

Inch Cape Offshore Wind Farm

New Energy for Scotland

Offshore Environmental Statement:
VOLUME 2H
Annex 19A.3: Hazard Log





Hazard Log

Inch Cape Offshore Wind Farm

(Annex 19A.3)

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19A.3.1 Hazard Workshop Methodology

When assessing the risks associated with siting a new offshore wind farm development, as per the requirements of MGN 371 and the DECC ‘Methodology for Assessing Marine Navigation Risk’s’, a hazard log must be produced to identify hazards that are introduced or altered by the Project. To produce the hazard log, a hazard workshop was held in Edinburgh in September 2012 with key stakeholders for the proposed Project.

The key risk terminology used during the process of creating the hazard log can be found in Table 19A.3.1.

Table 19A.3.1 Key Risk Terminology

Term	Definition
Hazard	A potential to threaten human life, health, property or the environment.
Risk	The likelihood of human life, health, property or the environment being threatened. Risk is calculated as a combination of the frequency of occurrence and the severity of the consequence (risk = frequency x consequence).
Frequency	The number of occurrences per unit time (e.g. per year).
Consequence	The outcome of an accident.
Cause	An event (or sequence of events) leading to a hazardous situation or accident.
Most likely outcome	The probable outcome of an event.
Worst credible outcome	The most serious/catastrophic outcome that could arise from an event.
Risk reduction measure	Measures which are put in place to reduce the frequency and/or consequences of a hazardous event.
Risk matrix	5x5 grid which gives a graphical representation of whether a risk is ‘broadly acceptable’, ‘tolerable’ or ‘unacceptable’ based on the frequency of occurrence and the severity of the consequences.
Broadly acceptable	Risks in this category are ‘low risk’ and generally regarded as insignificant and suitably controlled. There is not usually a requirement for any further action to be taken for risks in this category.

Term	Definition
Tolerable	Risks in this category are ‘intermediate risk’ and risk reduction measures should be put in place to reduce their level of risk. Risks in the ‘tolerable’ category should be periodically reviewed to ensure they are being kept ‘as low as reasonably practicable’ (ALARP).
Unacceptable	Risks in this category are ‘high risk’ and the activity should be ruled out unless modifications can be made to reduce the risk ranking.

During the hazard workshop, vessel types were considered separately to ensure the risk levels were assessed for each type and that the risk reduction measures were identified on a type-specific basis, e.g., risk reduction measures for fishing vessels differ to those for commercial vessels. Different phases of a project (i.e. construction, operation, maintenance and decommissioning) were taken into account as some hazards may only be relevant within certain phases. The inclusion of hazards such as dropped objects and man overboard helped to create a more comprehensive, preliminary hazard log for the project.

Following the identification of hazards at the workshop, the risks were ranked. In order to rank the risks, the frequency of occurrence and the severity of the consequences need to be determined.

The frequency of occurrence was assessed on a 5-point scale from negligible to frequent, as presented in Table 19A.3.2.

Table 19A.3.2 Frequency Bands

Rank	Description
1	Negligible
2	Extremely Unlikely
3	Remote
4	Reasonably Probable
5	Frequent

The severity of the consequences was also assessed on a five-point scale. The defined consequence bands are presented in Table 19A.3.3.

Table 19A.3.3 Consequence Bands

Rank	People	Property	Environment	Business
1	Zero injury	Zero damage	Zero effect	Zero impact
2	Minor injury	Minor damage	Minor effect	Minor impact
3	Major injury	Moderate damage	Moderate effect	Considerable impact
4	Single fatality	Major damage	Major effect	Major national impact
5	Multiple fatalities	Extensive damage	Extensive effect	Major international impact

Following this, the risk level was determined using the risk matrix illustrated in Table 19A.3.4. Note that in the risk matrix, the highest severity rating for consequences to people, property, the environment and business was used in the assessment of the most likely and worst case scenarios.

