



Offshore Wind Power Limited

# West of Orkney Offshore EIA Report

## Volume 2, Supporting Study 2: Major Accidents and Disasters

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# 1 INTRODUCTION

This supporting study assesses the risk of major accidents and/or disasters associated with the offshore elements of the West of Orkney Windfarm, including all offshore infrastructure and activities seaward of Mean High Water Springs (MHWS) during construction, operation and maintenance and decommissioning (hereafter referred to as the 'offshore Project').

This report has been produced in accordance with relevant legislation and guidance, as outlined in section 2, including the Institute of Environmental Management and Assessment (IEMA) (2020) guidance: Major Accidents and Disasters in EIA: A Primer.

Major accidents and/or disasters associated with the offshore Project may result from two main sources:

- **Internal:** the potential for the offshore Project to cause a major accident and/or disaster; or
- **External:** the potential for the offshore Project to interact with an external hazard to increase the risk of a major accident and/or disaster.

The IEMA (2020) guidance defines major accidents and disasters as:

- **Major accidents:**  
*"events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. fatalities or injury from blade failure) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events";* and
- **Disasters:**  
*"may be a natural hazard (e.g. earthquake) or a man-made/external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident."*

This supporting study considers the potential significant effects arising from the vulnerability of the offshore Project to major accidents and/or disasters from internal and external sources. The study draws on assessments within the following Offshore Environmental Impact Assessment (EIA) Report chapters:

- Chapter 5: Project description;
- Chapter 14: Commercial fisheries;
- Chapter 15: Shipping and navigation;
- Chapter 16: Marine archaeology and cultural heritage;
- Chapter 17: Military and aviation; and
- Chapter 18: Other sea users.

This chapter also draws on information within Supporting study (SS) 1: Climate and carbon assessment for the consideration of climate hazards and risks.



## 2 LEGISLATION, POLICY AND GUIDANCE

In addition to the legislation and policy described in Offshore EIA Report chapter 3: Planning policy and legislative context, the following key legislation, policy and guidance relate to the assessment of major accidents and/or disasters.

The EIA Regulations (as defined in Offshore EIA Report chapter 3: Planning policy and legislative context)<sup>1</sup> require the EIA to consider:

*"Expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to that development" and "a description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU law such as any law that implemented Directive 2012/18/EU of the European Parliament and of the Council<sup>2</sup> or Council Directive 2009/71/Euratom<sup>3</sup> or UK environmental assessments may be used for this purpose provided that the requirements of any law that implemented this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies."*

Other relevant legislation and policy include:

- Legislation:
  - Health and Safety at Work etc. Act 1974;
  - The Construction (Design and Management) (CDM) 2015 Regulations;
  - The Control of Major Accident Hazards Regulations 2015;
- Policy:
  - Scottish National Marine Plan:
    - Prepared in accordance with the UK Marine Policy Statement, 2010, which outlines the framework for marine plans for the UK marine environment. Policies relevant to major accidents and/or disasters include:
      - GEN 5 Climate change;
      - GEN 4 Co-existence; and
      - GEN 9 Natural heritage.
- Guidance:
  - IEMA (2020): Major Accidents and Disasters in EIA: A Primer; and
  - International Maritime Organization (IMO) (2018): Revised Guidelines for Formal Safety Assessment (FSA) for use in the IMO Rule-Making Process.

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<sup>1</sup> As defined in chapter 3: Planning policy and legislative context, the 'EIA Regulations' encompass Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (As Amended), The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), and The Marine Works (Environmental Impact Assessment) Regulations 2007.

<sup>2</sup> Directive 2012/18/EU is also known as the Seveso-III Directive and aims to control major chemical accident hazards. As this is an EU Directive it is no longer directly applicable in the UK. However, this Directive is implemented in the UK through Control of Major Accident Hazards Regulations 2015.

<sup>3</sup> The Directive 2009/71/EURATOM establishes a community framework for the nuclear safety of nuclear installations. This Directive is not directly applicable to the offshore Project.



### 3 SCOPING AND CONSULTATION

Stakeholder consultation has been ongoing throughout the EIA and has played an important part in ensuring the scopes of the baseline characterisation and impact assessment are appropriate with respect to the Project and the requirements of the regulators and their advisors.

The Scoping Report, which covered the onshore and offshore Project was submitted to Scottish Ministers (via Marine Scotland Licencing Operations Team (MS-LOT)<sup>4</sup>) and The Highland Council (THC) on 1<sup>st</sup> March 2022<sup>5</sup>. MS-LOT circulated the Scoping Report to consultees relevant to the offshore Project and a Scoping Opinion was received on 29<sup>th</sup> June 2022. Relevant comments from the Scoping Opinion and other consultation specific to major accidents and disasters are provided in Table 3-1 below, which provides a high-level response on how these comments have been addressed within this supporting study.

Additional consultation on hazards assessed within the Offshore EIA Report chapters is detailed within the relevant topic-specific chapter.

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<sup>4</sup> MS-LOT has since been renamed Marine Directorate – Licencing Operations Team (MD-LOT).

<sup>5</sup> The Scoping Report was also submitted to the Orkney Islands Council (OIC), as the scoping exercise included consideration of power export to the Flotta Hydrogen Hub, however, this scope is not covered in the Onshore and Offshore EIA Report and will be subject to a separate Marine Licence application to MS-LOT and a planning application to OIC.



