemic	X	X	Construction can be halted or postponed where there is there risk of transmitting disease. As demonstrated by the COVID-19 pandemic, government guidelines would be adhered to at all times in order to restrict the spread of disease. The risk to the Proposed Development (Offshore) from a pandemic is deemed to be insignificant and has been scoped out of the assessment.
Outbreak of an emerging infectious disease	X	X	Construction can be halted or postponed where there is there risk of transmitting disease. As demonstrated by the COVID-19 pandemic, government guidelines would be adhered to at all times in order to restrict the spread of disease. The risk to the Proposed Development (Offshore) from a

Potential Hazard	Scoped In (✓)/Out (X) of Shortlist		Justification
	External	Internal	
			pandemic is deemed to be insignificant and has been scoped out of the assessment.
Conflict and Instability			
Industrial action	X	X	This event would have a negligible effect on the Proposed Development (Offshore), and there will be no impact pathways.
Public disorder	X	X	This event would have a negligible effect on the Proposed Development (Offshore), and there will be no impact pathways.
Project Specific			
Disturbance of unexploded ordnance (UXO) in the area	✓	X	There is a potential risk associated with the accidental detonation of UXO in the area. The unintentional detonation of UXO may cause injury or fatality to project and/or third-party personnel, damage or loss of project and/or third-party vessels, and immediate damage to the marine environment. The Proposed Development (Offshore) will be subjected to desk-based UXO studies, UXO surveys and clearance of UXO prior to construction, and as such the risk of internal project disturbance is unlikely.
Collision risk - Aviation	✓	X	There is the potential for an aviation collision with infrastructure of the Proposed Development (Offshore) due to the presence of third-party aviation traffic arriving and departing from Wick John O'Groats Airport, in addition to Search and Rescue (SAR) and offshore helicopter operations. Aviation collision risk may result in injury or fatality to both project and/or third-party personnel, damage or loss of a project and/or third-party vessel, or damage to infrastructure of the Proposed Development (Offshore).
Collision/allision risk – Shipping and Navigation	✓	✓	Collision risks to shipping and navigation can be interpreted as coming from both external and internal sources. There is also the potential for an external accident to occur due to the presence of third-party marine traffic in the area. External accidents may result in injury or fatality to both project and/or third-party personnel, damage or loss of a project

Potential Hazard	Scoped In (✓)/Out (X) of Shortlist		Justification
	External	Internal	
			and/or third-party vessel, or damage to infrastructure of the Proposed Development (Offshore). There is the potential for an internal accident to occur involving transiting vessels associated with the Proposed Development (Offshore) that may result in injury or fatality to personnel, damage or loss of a vessel or damage to infrastructure of the Proposed Development (Offshore).
Exposed cables leading to vessel snagging	X	✓	There is the potential for a third-party vessel to get snagged on areas of exposed cable. This may lead to injuries and/or fatalities, damage to third-party vessels or damage to infrastructure of the Proposed Development (Offshore).
Seabed conditions affecting foundations (e.g., instability)	X	X	The seabed will be subject to geophysical surveys before construction commences to determine suitable locations for WTG placement, reducing the risk of a major accident or disaster caused by unsuitable ground conditions. Therefore, there is no impact pathway.
Floating WTGs breaking free during towing or mooring, or once moored	X	✓	There is the potential for a floating WTG to break free during towing, during the mooring process or from moorings once installed. This may lead to injuries and/or fatalities, damage to third-party and/or vessels and damage to infrastructure of the Proposed Development (Offshore).

4.2.3 Final Assessment

4.2.3.1 Risks that were scoped in and requiring consideration within this Major Accidents and Disasters assessment were collated into the resulting final assessment presented in Table 4-6 The severity and likelihood of the scoped in risks were determined across all of the Proposed Development (Offshore) stages (construction, O&M and decommissioning) and the significance of the risk considering embedded mitigation measures was assessed.

4.2.3.2 All risks included in the final assessment have been assessed as Acceptable with mitigation; therefore, the embedded mitigation measures included are sufficient and no secondary mitigation or further assessment has been identified.

Table 4-6: Assessment of risks to/from the Proposed Development (Offshore) due to external and internal hazards, including the severity, likelihood and significance of impact and a summary of any relevant embedded mitigation and any need for further risk assessment.