Table 19A.3.4 Risk Matrix

Consequences					Frequency				
Severity Rating	People	Property	Environment	Business	1	2	3	4	5
					Negligible	Extremely Unlikely	Remote	Reasonably Probable	Frequent
1	Zero injury	Zero damage	Zero effect	Zero impact					
2	Minor injury	Minor damage	Minor effect	Minor impact					
3	Major injury	Moderate damage	Moderate effect	Considerable impact					
4	Single fatality	Major damage	Major effect	Major national impact					
5	Multiple fatalities	Extensive damage	Extensive effect	Major international impact					

	Broadly Acceptable (low risk)
	Tolerable (intermediate risk)
	Unacceptable (high risk)

19A.3.2 Hazard Log

Table 19A.3.5 presents full details of the hazards which were logged and ranked during the workshop for the Project, held in Edinburgh on 3 September 2012.

Table 19A.3.5 Hazard Log

Area (S)	Receptors	Specific Receptors	Hazard Title	Hazard Detail	Phase (C, O/M, D)	Industry Standard Risk Reduction Measures (Assumed In Place)	Possible Causes	Most Likely Consequences	Most Likely			Worst Case			Risk Reduction Measures (Initial risk assessment was undertaken assuming industry standard mitigation is in place, therefore this column highlights mitigations above that level)	Additional Comments	
									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	All Vessels	N/A	Vessel allision with fixed structure	Due to the presence of fixed structures such as WTGs, met masts and offshore substations there could be an increased risk of vessel to structure allisions.	C, O/M, D	MGN 371, IALA O-139, Relevant HSE Guidance	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Fatigue Lack of awareness Lack of experience Vessel displacement from usual routes Vessel NUC Mechanical/machinery failure Failure in navigational equipment Failure in aids to navigation 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Notable environmental effect Extensive damage to OREI 	5	2	Tolerable	<ul style="list-style-type: none"> Promulgation of information Notices to Mariners Guard vessels during construction and decommissioning Increased Aids to Navigation Fenders/ bumper bollards installed on structures Structures marked on admiralty charts where suitable for the scale of the chart 	N/A
Inch Cape	All Vessels	Particularly relevant for wind farm work and support vessels which will be very close to the WTGs	Vessel allision with J tube	Vessel working on site or transiting in close proximity allides with J tube (cable support at the base of the foundation)	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Poor visibility Lack of experience Lack of awareness Inappropriate vessel being used for wind farm maintenance work Human error Lack of adequate planning 	<ul style="list-style-type: none"> Minor damage to J tube Minor damage to cable that the J tube is protecting Minor damage to vessel Disruption to business operations 	2	1	Broadly Acceptable	<ul style="list-style-type: none"> Major damage to J tube Major damage to cable that the J tube is protecting Major damage to vessel Severe disruption to business operations 	4	1	Tolerable	<ul style="list-style-type: none"> Internal J tubes used where possible Procedures for vessels working on site Increase awareness of the presence of J tubes Promulgation of information 	Very likely that J tubes will be internal for the WTGs at Inch Cape.

Project: A2401

Client: Inch Cape Offshore Limited

Title: Navigational Risk Assessment Development Area (Annex 19A.3)