Table 3-1 Summary of scoping opinion responses specific to major accidents and/or disasters

CONSULTEE	COMMENT	RESPONSE
Scottish Ministers (via MS-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 supporting study has been prepared to ensure that the vulnerability of the offshore Project to major accidents and/or disasters and the potential for the offshore Project to cause a major accident and/or disaster has been adequately considered.  The assessment presented within this supporting study is in line with the IEMA (2020). The IEMA (2020) guidance has been used to inform the assessment of risks presented in section 6.
Scottish Ministers (via MS-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.	Existing sources for the baseline have been utilised, as outlined in the IEMA (2020) guidance. The baseline for the assessment of the vulnerability of the offshore Project to major accidents and/or disasters has been informed by the Offshore EIA Report and the Construction Design Management (CDM) Risk Register, as outlined in section 5.  The potential hazards associated with the offshore Project are listed in section 6.2. The level of risk for the hazards scoped into the assessment is assessed in section 6.3.
Scottish Ministers (via MS-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 is provided in section 4 and this is in line with the IEMA (2020) guidance. Relevant embedded mitigation measures are outlined in section 6.1.
Scottish Ministers (via MS-LOT)	The Scottish Ministers acknowledge that the Scoping Report proposes that the EIA Report will not include a standalone topic for Major Accidents and/or Disasters and rather will be considered within the ecological topics.	This supporting study presents the assessment of major accidents and/or disasters and a summary is provided in chapter 5: Project description.



## 4 METHODOLOGY

### 4.1 Overview

The assessment of the offshore Project's vulnerability to major accidents and/or disasters has followed the methodology set out in the IEMA (2020) guidance. The assessment of major accidents and/or disasters involves three key steps:

1. Screening (section 4.2);
2. Scoping (section 4.3); and
3. Assessment (section 4.4).

### 4.2 Screening

The screening stage identifies whether a development has a vulnerability to major accidents and/or disasters, through a high-level consideration of the following:

- Whether a development could be a source of hazard that could result in a major accident and/or disaster;
- Whether a development could interact with any external sources of hazard that may make it vulnerable to a major accident and/or disaster; and
- Would the presence of a development increase the risk of a significant effect on the environment resulting from a major accident and/or disaster.

Based on the above criteria, it has been assessed that the offshore Project is potentially vulnerable to major accidents and/or disasters, and this vulnerability requires further assessment within this supporting study.

### 4.3 Scoping

The scoping stage considers the potential vulnerability of a development to major accidents and/or disasters in further detail by considering the development location, type, context, existing and future constraints and likely receptors.

A list of potential internal or external hazards (i.e. the source of the major accident and/or disaster) and receptors (i.e. features potentially affected by the major accident and/or hazard) is collated, based on existing sources of risk assessments (e.g. CDM risk register). Hazards can then be scoped in and out through the following key considerations:

- Major accidents and/or disasters can be scoped out for the following reasons:
  - There is no source-pathway-receptor linkage of a hazard that could trigger a major accident and/or disaster or potential for the development to lead to a significant environmental effect; and
  - All possible major accidents and/or disasters are adequately covered elsewhere or covered by existing embedded mitigation measures or compliance with legislation and best practice.

The IEMA (2020) guidance goes further to state that the scope of the assessment should focus on low likelihood and high consequence events for the following reasons:





- Low likelihood, low consequence events are addressed in receptor assessments within the Offshore EIA Report, where relevant (e.g. leaks and spills at construction sites); and
- High likelihood, high consequence events should already be designed-out by a development.

Section 6.1 outlines the internal and external hazards scoped in and out for the assessment of major accidents and/or disasters.

## 4.4 Assessment

The assessment stage involves the following key steps:

- Step 1 – hazard identification (based on the worst case for the grouped risk event<sup>6</sup>);
- Step 2 – identifying the likelihood and worst case consequence;
- Step 3 – if a risk is deemed unacceptable, based on the assessment criteria, additional secondary mitigation measures are identified: and
- Step 4 – if, following the application of additional mitigations, the risk is still deemed significant then more detailed assessment of the residual risk is required to eliminate or reduce the risk to acceptable levels.

The assessment methodology is informed by the Formal Safety Assessment (FSA) process (IMO, 2018), which aims to ensure risks are reduced to As Low As Reasonably Practicable (ALARP). As such the methodology differs slightly from that presented in chapter 7: EIA methodology.

### 4.4.1 Consequence

The reasonable worst case consequence is identified for each grouped risk event, using professional judgement. The worst case consequence is then assessed against the criteria set out in Table 4-1 to understand the potential for the consequence to constitute a major accident and/or disaster. The criteria for assigning consequence have been informed by FSA criteria (IMO, 2018) and are provided separately for each group of receptors: people and human health, material assets, and environment.

Table 4-1 Consequence criteria

SEVERITY OF CONSEQUENCE	DEFINITION
Negligible	All receptors: No perceptible effect
Minor	Population and human health: Minor injury or very short term health concerns. Material assets: Minor damage. Environment: Local (on site) assistance required.

<sup>6</sup> Risk events are unplanned events with the potential to result in a major accident and/or disaster and these are the subject of the risk assessment. A grouped risk event is a combined term that represents all sources and pathways that could lead to a major accident and/or disaster on a particular receptor.