Risk	Receptor (and Worst-Case Scenario)	Severity, Likelihood and Significance	Relevant Embedded Mitigation	Further Assessment Required?
External Hazards				
Disturbance of UXO in the area	Population and human health – Injuries and/or fatalities to project crew or third-party personnel. Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party vessels (including cargo and fuel). Environment – Damage of marine environment caused directly by the impact of explosion, and loss of infrastructure of the Proposed Development (Offshore) to environment, potentially leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Extremely remote Significance – Acceptable with embedded mitigation	Pre-construction surveys will identify potential UXO hazards within the boundaries of the Proposed Development (Offshore). UXO removal/clearance activities, and/or construction micro-siting and cable re-routing, will take place to reduce any risk to ALARP (M-74).	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.
Collision risk – Aviation	Population and human health – Injuries and/or fatalities to project crew or third-party personnel Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party aircraft (including cargo and fuel). Environment – Loss of infrastructure of the Proposed Development (Offshore) to environment, potential leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Remote Significance – Acceptable with embedded mitigation	The Proposed Development (Offshore) will be appropriately marked on Admiralty and aeronautical charts, including information of structure heights and provisions. This information will be provided to the UK UKHO, CAA, MoD and DGC (M-28). A LMP will be developed, which will contain legal requirements with regards to aviation marking and lighting (M-14). As described within this LMP, aviation lighting and marking will be installed in accordance with Article 223 of Civil Aviation Publication (CAP) 393, where the Air Navigation Order 2016 provides mandatory requirements for the lighting of offshore WTGs (M-34).	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.
Collision/allision risk – Shipping and Navigation	Population and human health – Injuries and/or fatalities to project crew or third-party personnel. Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party vessels (including cargo and fuel). Environment – Loss of infrastructure of the Proposed Development (Offshore) to environment, potential leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Remote Significance – Acceptable with embedded mitigation	The Applicant has committed to a number of relevant mitigation measures, including the development of and adherence to a VMP, LMP and NSP (M-13, M-14 and M-19). The Proposed Development (Offshore) has multiple measures that include communicating information on project activity, including safety zones and advisory passing distances, via Notice to Mariners and Kingfisher Bulletins (M-19 and M-21). Guard vessels will also be used to ensure adherence to these safety zones and advisory passing distances to reduce the likelihood of a collision (M-23). The Proposed Development (Offshore) will be appropriately marked on Admiralty and aeronautical charts, including information of structure heights and provisions. This information will be provided to the UKHO, CAA, MoD and DGC (M-28).	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.
Internal Hazards				
Major maritime pollution incident	Population and human health – Injuries and/or fatalities to project crew or third-party personnel, in addition to the public.	Severity – Severe (Population and human health); Severe (Tangible assets); Severe (Environment)	An outline Environmental Management Plan will be developed, which will ensure that any mitigation measures relevant to environmental	No – the risk of the Proposed Development (Offshore) has been