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Area (S)	Receptors	Specific Receptors	Hazard Title	Hazard Detail	Phase (C, O/M, D)	Industry Standard Risk Reduction Measures (Assumed In Place)	Possible Causes	Most Likely Consequences	Most Likely			Worst Case			Risk Reduction Measures (Initial risk assessment was undertaken assuming industry standard mitigation is in place, therefore this column highlights mitigations above that level)	Additional Comments	
									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	All Vessels	N/A	Vessel allision with partially constructed or deconstructed structure	During the construction and decommissioning stages, there could be an increased risk of vessels alliding with the WTGs (both above and below the waterline).	C, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Poor visibility Structures not adequately lit Aids to navigation not fully installed Human error Lack of awareness Lack of experience Structure not visible above the waterline Machinery failure leading to vessel NUC Manoeuvring error Navigational equipment failure Lack of passage planning Lack of planning by developer for installation 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to partially constructed/ deconstructed OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/loss of vessel Notable environmental effect Extensive damage to partially constructed/ deconstructed OREI 	5	1	Tolerable	<ul style="list-style-type: none"> Promulgation of information Notices to Mariners Guard vessels Safety zones/ precautionary areas during construction and decommissioning Planning of works to ensure that OREI are not left unmarked during construction or decommissioning Fenders/ bumper bollards installed on structures 	N/A
Inch Cape	All Vessels	Tankers transiting between Inch Cape Development Area and Bell Rock (whether they did this would depend on conditions, tanker size, laden/ unladen and the final decision of the mariner) and vessels fishing in this area.	Vessel-to-vessel collision due to avoidance of Inch Cape Development Area, Bell Rock and/or support vessels in area	Displaced traffic increases congestion outside of the Development Area. This can lead to an increase in vessel-to-vessel encounters and collisions.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Vessels being displaced from usual routes into congested areas Lack of experience Lack of awareness Lack of compliance with COLREGS Lack of passage planning 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Minor environmental effect 	2	4	Tolerable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Major pollution event Damage to business/ reputation 	5	2	Tolerable	<ul style="list-style-type: none"> Promulgation of information Additional Aids to Navigation Passage planning Up-to-date charts 	Vessels transiting in proximity to Inch Cape also need to avoid Bell Rock, which could lead to additional vessel to vessel collisions.
Inch Cape	All Vessels	N/A	Vessel anchoring on or dragging over cable or other sub surface structures	Vessels may anchor over a subsea cable/ structure or a nearby vessel at anchor may drag its anchor over a subsea cable/ structure. It is also possible that vessels anchor in an emergency and drop their anchor on a subsea cable/ structure.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Human error Adverse weather Poor visibility Cable not adequately projected/ buried Cable becomes exposed over time Anchoring in an emergency situation (machinery failure, steering gear failure) Lack of information about presence of subsurface structures Cables not charted 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Damage to cable/ subsurface structure leading to disruption of business opportunities 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Severe damage to cable leading to disruption of business opportunities and potential reputation damage 	5	1	Tolerable	<ul style="list-style-type: none"> Cables and structures marked on admiralty charts where suitable for the scale of the chart Cables adequately buried and/or protected Regular inspections to ensure that cables remain buried/sufficiently protected and maintenance as required Promulgation of information 	N/A

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									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	All Vessels	N/A	Man overboard in Development Area under normal operations	Technician falls overboard during transfer operations or whilst working on WTG or vessel at Development Area.	C, O/M, D	MGN 371, IALA O-139, CDM Regulations, SOLAS	<ul style="list-style-type: none"> Human error Adverse weather Poor visibility Inadequate/ poorly maintained equipment for transfer Equipment failure Inappropriate vessel for transfer operation 	<ul style="list-style-type: none"> Minor injury to technician Delay in operations 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Single fatality Major delay in operations Reputation/ business damage 	4	2	Tolerable	<ul style="list-style-type: none"> Keep the number of transfers to a minimum Adverse weather working policy and procedures Training to all technicians Adequate PPE which is regularly inspected and maintained Creation of adequate work procedures Training in offshore survival and first aid Personal locator beacons Advanced ERCoP Use appropriate vessel for the transfer operation 	N/A
Inch Cape	All Vessels	N/A	Access to structure in an emergency situation	During emergency situations, a vessel may have to moor to an OREI or people may have to access the structure as a last resort for a safe place of refuge.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Machinery failure leading to vessel NUC Adverse weather Human error Failure of navigational equipment Steering gear failure 	<ul style="list-style-type: none"> Potential for minor injury when accessing the structure Minor damage to structure Minor damage to vessel moored to structure 	2	2	Broadly Acceptable	<ul style="list-style-type: none"> Major injury when accessing the structure Becoming stranded on the structure Business/ reputation damage Major damage to structure Major damage to vessel moored to structure 	4	1	Tolerable	<ul style="list-style-type: none"> Alarm Means of alerting presence Clear way of notifying SAR about which structure you are on (WTG lettering/ numbering) Fenders/ bumper bollards installed on structures Locked access to restricted areas Enhanced ERCoP for stranded person on WTG 	N/A
Inch Cape	All Vessels	Recreational vessels	Impact on on-board navigation/ communication systems	A vessel's on-board navigation/ communication system may be impacted by the presence of the wind farm.	O/M	MGN 371	<ul style="list-style-type: none"> Inadequate design 	<ul style="list-style-type: none"> Small vessels becoming disorientated in a wind farm 	2	2	Broadly Acceptable	<ul style="list-style-type: none"> Small vessel collision or allision resulting in major damage to vessel/ structure and major injuries 	4	1	Tolerable	<ul style="list-style-type: none"> Wind farm design Promulgation of information to recreational users Awareness schemes 	N/A
Inch Cape	All Vessels	Recreational vessels	Reduced vessel detection on Radar due to the presence of WTGs	Small craft such as recreation vessels may not be easily identifiable on a vessels Radar, therefore increasing the risk of collisions.	O/M	MGN 371, IALA O-139	<ul style="list-style-type: none"> Inadequate design 	<ul style="list-style-type: none"> Small vessels not identified by larger vessels, resulting in a near miss 	1	3	Broadly Acceptable	<ul style="list-style-type: none"> Vessel encounter resulting in major damage to vessel(s) and major injuries 	4	2	Tolerable	<ul style="list-style-type: none"> Wind farm design Promulgation of information Awareness schemes 	N/A