SEVERITY OF CONSEQUENCE	DEFINITION
Moderate	<p><b>People and human health:</b> Multiple minor injuries or injuries resulting in medium health concerns (e.g. multiple days off work).</p> <p><b>Material assets:</b> Damage to a level that is not critical to operations.</p> <p><b>Environment:</b> Limited external assistance required.</p>
Serious	<p><b>Population and human health:</b> Single fatality or injury resulting in permanent disability.</p> <p><b>Material assets:</b> Damage to a level that results in a critical impact on operations.</p> <p><b>Environment:</b> Regional assistance required.</p>
Major	<p><b>Population and human health:</b> Multiple fatalities or injuries resulting in permanent disability.</p> <p><b>Material assets:</b> Total loss of asset.</p> <p><b>Environment:</b> National assistance required.</p>

#### 4.4.2 Likelihood

The likelihood of the reasonable worst-case consequence occurring relates both to the likelihood of the grouped risk event and the likelihood of the receptor being affected, and in both instances, embedded mitigation is taken into account.

The likelihood criteria are set out in Table 4-2 and are based on FSA criteria (IMO, 2018).

Table 4-2 Likelihood criteria

LIKELIHOOD	DEFINITION
Negligible	Less than 1 occurrence per 10,000 years.
Extremely unlikely	1 occurrence per 100 to 10,000 years.
Remote	1 occurrence per 10 to 100 years.
Reasonably probable	1 occurrence per 1 to 10 years.
Frequent	Yearly occurrence.

#### 4.4.3 Risk ranking

The tolerability matrix used to determine the significance of effects from the frequency of occurrence and the severity of consequences is presented in Table 4-3. The risks are ranked as low (broadly acceptable), intermediate (tolerable with mitigation) and high (unacceptable). Low and intermediate risks are considered to be managed to an acceptable level. High risks are considered to be unacceptable.



Table 4-3 Tolerability matrix

<b>CONSEQUENCE</b>	<b>MAJOR</b>	Tolerable with mitigation	Tolerable with mitigation	Unacceptable	Unacceptable	Unacceptable
	<b>SERIOUS</b>	Broadly acceptable	Tolerable with mitigation	Tolerable with mitigation	Unacceptable	Unacceptable
	<b>MODERATE</b>	Broadly acceptable	Broadly acceptable	Tolerable with mitigation	Tolerable with mitigation	Unacceptable
	<b>MINOR</b>	Broadly acceptable	Broadly acceptable	Broadly acceptable	Tolerable with mitigation	Tolerable with mitigation
	<b>NEGLIGIBLE</b>	Broadly acceptable	Broadly acceptable	Broadly acceptable	Broadly acceptable	Tolerable with mitigation
	<b>NEGLIGIBLE</b>	<b>EXTREMELY UNLIKELY</b>	<b>REMOTE</b>	<b>REASONABLY PROBABLE</b>	<b>FREQUENT</b>	
	<b>LIKELIHOOD</b>					



## 5 BASELINE CHARACTERISATION

Relevant aspects of the Offshore EIA Report have considered the risk of major accidents and disasters, alongside the associated risks to the environment and society. The following chapters include details on the baseline characterisation used to inform this supporting study:

- Chapter 5: Project description;
- Chapter 14: Commercial fisheries;
- Chapter 15: Shipping and navigation;
- Chapter 16: Marine archaeology and cultural heritage;
- Chapter 17: Military and aviation; and
- Chapter 18: Other sea users.

Each of the topic-specific assessment chapters present the future baseline for that topic taking into account, for example, climate change or changes in use of the marine environment (e.g. changes in fishing practices, vessel use and developments). SS1: Climate and carbon assessment provides a description of the future baseline environment associated with climate change, including changes in extreme weather events such as an increased frequency in heavy rainfall events, storms and heat waves, as well as changes in average weather and sea conditions such as rises in sea level, increased air and sea temperatures, decreased summer rainfall and increased winter rainfall.



## 6 RISK ASSESSMENT

### 6.1 Embedded mitigation

As part of the offshore Project design process, a number of embedded mitigation measures and management plans have been proposed, and those that reduce the potential for major accidents and/or disasters are listed in Table 6-1. There is a commitment to implement these measures and they are considered inherently part of the design of the offshore Project. Therefore, they have been considered in the assessment of risks scoped into the assessment and presented below (i.e. the determination of magnitude of consequence and therefore significance of effects assumes implementation of these measures).

*Table 6-1 Embedded mitigation measures and management plans relevant to the assessment of major accidents and/or disasters*

EMBEDDED MITIGATION AND MANAGEMENT PLAN	DESCRIPTION
<b>Embedded mitigation measures</b>	
<b>Wind Turbine Generator (WTG) and Offshore Substation Platform (OSP) design</b>	The WTG and OSP topsides are designed and constructed to contain leaks, thereby reducing the risk of spillage into the marine environment. Details on control measures for reducing the risk of accidental leaks and spills will be detailed within the Marine Pollution and Contingency Plan (MPCP) (see Outline Plan (OP) 1: Outline Environmental Management Plan which contains the outline MPCP).
<b>Minimum spacing between WTGs</b>	The minimum spacing between WTGs will be 944 m.
<b>Cable protection</b>	Suitable implementation and monitoring of cable protection (via burial or external protection).  Cables will be buried as the first choice of protection. External cable protection will be used where adequate burial cannot be achieved and this will be minimised as far as is practicable. This will be informed by a Cable Burial Risk Assessment (CBRA) undertaken post consent following results of the geotechnical survey.
<b>Crossing and proximity agreements with known existing cable operators</b>	Crossing and proximity agreements will be agreed with Scottish Hydro Electric Transmission Limited (SHET-L) for the crossing with the SHET-L Caithness – Orkney High Voltage Alternating Current (HVAC) Link, as required.
<b>Buoyed construction area</b>	Buoyage to mark construction area of the Option Agreement Area (OAA) during the construction stage, as directed by Northern Lighthouse Board (NLB). The buoys will alert vessels to the construction area, they will not act to exclude vessels from the area.