Risk	Receptor (and Worst-Case Scenario)	Severity, Likelihood and Significance	Relevant Embedded Mitigation	Further Assessment Required?
	Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel resulting in a pollution incident), and damage or loss of third-party vessels (including cargo and fuel resulting in a pollution incident). Environment – Loss of infrastructure of the Proposed Development (Offshore) and associated inventory to environment, leading to damage/contamination and a reduction in water quality.	Likelihood – Remote Significance – Acceptable with embedded mitigation	management, including chemical management and pollution prevention and contingency planning are adhered to (M-8). A Marine Pollution Contingency Plan (MPCP) will be developed to help identify potential sources of pollution and the associated spill response and reporting procedures (M-9), limiting the risk of a major maritime pollution incident.	reduced to ALARP with embedded mitigation.
Major fire	Population and human health – Injuries and/or fatalities to project crew or third-party personnel. Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party vessels (including cargo and fuel). Environment – Loss of infrastructure of the Proposed Development (Offshore) to environment, potentially leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Remote Significance – Acceptable with embedded mitigation	The Proposed Development (Offshore) contains many components that are susceptible to fire. However, there are embedded mitigation measures in place to reduce the likelihood of a fire becoming a major fire. Any flammable substances will be stored correctly according to the relevant health and safety regulations and policy. ERCoPs will be developed according to discussions with the MCA, which will include appropriate fire risk assessments and evacuation plans (M-25). The isolated nature of components of the Proposed Development (Offshore) (e.g., spacing between WTGs, Offshore Substation Platforms (OSPs), etc.) means that the risk of fire spreading is negligible. Tall infrastructure will also be fitted with lightning protection equipment, which is designed to dissipate electricity, limiting the risk of fire.	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.
Collision/allision risk – Shipping and Navigation	Population and human health – Injuries and/or fatalities to project crew. Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party vessels (including cargo and fuel). Environment – Loss of infrastructure of the Proposed Development (Offshore) to environment, potential leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Remote Significance – Acceptable with embedded mitigation	Project vessels will adhere to a VMP, which will include vessel coordination through indicative transit route planning, in order to identify risks before transit (M-13). The Proposed Development (Offshore) has multiple measures that include communicating information on project activity, including safety zones and advisory passing distances, via Notice to Mariners and Kingfisher Bulletins (M-19 and M-21). Guard vessels will also be used to ensure adherence to these safety zones and advisory passing distances to reduce the likelihood of a collision (M-23).	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.
Exposed cables leading to vessel snagging	Population and human health – Injuries and/or fatalities to project crew or third-party personnel Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party vessels (including cargo and fuel) Environment – Loss of infrastructure of the Proposed Development (Offshore) to environment, potentially leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Remote Significance – Acceptable with embedded mitigation	A CaP will be developed and adhered to, which will confirm details on planned cable routing, burial and any additional protection or post-installation monitoring methods required (M-1 and M-7). To reduce the risk of snagging, burial of the cable will be the preferred means of cable protection and will be informed by the cable burial risk assessment (M-5).	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.

Risk	Receptor (and Worst-Case Scenario)	Severity, Likelihood and Significance	Relevant Embedded Mitigation	Further Assessment Required?
Floating WTGs breaking free during towing or mooring, or once moored	Population and human health – Injuries and/or fatalities to project crew or third-party personnel Tangible assets – Damage or loss of infrastructure of the Proposed Development (Offshore) and or vessels (including cargo and fuel), and damage or loss of third-party vessels (including cargo and fuel) Environment – Loss of infrastructure of the Proposed Development (Offshore) to environment, potential leading to damage/contamination.	Severity – Severe (Population and human health); Severe (Tangible assets); Minor (Environment) Likelihood – Extremely remote Significance – Acceptable with embedded mitigation	Deployment of floating WTGs will, where possible, avoid adverse weather conditions, and be supported by suitable vessels (e.g., tugs, guard vessels). An Emergency Recovery Plan will be developed prior to construction in the event of the loss of floating WTGs during towing. When moored, the floating WTG is unlikely to break free, as it will be secured by multiple anchors. Should floating WTGs be deployed (within Caledonia South), the Proposed Development (Offshore) will be in compliance with the Regulatory Expectations on Moorings for Floating Wind and Marine Devices (Health and Safety Executive and MCA, 2017[12]) (M-31), which states: ▪ The mooring should be able to withstand reasonably foreseeable forces (such as environmental conditions, operational loads, tow out and unplanned incidents such as vessel impact and mooring failure); ▪ The mooring will maintain integrity during all phases of its life cycle; ▪ It can be safely dismantled/decommissioning; and ▪ In the event of damage or mooring failure, it will retain sufficient integrity to enable the safeguarding of the health and safety of people on or near it.	No – the risk of the Proposed Development (Offshore) has been reduced to ALARP with embedded mitigation.

5 Conclusion

5.1.1.1 This appendix presents an assessment of the potential Major Accidents and Disasters relevant to the Proposed Development (Offshore) during the Construction, O&M and decommissioning phases.

5.1.1.2 Overall, all risks were identified as being acceptable with embedded mitigation. Therefore, none of these risks will be capable of leading to a Major Accident and/or Disaster with the current embedded mitigation in place.

5.1.1.3 The Proposed Development (Offshore) will be built in line with measures committed to by Applicant within the embedded mitigation listed in Table 4-1. All required risk assessments and method statements will be conducted prior to commencing works, and the Applicant will adhere to risk management procedures in order to keep the risk of a Major Accident and/or Disaster to ALARP.

6 References

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