



mates



aquateira

EE3. MRE Case Study

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Overview of module

- MeyGen
- Brims



MeyGen

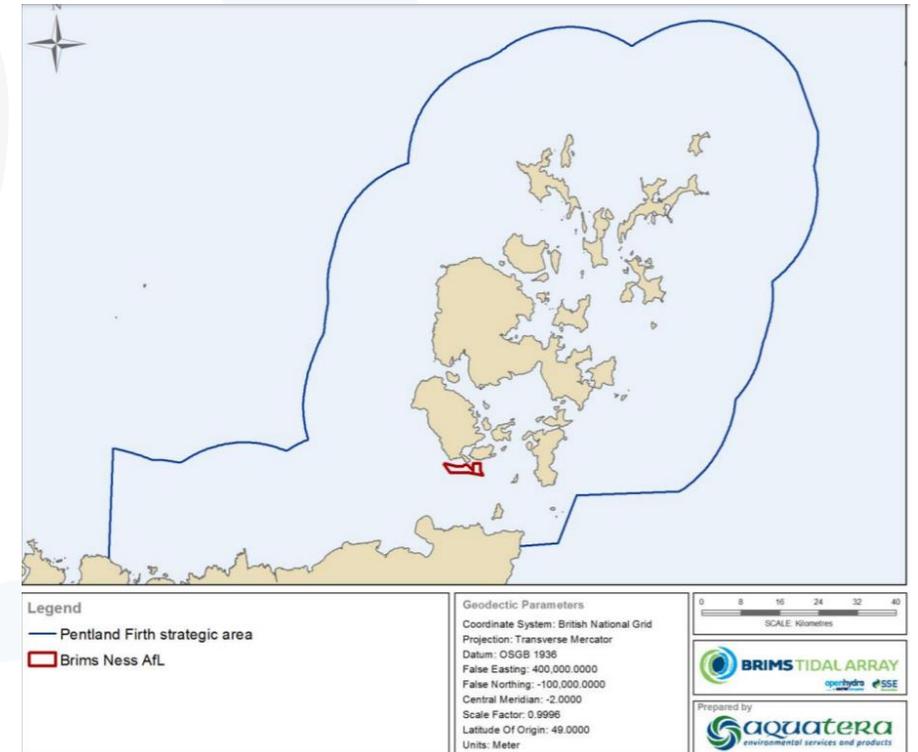
- 2014- EIA completed and Marine License granted
- 2015- Onshore construction commenced
- 2018- MeyGen Phase 1A officially enters into operation
- Consent was sought in phases
 - Phase 1 consent for 86 MW
 - Phase 2 consent will be sought separately (312 MW)
- Turbines 1 MW capacity each, with an export cable to shore each



Source: Gillespie, 2020 Presentation. OES Environmental International Monitoring Forum

Brims

- OpenHydro
- EIA submitted 2016 for the full project
- Indications were positive that it would be consented
- 200 turbines with capacity of 200MW



Design Envelopes

- Rochdale Design Envelope
 - Set of maximum and minimum parameters
 - Developer can seek consent on the basis that the final development design is within the parameters
 - The significance of environmental impact is no greater than predicted.
 - Allows for development of technologies, installation methodologies and equipment during the consenting process which can take years
 - This project was technology neutral within the parameters of horizontal axis turbines

Questions to be put forward to the Regulators

Q2. Are MS-LOT / OIC comfortable in the application of the Rochdale Envelope principle to the assessment of impacts of the proposed Project and would any further information be required?