EMBEDDED MITIGATION AND MANAGEMENT PLAN	DESCRIPTION
<b>Compliance with the International Regulations for the Prevention of Collision at Sea (COLREGs) and the International Regulations for the Safety of Life at Sea (SOLAS)</b>	All vessels will comply with the provisions of COLREGs and SOLAS, including the display of appropriate lights and shapes such as when vessels are restricted in their ability to manoeuvre.
<b>Adherence to the International Convention for the Prevention of Pollution from Ships (MARPOL)</b>	The risk of marine pollution will be minimised through compliance with The International Convention for the Prevention of Pollution from Ships (MARPOL) convention requirements.  Control measures and shipboard oil pollution emergency plans (SOPEP) (for oil tankers of 150 gross tonnage and above and all vessels of 400 gross tonnage and above) will be established and adhered to, as required under MARPOL Annex I.
<b>Promulgation of information, such as Notice to Mariners, Kingfisher notifications and other navigational warnings on the location, duration and nature of works</b>	Timely and efficient distribution of Notice to Mariners (NtMs), Kingfisher notifications and other navigational warning on the location, duration and nature of works.
<b>Charting of installed infrastructure</b>	Notification to the UK Hydrographic Office (UKHO)/Kingfisher of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical /admiralty charts and publications.  All permanent structures of more than 91.4 m in height will be charted on aeronautical charts and reported to the Defence Geographic Centre (DGC), which maintains the UK's database of tall structures (Digital Vertical Obstruction File) at least ten weeks prior to construction.
<b>Compliance with Marine Guidance Note (MGN) 654 and its annexes (particularly Search and Rescue (SAR) annex 5 (MCA, 2021) and completion of a SAR checklist)</b>	The offshore Project will be fully compliant with MGN 654 and its annexes which will aim to ensure that impacts on navigational safety and emergency response are considered, assessed, and mitigated.
<b>Use of guard vessel(s), where required</b>	Use of guard vessels where appropriate (as required by project risk assessment of hazards / activities).
<b>Application for and implementation of safety zones</b>	Application for safety zones of up to 500 m around structures during construction and periods of major maintenance, and 50 m around structures pre-commissioning.
<b>Dropped objects procedures</b>	Procedures for dropped objects and claim processes for loss/damage to fishing gear/vessels. The procedure will be outlined within the Fisheries Management and Mitigation Strategy (FMMS) (see OP3: Outline Fisheries Management and Mitigation Strategy).
<b>Promulgation of information to the Civil Aviation Authority (CAA)</b>	CAA will be informed of the locations, heights and lighting status of the WTG, including estimated and actual dates of construction



EMBEDDED MITIGATION AND DESCRIPTION MANAGEMENT PLAN	
	and the maximum heights of any construction equipment to be used, prior to the start of construction.
<b>Waste</b>	All wastes will be securely brought to shore and disposed of in accordance with industry best practice.
<b>Notifications to Dounreay Site Restoration Limited (DSRL) and the Ministry of Defence (MoD)</b>	Notification to Dounreay Site Restoration Limited (DSRL) and the Ministry of Defence (MoD) regarding plans for offshore activity for compliance with the security measures of the Dounreay Nuclear Power Development Establishment (NPDE) and Vulcan Naval Reactor Test Establishment (NRTE) given their proximity to the offshore Project.
<b>Management plans</b>	
<b>Development Specification and Layout Plan (DSLPL)</b>	The DSLP confirms details of the final design and layout of the Project.
<b>Cable burial risk assessment (CBRA) and Cable Plans (CaPs)</b>	The CaPs will present the final layout, design and installation approach of the inter-array, interconnector and export cables. It will be informed by a CBRA and survey data.
<b>Environmental Management Plan (EMP) covering pollution prevention, biosecurity assessment and waste management</b>	<p>The EMP will provide the overall framework for environmental management during the construction and operation and maintenance stages. The document will provide practical guidance to ensure that all activities are carried out in a manner that minimises their impact on the environment, and that mitigation measures contained in the Offshore EIA Report and consent conditions, or as otherwise agreed, are fully implemented.</p> <p>An outline EMP has been provided alongside the Offshore EIA Report in OP1: Outline Environmental Management Plan.</p>
<b>Fisheries Management and Mitigation Strategy (FMMS)</b>	<p>The FMMS will present the approach to collaborating with the fishing industry and the approaches taken to mitigate impacts.</p> <p>An outline FMMS has been provided alongside the Offshore EIA Report in OP3: Outline Fisheries Management and Mitigation Strategy.</p>
<b>Marine Pollution Contingency Plan (MPCP)</b>	<p>The MPCP will outline procedures to protect personnel and to safeguard the marine environment in the event of an accidental pollution event arising from offshore operations. The MPCP will also outline mitigation measures should an accidental spill occur, address all potential contaminant releases and include key emergency contact details. The MPCP will demonstrate adherence to all requirements under the International Convention for the Prevention of Pollution from Ships (MARPOL) convention.</p> <p>An outline MPCP is provided within the outline EMP alongside the Offshore EIA Report in OP1: Environmental Management Plan.</p>