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									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	All Vessels	Deep draughted vessels	Interaction with cable protection due to reduction in navigable water depths	Where cable protection methods reduce the water depth, there is an increased safety risk for vessels.	O/M	MGN 371, IALA O-139, Relevant HSE Guidance	<ul style="list-style-type: none"> Inappropriate cable protection method that reduces the water depth more than necessary Human error Vessel NUC Correct water depth not marked on chart Inadequate passage planning Lack of awareness Manoeuvring error 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Minor environmental effect 	2	2	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Major pollution event Damage to business/ reputation 	5	1	Tolerable	<ul style="list-style-type: none"> Consideration for vessel draughts given when designing protection methods Do not reduce water depth more than required Up-to-date charts Promulgation of information Additional Aids to Navigation Passage planning 	N/A
Inch Cape	All Vessels	N/A	Restricted search and rescue in the wind farm in an emergency situation	Access into the wind farm for search and rescue operations may be affected by the presence of the OREIs.	C, O/M, D	MGN 371, IALA O-139, Standard Template ERCoP	<ul style="list-style-type: none"> Presence of OREI limiting access for SAR vessels and helicopters Confusion over location of casualty(s) Ineffective industry wide emergency response Increased chance of casualty on site due to number of personnel working on site 	<ul style="list-style-type: none"> Minor injury Business/reputation damage Delayed response time 	2	4	Tolerable	<ul style="list-style-type: none"> Multiple fatalities Major damage to business/reputation Failure to locate casualty(s) 	5	2	Tolerable	<ul style="list-style-type: none"> Enhanced ERCoP Clear pattern in wind farm design Structure marking to aid navigation (clear letters and numbers in a logical pattern) Flight training for rescue crews National contingency plan Integrated emergency response plans between developers in the Firth of Forth and Firth of Tay regions (shared rapid intervention vessels) Personal locator beacons 	Emergency response self-help requirements are still under discussion at MCA.
Inch Cape	All Vessels	N/A	Restricted oil spill response in a pollution incident	Access into the wind farm for oil spill response operations may be affected by the presence of the OREIs.	C, O/M, D	MGN 371, IALA O-139, National Contingency Plan for Marine Pollution from Shipping and Offshore Installations	<ul style="list-style-type: none"> Presence of OREI limiting access for pollution control vessels Increase risk of pollution due to risk of tankers colliding with OREIs 	<ul style="list-style-type: none"> Pollution and business damage due to increased clean-up/ response time. 	3	4	Tolerable	<ul style="list-style-type: none"> Major environmental effect Significant damage to business/ reputation 	5	2	Tolerable	<ul style="list-style-type: none"> Enhanced ERCoP Marine Pollution Plan National contingency plan Guard vessel cooperation training 	N/A