Scoping

- Ecological

- Birds
- Marine
- Fish
- Coastal
- Seabed

- Physical environment

- Physical
- Air and
- Geology
- Water

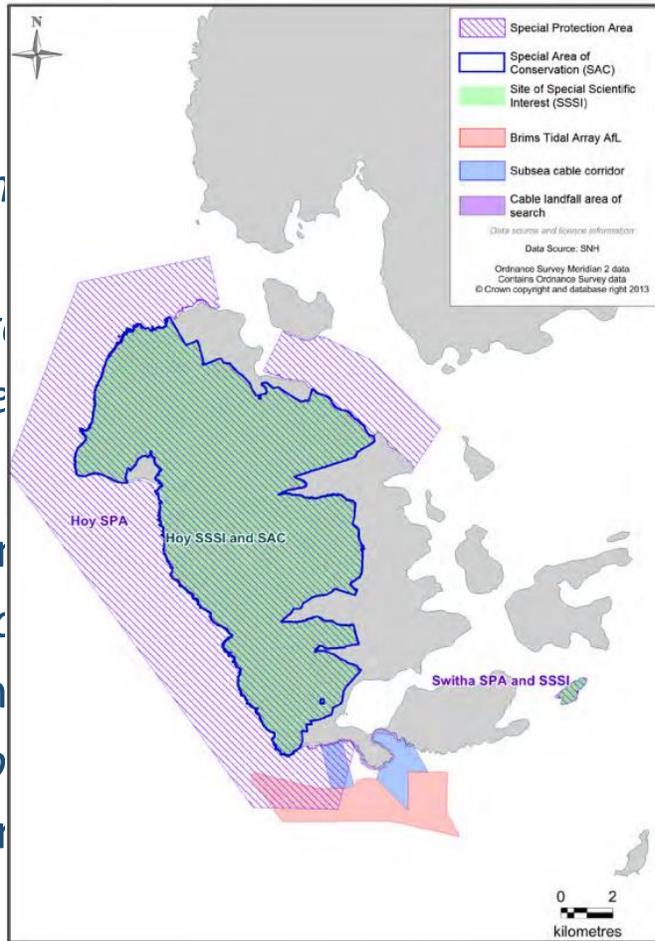


Figure 7.3 Stutory Designated Sites

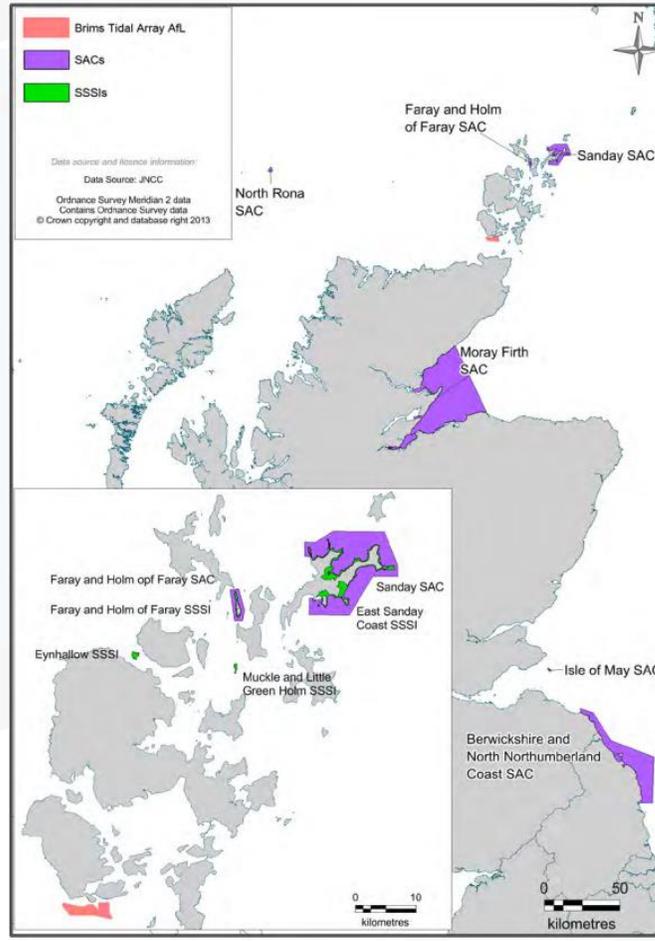
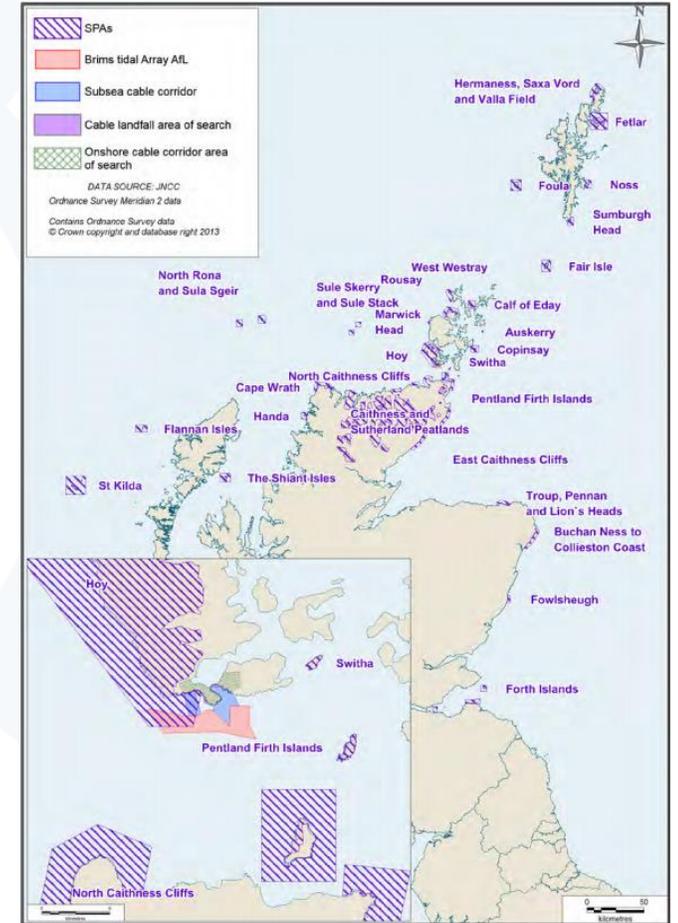