EMBEDDED MANAGEMENT PLAN	MITIGATION	AND	DESCRIPTION
<b>Emergency Response Cooperation Plan (ERCoP)</b>			Emergency response planning relating to the offshore Project and requirements for SAR helicopter operations.
<b>Navigational Safety and Vessel Management Plan (NSVMP)</b>			<p>The NSVMP will confirm the types and numbers of vessels that will be engaged on the Project and consider vessel coordination including indicative transit route planning. The NSVMP will present the various navigational safety measures to be followed and applied.</p> <p>An outline NSVMP has been provided alongside the Offshore EIA Report in OP4: Outline Navigational Safety and Vessel Management Plan.</p>
<b>Construction Method Statement (CMS)</b>			A CMS will be developed in accordance with the EMP detailing how project activities and plans identified within the EMP will be carried out, and also highlighting any possible dangers/risks associated with particular offshore Project activities.
<b>Decommissioning Programme</b>			The decommissioning programme will ensure the decommissioning of the Project in an appropriate and environmentally acceptable manner, and in the interests of safety and environmental protection.

## 6.2 Hazard identification

In line with the scoping stage outlined in section 4.3, a list of internal and external hazard sources (as defined in section 1) has been collated and a scoping exercise was conducted to identify those hazards that require further assessment in section 6.3. Hazards have been identified through the review of internal risk registers (e.g. CDM risk register) and offshore EIA topic-specific chapters. Section 6.2.1 lists the hazards scoped in for further assessment and section 6.2.2 lists the hazards scoped out for further assessment.





## 6.2.1 Hazards requiring assessment

The hazards identified as requiring consideration within the assessment of major accidents and/or disasters are listed in Table 6-2.

Table 6-2 Hazards scoped into the assessment (NB. Internal source refers to the potential for the offshore Project to cause a major accident and/or disaster and external source refers to the potential for the offshore Project to interact with an external hazard to increase the risk of a major accident and/or disaster).

HAZARD	SOURCE		RECEPTOR(S)	JUSTIFICATION
	INTERNAL	EXTERNAL		
External interference – cable snagging	✗	✓	Population and human health / material asset	There is a risk of a third-party vessel snagging or damaging the inter-array, interconnector of offshore export cables. As described in Offshore EIA Report chapter 14: Commercial fisheries, snagging of fishing gear on offshore Project infrastructure may result in potential injury, fatalities, damage to assets and/or vessels.
External interference – third-party vessel or aviation collision and allision	✗	✓	Population and human health / material asset	It is possible that third-party vessel or aviation collision could impact on the offshore Project or offshore Project vessels, either on site or in transit to site. The presence of offshore Project vessels and infrastructure may increase encounters and collision risk for third-party vessels and aviation receptors in the area. This risk could result in potential injury, fatalities, damage to assets and/or vessels. Chapter 15: Shipping and navigation includes information on potential third-party vessel collisions and allisions with offshore Project infrastructure or vessels and chapter 17: Military and aviation outlines the potential impact of the offshore Project to aviation receptors, including on low-flying aircraft.
Transport accidents – vessel or aviation collision	✓	✗	Population and human health / material asset	There is the potential for accidents to occur on transiting offshore Project vessels or helicopters transporting equipment or personnel which could lead to fatalities or injury to offshore Project personnel or third-parties, and damage to offshore Project and/or third-party infrastructure and vessels. Chapter 15: Shipping and navigation includes information on potential third-party vessel collisions with offshore Project vessels and chapter 5: Project description outlines the vessel and helicopter requirements for the construction and operation and maintenance stage.
Ground hazards – unexploded ordnance	✗	✓	Population and human health /	There is the potential for a major accident to arise from Unexploded Ordnance (UXO) being unintentionally encountered which would pose a health and safety risk to people, and potential damage to offshore Project



HAZARD	SOURCE		RECEPTOR(S)	JUSTIFICATION
	INTERNAL	EXTERNAL		
			environment / material asset	and/or third party infrastructure and vessels. The unexpected detonation of UXO could also result in adverse effects on the environment (e.g. from underwater noise effects). Chapter 16: Marine archaeology and cultural heritage and chapter 5: Project description provide a description of the potential UXO at the offshore Project area and chapter 10: Benthic subtidal and intertidal ecology, chapter 11: Fish and shellfish ecology, and chapter 12: Marine mammals and megafauna provide a description of the potential impacts of UXO detonation on marine ecology receptors.
Natural and climate hazards (e.g. increased frequency of extreme weather events)	x	✓	Population and human health / material asset.	As described in SS1: Climate and carbon assessment, it is possible for the offshore Project to be vulnerable to climate hazards. For example, extreme weather events (e.g. lightning strikes, high winds and storm surges) could increase the likelihood of a major accident and/or disaster (e.g. for transiting offshore Project or third-party vessels or offshore Project personnel) or result in a loss of structural integrity of the offshore Project infrastructure. This could pose a health and safety risk to people, and damage offshore Project and/or third party infrastructure and vessels. Any potential welfare effects on works due to ambient weather conditions will be managed by existing health and safety protocols and this hazard is not considered further within this supporting study.
Electrical / system failures	✓	x	Population and human health / material asset.	There is a risk of an unexpected electrical and/or system failure resulting in a major accident and/or disaster, for example, through the malfunction of equipment (e.g. loss of blade at sea), or through a fire or explosion (as a result of an electrical fault and the presence of combustibles or explosion hazards). If a major accident and/or disaster were to arise from an electrical or system failure, this could pose a health and safety risk to offshore Project personnel and third parties and potentially damage offshore Project and/or third-party infrastructure and vessels.
External industrial hazards (i.e. major accidents at a nearby development)	x	✓	Population and human health / environment / material asset.	Due to the proximity of the offshore Project landfall(s) to the Dounreay NPDE and Vulcan NRTE nuclear facilities, there is a risk of a major accident at these sites resulting in a radioactive release, posing a health and safety risk to offshore Project personnel and potential, and resulting in adverse environmental affects to marine species.