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									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	All Vessels	N/A	Medevac from OREI in a medical emergency situation	During a medical emergency situation, a vessel may have to medevac an injured person from an OREI.	C, O/M, D	MGN 371, IALA O-139, Standard Template ERCoP	<ul style="list-style-type: none"> • Presence of OREI limiting access for vessels involved in medevac • Increased chance of medical evacuations being required due to the number of personnel working on wind farm who could be injured or suffer individual health issues 	<ul style="list-style-type: none"> • Minor injury • Business/ reputation damage • Delayed response time 	2	4	Tolerable	<ul style="list-style-type: none"> • Single fatality • Damage to business/ reputation 	4	3	Tolerable	<ul style="list-style-type: none"> • Enhanced ERCoP • Clear pattern in wind farm design • Structure marking to aid navigation (clear letters and numbers in a logical pattern) • Personal locator beacons • Training of rescue crews 	N/A
Inch Cape	All Vessels	N/A	Navigating vessels in adverse weather conditions	During periods of adverse weather, a vessel navigating in the wind farm may get into trouble	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> • Adverse weather • Vessel committed and can't return to a safe haven • Vessel allides with OREI 	<ul style="list-style-type: none"> • Minor injury to persons on board • Minor damage to vessel • Minor damage to OREI 	2	4	Tolerable	<ul style="list-style-type: none"> • Multiple fatalities • Extensive damage to vessel/ loss of vessel • Extensive damage to OREI 	5	2	Tolerable	<ul style="list-style-type: none"> • Enhanced ERCoP • Passage planning taking weather conditions into account • Fenders/ bumper bollards installed on structures 	N/A
Inch Cape	Commercial	N/A	Commercial vessel (powered) allision with OREI	Commercial vessel, e.g., cargo, passenger or tanker, allides with OREI when under power (steaming).	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> • Adverse weather • Poor visibility • Human error • Fatigue • Inadequate markings • Manoeuvring error • Machinery/ mechanical failure • Displacement of traffic • Lack of passage planning • Navigation equipment failure 	<ul style="list-style-type: none"> • Minor injury to persons on board • Minor damage to vessel • Small environmental effect • Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> • Multiple fatalities • Extensive damage to vessel/ loss of vessel • Notable environmental effect • Extensive damage to OREI 	5	2	Tolerable	<ul style="list-style-type: none"> • Fenders/ bumper bollards installed on structures • Promulgation of information • Notice to Mariners • Up-to-date charts • Additional Aids to Navigation • Guard vessels during construction and decommissioning • Site design including consideration for peripheral structures 	N/A
Inch Cape	Commercial		Drifting vessel allision with OREI	Vessel loses power and drifts with wind and/or tide towards OREI.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> • Machinery failure leading to vessel NUC • Human error • Adverse weather 	<ul style="list-style-type: none"> • Minor injury to persons on board • Minor damage to vessel • Small environmental effect • Minor damage to OREI 	2	2	Broadly Acceptable	<ul style="list-style-type: none"> • Multiple fatalities • Extensive damage to vessel/loss of vessel • Notable environmental effect • Extensive damage to OREI (possibly multiple OREI if the vessel is drifting) 	5	1	Tolerable	<ul style="list-style-type: none"> • Fenders/ bumper bollards installed on structures • Emergency response planning to deal with drifting vessels (provision of tugs) 	N/A