Figure 7.2 Designated sites for marine mammals



Consultation

- Examples of Consultation undertaken
 - Project Briefing Document circulated to stakeholders
 - Meetings with key stakeholders
 - Project website
 - Records taken at all meetings and a consultation database kept
 - This consultation database with issues raised and actions taken in response presented in summary in the EIAR

Brims Tidal Array Ltd (BTAL)
ELECTRICITY ACT 1989
THE ELECTRICITY WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) (SCOTLAND)
REGULATIONS 2000 (AS AMENDED)
MARINE (SCOTLAND) ACT 2010
THE MARINE WORKS (ENVIRONMENTAL IMPACT ASSESSMENT) REGULATIONS
2007 (AS AMENDED)

Notice is hereby given that Brims Tidal Array Ltd (BTAL), registered in Scotland SC373159, of 1 George Square, Glasgow, G2 1AL, has applied to the Scottish Ministers for:

1. Consent, pursuant to Section 36 of the Electricity Act 1989, to construct and operate an offshore generating station at a site with an area of 11.5 km² located 0.4 km south of Hoy, Orkney, Central Grid Reference 58° 45.611' N, 03° 14.431' W (WGS84), the Brims Tidal Array. The installed capacity of the proposed generating station would be up to 200 MW comprising up to 200 tidal turbines, the operational life would be 25 years.
2. A Marine Licence, pursuant to Section 20 of the Marine (Scotland) Act 2010, for the deposit of substances and objects and the construction, alteration or improvement of works within the Scottish Marine Area in relation to the Brims Tidal Array and offshore transmission works.

Copies of the applications, with a plan showing the land to which they relate, together with a copy of the Environmental Statement discussing BTAL's proposals in more detail and presenting an analysis of the environmental implications, are available for inspection, free of charge, during normal office/opening hours at:

Longhope Post Office & Shop Longhope Stromness Orkney KW16 3PG	Kirkwall Public Library 44 Junction Road Kirkwall Orkney KW15 1AG	Scottish Government Marine Laboratory Library 375 Victoria Road Aberdeen AB11 9DB
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The Environmental Statement can also be viewed at the Scottish Government Library at Victoria Quay, Edinburgh, EH6 6QQ.