## 6.2.2 Hazards scoped out of the assessment

The hazards scoped out of the assessment, and the justification for this, are listed in Table 6-3. Generally, it is considered that the risks associated with the development of offshore structures are well understood and adequately managed through existing processes and risk assessments, such as the CDM Regulations and best practice. All elements of risk will be assessed once the Project Design Envelope has been further refined, and the appointed CDM engineer will ensure that all offshore Project design choices comply with the requirements under the CDM regulations. Other hazards scoped out for further assessment are considered to be adequately covered by existing embedded mitigation measures and management plans outlined in section 6.1.

Table 6-3 Hazards scoped out of the assessment

HAZARD	SOURCE		RECEPTOR(S)	JUSTIFICATION
	INTERNAL	EXTERNAL		
Marine pollution	✓	✗	Population and human health / environment	<p>There is the potential for the offshore Project to result in marine pollution events through the accidental release of hazardous substances contained within the WTGs and vessels. The risk and impact of accidental releases of hazardous substances will be reduced through the implementation of the EMP, including measures for compliance with international requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL) convention, as well as best practice for works in the marine environment (e.g. preparation of Shipboard Oil Pollution Emergency Plans (SOPEP)). In this manner, accidental release of potential contaminants from construction vessels will be strictly controlled and procedures will be in place to minimise the impact of any accidental release if it occurs.</p> <p>Offshore EIA Report chapter 9: Water and sediment quality assesses the potential effect from the disturbance and release of contaminants and concludes that the effects are not significant (minor consequence).</p> <p>Therefore, possible major accidents and/or disasters are considered to be adequately covered by existing embedded mitigation measures and compliance with legislation and best practice. The offshore Project is not considered to be vulnerable to pollution and contamination and this hazard has not been assessed further in this supporting study.</p>



HAZARD	SOURCE		RECEPTOR(S)	JUSTIFICATION
	INTERNAL	EXTERNAL		
Workplace accidents	✓	✗	Population and human health / material asset.	Potential workplace accidents (e.g. industrial site accidents) will be managed through existing health and safety protocols. Therefore, possible major accidents and/or disasters are considered to be adequately covered by existing embedded mitigation measures and compliance with legislation and best practice. This hazard has not been assessed further in this supporting study.
Security (malicious attacks) or threats societal	✗	✓	Population and human health.	The offshore Project will not be publicly accessible without specialist vehicles and equipment, and as such, there is no source-pathway-receptor linkage that could trigger a major accident and/or disaster. Other potential attacks on a regional, national or international scale are considered to be adequately controlled through existing protocols, legislation, policy and strategy.  Therefore, this hazard has not been assessed further in this supporting study.



### 6.3 Assessment

Table 6-4 risk assessment has been undertaken for the offshore Project across all stages to assess if any of the hazards identified would result in significant risk on receptors with the embedded mitigation and management plans in place. All risk events are assessed as being **tolerable** with embedded mitigation as outlined in section Table 6-1. Therefore, with the implementation of embedded mitigation measures, all risks are considered to be at an acceptable level and no secondary mitigation has been identified.

Table 6-4 Assessment of vulnerability of the offshore Project to major accidents and/or hazards

RISK EVENT	SOURCE PATHWAY	AND/OR	RECEPTOR(S)	SOURCE DOCUMENT / CHAPTER	CONSEQUENCE	LIKELIHOOD	SIGNIFICANCE OF RISK	FURTHER ASSESSMENT REQUIRED
<b>External hazards</b>								
<b>External interference – cable snagging</b>	Fishing vessels snagging on offshore Project inter-array, interconnector and offshore export cables.		Population and human health – crew on board fishing vessels	Chapter 14: Commercial fisheries	<b>Serious</b> Multiple serious injuries and/or fatality.	<b>Remote</b> Although fishing activity occurs in the offshore Project area (including demersal trawling and scallop dredging which are more vulnerable to snagging), the risk of snagging is reduced with the implementation of embedded mitigation measures that ensure effective liaison with all fishers including the promulgation of information on the presence of statutory and advisory safety zones <sup>7</sup> and unburied or unprotected areas of cable.	Tolerable with (embedded) mitigation	No
			Material assets – commercial fishing vessels and equipment		<b>Serious</b> Severe damage to fishing equipment and/or vessel to a level that is critical on operations.		Tolerable with (embedded) mitigation	No
			Material assets – offshore Project infrastructure		<b>Serious</b> Damage to offshore Project cables resulting in cable fault that is crucial to operations.		Tolerable with (embedded) mitigation	No
<b>External interference – third-party vessel or aviation collision</b>	Third-party vessels or aircraft collide or allide with offshore Project infrastructure or vessels.  Increased third-party to third-party vessel collision as a result of the presence of offshore Project infrastructure and/or vessels.		Population and human health – offshore Project workforce, mariners and aircraft crew	Chapter 15: Shipping and navigation  Chapter 17: Military and aviation	<b>Serious</b> Multiple serious injuries and/or fatality.	<b>Remote</b> As discussed in chapter 15: Shipping and navigation, the existing and future levels of vessel-to-vessel collision and marine incidents within the offshore Project area are predicted to be low. The risk of remote powered or drifting allision between third-party vessels and offshore Project structures is remote with the implementation of embedded mitigation measures. Collision risk between third-party vessels and the offshore Project structures and offshore Project vessels is anticipated to be extremely unlikely and managed with embedded mitigation measures.  The risk of aviation collision is also anticipated to be low with the implementation of embedded mitigation measures, such as aviation lighting and charting and issue of Notice to Airmen (NOTAM) as required.	Tolerable with (embedded) mitigation	No
			Material assets – third-party vessels and aircraft	<b>Serious</b> Loss or damage to a single third-party vessel and/or aircraft that is critical to operations, with loss of fuel / cargo into the marine environment.	Tolerable with (embedded) mitigation		No	
			Material assets – offshore Project infrastructure and vessels	<b>Serious</b> Damage to WTGs, OSPs or damage or loss of a single offshore Project vessel to a level that is critical to operations.	Tolerable with (embedded) mitigation		No	
<b>Ground hazards – unexploded ordnance</b>	Accidental detonation of UXO.		Population and human health – offshore Project workforce and mariners	Chapter 5: Project description	<b>Serious</b> Multiple serious injuries and/or fatality.	<b>Extremely unlikely</b> The offshore Project will conduct pre-construction UXO surveys to identify the presence of UXOs within the offshore Project boundary and clearance of UXO	Tolerable with (embedded) mitigation	No