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									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	Fishing	The main fishing activities in the vicinity of Inch Cape Development Area are trawling (fishing for prawns and scallops and seasonally for squid) and creeling	Fishing vessel allision with OREI	Fishing vessel allides with OREI whilst fishing in area or steaming in transit.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Human error Fatigue Fishing vessels attracted to Development Area Manoeuvring error Poor visibility Steering gear failure Machinery failure leading to vessel NUC Target not visible on Radar Lack of awareness of hazards associated with fishing in close proximity to OREIs Failure of navigational equipment Aid to Navigation failure 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to OREI 	2	4	Tolerable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Notable environmental effect Extensive damage to OREI 	5	2	Tolerable	<ul style="list-style-type: none"> Fenders/ bumper bollards installed on structures Fisheries liaison Promulgation of information Notice to Mariners Pollution response plans Up-to-date charts Additional Aids to Navigation Guard vessels during construction and decommissioning 	Fishing is predominantly to the north-west of the Inch Cape Development Area.
Inch Cape	Fishing	The main fishing activities in the vicinity of Inch Cape Development Area are trawling (fishing for prawns and scallops and seasonally for squid) and creeling	Fishing gear interaction with inter-array cabling	Potential for fishing gear to interact with inter-array cables and snag.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Fishing in close proximity to cable Human error Lack of awareness of location of cables Cable not correctly buried or protected Cable has become exposed over time Dragged fishing gear Anchoring in emergency situation (machinery failure/ steering gear failure) 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Damage to cable leading to disruption of business opportunities 	2	4	Tolerable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Severe damage to cable leading to disruption of business opportunities 	5	2	Tolerable	<ul style="list-style-type: none"> Cables marked on admiralty charts Promulgation of information through Notices to Mariners, Kingfisher Bulletins and Fish Safe Cables adequately buried (to at least 1 m) and/or protected to avoid interaction with fishing gear Over-trawlability trials following cable installation before any fishing is allowed Regular inspections to ensure that cables remain buried/ sufficiently protected and maintenance as required 	Fishing is predominantly to the north-west of the Inch Cape Development Area. If rock dumping is used as a cable protection method then rocks which are 3 to 5 inches in size are preferred by the fishing industry.

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Title: Navigational Risk Assessment Development Area (Annex 19A.3)



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									Consequence	Frequency	Risk	Consequence	Frequency	Risk		
Inch Cape	Fishing	The main fishing activities in the vicinity of Inch Cape Development Area are trawling (fishing for prawns and scallops and seasonally for squid) and creeling	Fishing gear interaction with offshore export cable	Fishing gear is dragged over an offshore export cable leading to snagging.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Fishing in close proximity to cable Human error Lack of awareness of location of cables (not charted) Cable not correctly buried or protected Cable has become exposed over time Dragged fishing gear Anchoring in emergency situation (machinery failure/ steering gear failure) 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Damage to cable leading to disruption of business opportunities 	2	4	Tolerable	5	2	Tolerable	<ul style="list-style-type: none"> Cables marked on admiralty charts Promulgation of information through Notices to Mariners, Kingfisher Bulletins and Fish Safe Cables adequately buried (to at least 1m) and/or protected to avoid interaction with fishing gear Over-trawlability trials following cable installation before any fishing is allowed Regular inspections to ensure that cables remain buried/sufficiently protected and maintenance as required 	Fishing is predominantly to the north-west of the Inch Cape site. If rock dumping is used as a cable protection method then rocks which are 3 to 5 inches in size are preferred by the fishing industry.
Inch Cape	Fishing	The main fishing activities in the vicinity of Inch Cape are trawling (fishing for prawns and scallops and seasonally for squid) and creeling	Fishing gear interaction with subsurface OREI structure	Fishing vessel drags gear and snags with WTG/ offshore substation foundations.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Human error Adverse weather Lack of experience/ awareness of the hazards of fishing in proximity to OREIs Design flaw Fishing vessels attracted to site Manoeuvring error Aid to Navigation failure Targets not visible on Radar 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Minor damage to OREI foundations 	2	4	Tolerable	5	2	Tolerable	<ul style="list-style-type: none"> Additional aids to navigation Promulgation of information through Notices to Mariners, Kingfisher Bulletins and Fish Safe Increase awareness of hazards arising from fishing in close proximity to OREIs Guard vessels during construction and decommissioning Consideration given to fishing vessel types when designing OREI foundations 	Fishing is predominantly to the north-west of the Inch Cape Development Area.