The Environmental Statement and Non-Technical Summary are available online for download at www.openhydro.com/brims. Copies of the Environmental Statement may be obtained from BTAL (Tel: +353 42 934 9054 or Email: shane.quill@openhydro.com) at a charge of £260 per hard copy (including p & p) or on DVD (no charge). Copies of a short Non-Technical Summary may be obtained free of charge from BTAL.

Any representation on the application should be made by email to The Scottish Government, Marine Scotland Licensing Operations Team mailbox at BTAL.Representations@gov.scot



EIA

Marine Mammals

- Project description
- Baseline information including a 2-year specific marine mammal surveys carried out by developer
 - Vantage point, boat based and passive acoustic surveys
- From these surveys- data on abundance and behaviour, distribution and seasonality could be qualitatively deduced



Collision Risk

- It is possible to model the risk of collision for marine mammals but the confidence envelope is large as as there are uncertainties about their near field behaviour
- Uncertainties exist about the consequences of collision risk as not enough known about level of injury caused
 - Although we are learning more with every deployment
- Encounter rate is calculated between the turbines and marine mammals
- Collision risk is a function of encounter rate
- Encounter rate for a single predator can be simply expressed as the product of the volume swept by the predator per unit time and the density of prey (Where the animal is the predator, and the turbine is the prey)
- This is calculated based on:
 - Turbine dimensions
 - Characteristics of the physical environment (e.g. tide)
 - Species selection
 - Density
 - Depth distribution
 - Swimming speed





Legend

- Phase 1 area for turbine deployment
- Potential area for cable deployment
- Potential area for PCC
- Potential underground cable routes
- Potential locations for new Shet substation
- Cable corridor
- Lease option area 1km buffer
- Actual boat-based transect route (Dec 2009 - Sept 2011)
- Trial boat-based transect route (Oct - Nov 2009)