<sup>7</sup> Statutory safety zones are issued under Section 95 and Schedule 16 of the Energy Act 2004 and the Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulation 2007. An application for statutory safety zones of 500m will be sought during the construction stage around structures where construction activity is underway and while restricted in ability to manoeuvre vessels are present (i.e. where a construction vessel is present). Advisory safety zones (i.e. advisory safe passing distances), as defined by a risk assessment, may also be applied where statutory safety zones do not apply (e.g. around cable installation vessels).



RISK EVENT	SOURCE PATHWAY	AND/OR	RECEPTOR(S)	SOURCE DOCUMENT / CHAPTER	CONSEQUENCE	LIKELIHOOD	SIGNIFICANCE OF RISK	FURTHER ASSESSMENT REQUIRED
			Material assets – third-party vessels and infrastructure	Chapter 10: Benthic subtidal and intertidal ecology	<b>Serious</b> Severe damage to nearby assets (e.g. Scottish SHET-L Orkney to Mainland HVAC Link) that is critical to operations.	that will be required ahead of construction. Standard best practice measures and control measures will be implemented to reduce the potential for an accidental detonation of UXO.	Tolerable with (embedded) mitigation	No
		Material assets – offshore Project infrastructure	Chapter 11: Fish and shellfish ecology	<b>Serious</b> Severe damage to offshore Project infrastructure that is critical to operations.	Tolerable with (embedded) mitigation			
		Environment – marine species	Chapter 12: Marine mammals and megafauna Chapter 16: Marine archaeology and cultural heritage	<b>Moderate</b> Injury or disturbance to marine species - limited external assistance required.	Tolerable with (embedded) mitigation		No	
<b>Natural and climate hazards (e.g. increased frequency of extreme weather events)</b>	Extreme weather events (lightning strikes, high winds and storm surges) results in loss of structural integrity at the offshore Project and/or fires and explosions.		Population and human health – offshore Project workforce and mariners	SS1: Climate and carbon assessment	<b>Serious</b> Multiple serious injuries and/or fatality.	<b>Remote</b> As discussed in SS1: Climate and carbon, climate hazards present a low or negligible risk to the offshore Project. The offshore Project will be designed in line with best practice in order to withstand climate hazards (e.g. lighting and surge protection). Furthermore, offshore Project workers are unlikely to be on-site for any significant length of time and daily weather and sea state forecasts will be studied to ensure it is safe for activities to commence.	Tolerable with (embedded) mitigation	No
			Material assets – third-party vessels		<b>Serious</b> Damage or loss of single third-party vessel that is critical to operations.		Tolerable with (embedded) mitigation	No
			Material assets – offshore Project infrastructure, vessels and aircraft		<b>Serious</b> Severe damage to offshore Project infrastructure, or loss or damage to a single offshore Project vessel and/or helicopter that is critical to operations.		Tolerable with (embedded) mitigation	No
<b>External industrial hazards (i.e. major accidents at a nearby development)</b>	A major accident at the Dounreay NPDE and/or Vulcan NRTE nuclear facilities, results in a radioactive release.		Population and human health – offshore Project workforce and mariners	CDM Risk register	<b>Serious</b> Radiation exposure results in multiple serious injuries and/or fatality. The risk would be greatest for those personnel or mariners in the nearshore environment.	<b>Extremely unlikely</b> Nuclear facilities are heavily regulated in terms of health and safety and would be managed by existing protocols and legislation.	Tolerable with (embedded) mitigation	No
			Environment – marine species		<b>Serious</b> Injury or disturbance to marine species - limited external assistance required.		Tolerable with (embedded) mitigation	No
<b>Internal hazards</b>								
<b>Transport accidents – vessel or aviation collision</b>	Offshore Project vessels or helicopters collide with third-party structures or vessels as a result of equipment failure or human error.		Population and human health – offshore Project workforce and mariners	Chapter 15: Shipping and navigation CDM Risk register	<b>Serious</b> Multiple severe injuries and/or fatality.	<b>Remote</b> As discussed in chapter 15: Shipping and navigation, the existing and future levels of vessel-to-vessel collision and marine incidents within the offshore Project area are predicted to be low. The offshore Project vessels and helicopters will comply with all legislation and standard industry practice / design to reduce the potential for any equipment failure or human error.	Tolerable with (embedded) mitigation	No
			Material assets - third-party vessels and aircraft	<b>Serious</b> Loss or damage to a single third-party vessel and/or aircraft that is critical on operations with loss of fuel / cargo into the marine environment that is critical to operations.	Tolerable with (embedded) mitigation		No	
			Material assets – offshore Project vessels and helicopters	<b>Serious</b> Damage or loss of a single offshore Project vessel and/or helicopter that is critical to operations.	Tolerable with (embedded) mitigation		No	
<b>Electrical / system failures</b>	Unexpected electrical or system failure results in		Population and human health – offshore	CDM Risk register	<b>Serious</b> Multiple severe injuries and/or fatality.	<b>Extremely unlikely</b>	Tolerable with (embedded) mitigation	No