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Client: Inch Cape Offshore Limited

Title: Navigational Risk Assessment Development Area (Annex 19A.3)



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Area (S)	Receptors	Specific Receptors	Hazard Title	Hazard Detail	Phase (C, O/M, D)	Industry Standard Risk Reduction Measures (Assumed In Place)	Possible Causes	Most Likely Consequences	Most Likely			Worst Case			Risk Reduction Measures (Initial risk assessment was undertaken assuming industry standard mitigation is in place, therefore this column highlights mitigations above that level)	Additional Comments	
									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	Recreational	Recreational vessels could either be local vessels or visiting boats transiting north-south or over from continental Europe.	Recreational craft allision with OREI	Recreational craft allide with OREI.	C, O/M, D	MGN 371, IALA O-139, RYAs Position on Offshore Energy Developments	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Fatigue Recreational vessels attracted to the wind farm out of curiosity Manoeuvring error Target not visible on Radar Lack of awareness of hazards associated with sailing in close proximity to OREIs Failure of navigational equipment Aid to Navigation failure 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Notable environmental effect Extensive damage to OREI 	5	2	Tolerable	<ul style="list-style-type: none"> Adequate passage planning Education Promulgation of information through marina's and in pilot books in addition to Notices to Mariners Fenders/ bumper bollards installed on structures Up-to-date charts Guard vessels during construction and decommissioning Minimum blade clearance Increased Aids to Navigation 	Generally low level of recreation activity and no regular races in the area. Vessels in the area would typically be around 10 m in length. Majority of recreational vessels would be before and after July and transiting the coast on the way to Caledonian Canal and Northern Isles. Expected to be very low in winter. Recreational users could include sea anglers and kayakers.

Project: A2401

Client: Inch Cape Offshore Limited

Title: Navigational Risk Assessment Development Area (Annex 19A.3)



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Area (S)	Receptors	Specific Receptors	Hazard Title	Hazard Detail	Phase (C, O/M, D)	Industry Standard Risk Reduction Measures (Assumed In Place)	Possible Causes	Most Likely Consequences	Most Likely			Worst Case			Risk Reduction Measures (Initial risk assessment was undertaken assuming mitigation is in place, therefore this column highlights mitigations above that level)	Additional Comments	
									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	Recreational	Recreational vessels could either be local vessels or visiting boats transiting north-south or over from continental Europe.	Navigating recreational vessels in adverse weather conditions	During periods of adverse weather, a recreational vessel navigating in the wind farm may get into trouble	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Vessel committed and can't return to a safe haven Vessel allides with OREI 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Extensive damage to OREI 	5	1	Tolerable	<ul style="list-style-type: none"> Enhanced ERCoP Passage planning taking weather conditions into account Fenders/ bumper bollards installed on structures 	Generally low level of recreation activity and no regular races in the area. Vessels in the area would typically be around 10 m in length. Majority of recreational vessels would be before and after July and transiting the coast on the way to Caledonian Canal and Northern Isles. Expected to be very low in winter. Recreational users could include sea anglers and kayakers.
Inch Cape	Wind Farm support or maintenance vessels	N/A	O&M vessel allision with OREI	O&M vessel allides with OREI during work activities at the site.	O/M	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Fatigue Inadequate work vessel planning Manoeuvring error Mechanical fault leading to vessel NUC Failure of navigational equipment Aid to Navigation failure 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Notable environmental effect Extensive damage to OREI Interruption to operations 	5	2	Tolerable	<ul style="list-style-type: none"> Work procedures and planning Fenders/ bumper bollards installed on structures Adverse weather working policy and procedures Increased Aids to Navigation Personnel training and education 	N/A

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Client: Inch Cape Offshore Limited

Title: Navigational Risk Assessment Development Area (Annex 19A.3)



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Area (S)	Receptors	Specific Receptors	Hazard Title	Hazard Detail	Phase (C, O/M, D)	Industry Standard Risk Reduction Measures (Assumed In Place)	Possible Causes	Most Likely Consequences	Most Likely			Worst Case			Risk Reduction Measures (Initial risk assessment was undertaken assuming industry standard mitigation is in place, therefore this column highlights mitigations above that level)	Additional Comments	
									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	Wind Farm support or maintenance vessels	N/A	Construction vessel allision with OREI	Construction vessel allides with OREI during construction activities at the wind farm.	C	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Fatigue Inadequate work vessel planning Manoeuvring error Mechanical fault leading to vessel NUC Failure of navigational equipment Aid to Navigation failure 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Notable environmental effect Extensive damage to OREI Interruption to construction work 	5	2	Tolerable	<ul style="list-style-type: none"> Work procedures and planning Fenders/ bumper bollards installed on structures Adverse weather working policy and procedures Increased Aids to Navigation Personnel training and education 	N/A
Inch Cape	Wind Farm support or maintenance vessels		De-commissioning vessel allision with OREI	Decommissioning vessel allides with OREI during decommissioning activities at the site.	D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Fatigue Inadequate work vessel planning Manoeuvring error Mechanical fault leading to vessel NUC Failure of navigational equipment Aid to Navigation failure 	<ul style="list-style-type: none"> Minor injury to persons on board Minor damage to vessel Small environmental effect Minor damage to OREI 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Multiple fatalities Extensive damage to vessel/ loss of vessel Notable environmental effect Extensive damage to OREI Interruption to decommissioning work 	5	2	Tolerable	<ul style="list-style-type: none"> Work procedures and planning Fenders/ bumper bollards installed on structures Adverse weather working policy and procedures Increased Aids to Navigation Personnel training and education 	N/A
Inch Cape	Wind Farm support or maintenance vessels		Dropped object in sea during work activities at the wind farm	Dropped object into the sea during operations.	C, O/M, D	MGN 371, IALA O-139, CDM Regulations	<ul style="list-style-type: none"> Adverse weather Poor visibility Human error Fatigue Lack of awareness/ experience Lack of training for lifting operations Equipment/ mechanical failure Inadequate planning 	<ul style="list-style-type: none"> Minor damage to vessel (if dropped object becomes floating hazard) Minor disruption to business whilst dropped object is retrieved 	2	3	Broadly Acceptable	<ul style="list-style-type: none"> Major damage to vessel (if dropped object becomes floating hazard) Creation of permanent navigational hazard Injury to personnel during retrieval operations Damage to subsurface structures 	4	2	Tolerable	<ul style="list-style-type: none"> Training given to all personnel carrying out lifting operations Regular inspection of lifting equipment and maintenance as required PPE Adverse weather working policy and procedures Creation of adequate work procedures 	Dropped object could either sink or become a floating hazard.

Project: A2401

Client: Inch Cape Offshore Limited

Title: Navigational Risk Assessment Development Area (Annex 19A.3)



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Area (S)	Receptors	Specific Receptors	Hazard Title	Hazard Detail	Phase (C, O/M, D)	Industry Standard Risk Reduction Measures (Assumed In Place)	Possible Causes	Most Likely Consequences	Most Likely			Worst Case			Risk Reduction Measures (Initial risk assessment was undertaken assuming industry standard mitigation is in place, therefore this column highlights mitigations above that level)	Additional Comments	
									Consequence	Frequency	Risk	Consequence	Frequency	Risk			
Inch Cape	Third Parties	N/A	Unauthorised mooring to structure and/or deliberate damage to OREI	Vessels moor to the structure without the authority to do so with the intention of causing damage to the device.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Attracted to the wind farm out of curiosity Malicious/ criminal intent Protest 	<ul style="list-style-type: none"> Moderate damage to OREI Injury 	3	1	Broadly Acceptable	<ul style="list-style-type: none"> Major damage to OREI Major injury Reputation/ business damage 	4	1	Tolerable	<ul style="list-style-type: none"> Appropriate signage on structure warning of hazards Alarms Method of alerting presence Locked access to all restricted areas Publicity campaigns to make third parties aware of hazards of OREI 	N/A
Inch Cape	Third Parties	N/A	Unauthorised access to structure and/or deliberate damage to OREI	People access the structure without the authority to do so with the intention of causing damage to the device.	C, O/M, D	MGN 371, IALA O-139	<ul style="list-style-type: none"> Attracted to the wind farm out of curiosity Malicious/ criminal intent Protest 	<ul style="list-style-type: none"> Moderate damage to OREI Injury 	3	1	Broadly Acceptable	<ul style="list-style-type: none"> Major damage to OREI Major injury Reputation/ business damage 	4	1	Tolerable	<ul style="list-style-type: none"> Appropriate signage on structure warning of hazards Alarms Method of alerting presence Locked access to all restricted areas Publicity campaigns to make third parties aware of hazards of OREI 	N/A