RISK EVENT	SOURCE PATHWAY	AND/OR RECEPTOR(S)	SOURCE DOCUMENT / CHAPTER	CONSEQUENCE	LIKELIHOOD	SIGNIFICANCE OF RISK	FURTHER ASSESSMENT REQUIRED
	loss of structural integrity (e.g. loss of blade at sea) and/or a fire or explosion.	Project workforce and mariners Material assets – offshore Project infrastructure		<b>Serious</b> Damage or loss of offshore Project infrastructure or a single vessel to a level that would be critical to operations.	Offshore WTGs have an excellent safety record with a very low failure rate and fire detection and protection systems in place, to prevent the escalation of fires in the unlikely event of an occurrence. The electrical equipment will be designed in accordance with internationally recognised design standards and maintained in accordance with best practices. Fault detection systems will be in place and system protection will be built into the design to limit the likelihood of any ignition source.  Flammable liquids will be stored in secure cabinets in accordance with Control of Substances Hazardous to Health (COSHH) Regulations 2022. With these measures in place the likelihood of an explosion or fire is extremely unlikely.	Tolerable with (embedded) mitigation	No



## 7 CONCLUSIONS

This supporting study assesses the potential vulnerability of the offshore Project to major accidents and/or disasters, both in terms of the potential for the offshore Project to interact with an external major accident and/or disaster and the potential for the offshore Project to cause a major accident and/or disaster.

All risk events are assessed as being tolerable with the implementation of embedded mitigation measures, and therefore, managed to an acceptable level. Risks from the offshore Project will continue to be reviewed, assessed and managed, in accordance with relevant regulations, throughout the offshore Project life-cycle. All West of Orkney staff, contractors and subcontractors will be required to provide Risk Assessments and Method Statements (RAMS), as required, and adhere to risk management procedures in order to manage risks to an acceptable level. The review of RAMS will be detailed in relevant consent plans, such as the EMP (see OP1: Outline Environmental Management Plan).





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## 8 REFERENCES

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## ABBREVIATIONS

TERM	DEFINITION
ALARP	As Low as Reasonably Practicable
CAA	Civil Aviation Authority
CBRA	Cable burial risk assessment
CDM	Construction Design Management
CMS	Construction Method Statement
COLREGS	Compliance with the International Regulations for the Prevention of Collision at Sea
COSHH	Control of Substances Hazardous to Health
DGC	Defence Geographic Centre
DSLPL	Development Specification and Layout Plan
DSRL	Dounreay Site Restoration Limited
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EU	European Union
FMMS	Fisheries Management and Mitigation Strategy
FSA	Formal Safety Assessment
HVAC	High Voltage Alternative Current
IEMA	Institute of Environmental Management and Assessment
IMO	International Maritime Organisation
MARPOL	The International Convention for the Prevention of Pollution from Ships
MCA	Marine Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MPCP	Marine Pollution Contingency Plan
MS-LOT	Marine Scotland Licensing Operations Team
MD-LOT	Marine Directorate Licensing Operations Team
NLB	Northern Lighthouse Board
NOTAM	Notice to Airmen
NPDE	Nuclear Power Development Establishment
NRTE	Naval Reactor Test Establishment



TERM	DEFINITION
NSVMP	Navigational Safety and Vessel Management Plan
OAA	Option Agreement Area
OP	Outline Plan
OSP	Offshore Substation Platform
RAMS	Risk Assessment and Method Statement
SAR	Search and Rescue
SHET-L	Scottish Hydro Electric Transmission Limited
SOLAS	The International Regulations for the Safety of Life at Sea
SOPEP	Ship Oil Pollution Emergency Plan
THC	The Highland Council
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator



## GLOSSARY OF TERMS

TERM	DEFINITION
As Low As Reasonably Practicable (ALARP)	Involves weighing a risk against the trouble, time and money needed to control it. Thus, ALARP describes the level to which we expect to see risks controlled.
Major accident	Events that threaten immediate or delayed serious environmental effects to human health, welfare and/or the environment and require the use of resources beyond those of the client or its appointed representatives to manage. Whilst malicious intent is not accidental, the outcome (e.g. train derailment) may be the same and therefore many mitigation measures will apply to both deliberate and accidental events.
Disaster	A natural hazard (e.g. earthquake) or a man-made/external hazard (e.g. act of terrorism) with the potential to cause an event or situation that meets the definition of a major accident.
Risk event	An identified, unplanned event, which is considered relevant to the development and has the potential to result in a major accident and/or disaster, subject to assessment of its potential to result in a significant adverse effect on an environmental receptor.