Total pinniped observations

- 1
- 2 - 3
- 4 - 5
- 6 - 12

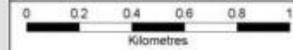
Total cetacean observations

- 1
- 2 - 3
- 4 - 5
- 6 - 12
- 13 - 15

**Relative sightings rate
(Number of marine mammal sightings/km)**

- 0
- 0.000001 - 0.1
- 0.100001 - 0.4
- 0.400001 - 0.85
- >0.85

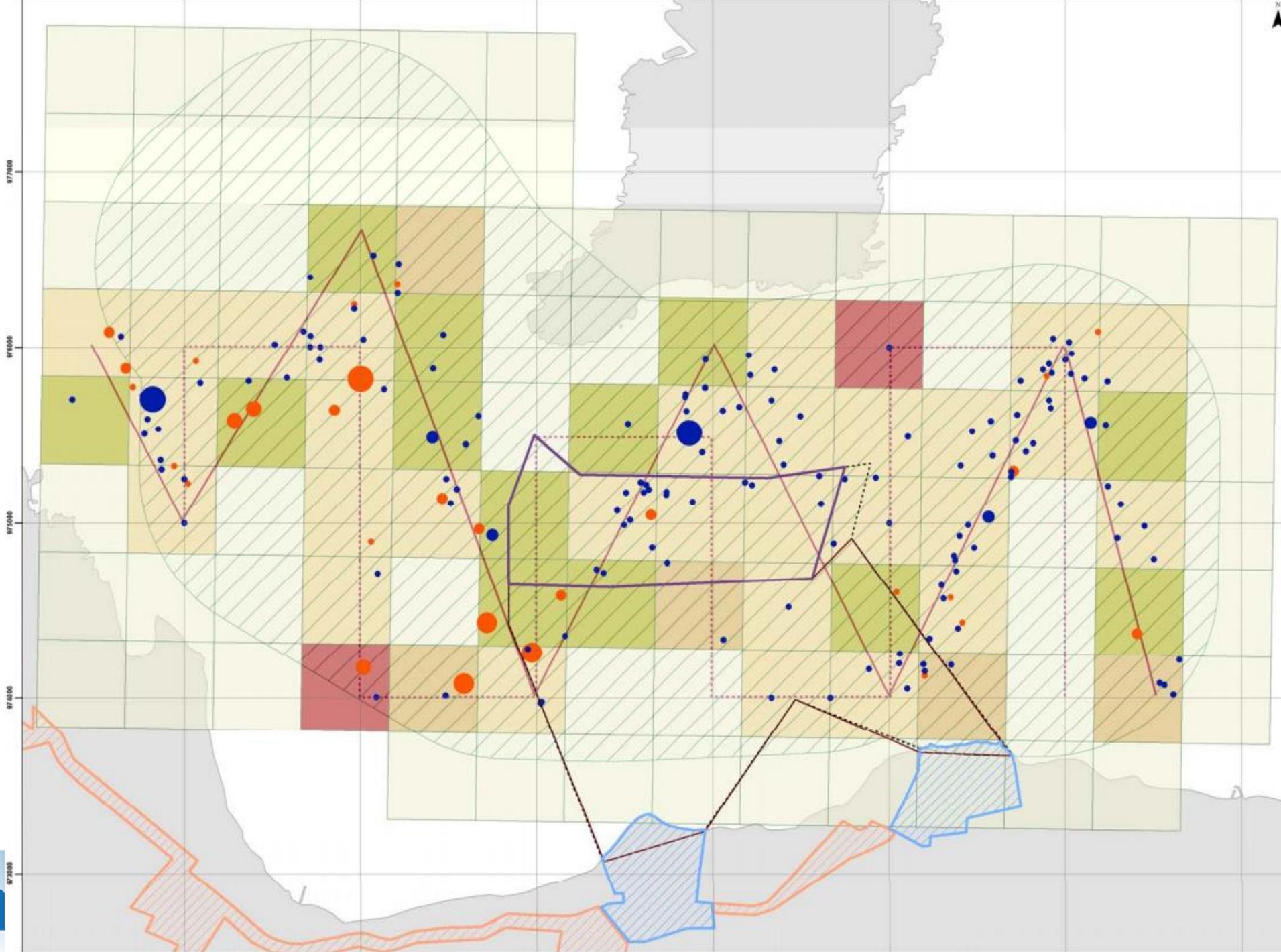
Survey information obtained from RPS.
Ordnance Survey data © Crown copyright.
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Datum: OSGB36 Proj: British National Grid
EPSG Code 27700

Produced by:

Date: 8/11/2011



ucts

Collision Risk

- Four species focused on: harbour porpoise, minke whale and the grey and harbour seals
- Assumption made that encounter rate increases linearly as the number of turbines increases through installation period.
- Encounter rates do not predict animals' interaction with the turbine (Avoidance, evasion, collision causing injury, collision causing death, collision causing no harm)
- Encounter rate expressed as number of animals per turbine per year. Also expressed as percentage of population



Collision Risk

- **Potential Biological Removal** is a widely used method of calculating whether current levels of anthropogenic mortality are consistent with reaching or exceeding a specific target population for a species.
- The Scottish Government issues limits
- For seals in the Orkney and North Coast management area in 2012
 - 959 grey seals
 - 18 harbour seals
- Encounter rates that exceed this number are of particular importance
 - if it is assumed that an encounter may cause serious injury or death

Species	Avoidance Rate ¹⁸	Density data from Project specific data (except minke whale as sightings rate too low)						Other species density estimate (harbour seal haul out estimate, harbour porpoise and grey seal upper 95% CI from Project survey)					
		10 turbines		20 turbines		86 turbines		10 turbines		20 turbines		86 turbines	
		Encounter rate	% of Regional Population	Encounter rate	% of Regional Population	Encounter rate	% of Regional Population	Encounter rate	% of Regional Population	Encounter rate	% of Regional Population	Encounter rate	% of Regional Population
Grey seal feeding	50	27	0.17	54	0.34	232	1.45	84	0.53	168	1.05	722	4.52
	75	14	0.08	27	0.17	116	0.73	42	0.26	84	0.53	361	2.26
	80	11	0.07	22	0.14	93	0.58	34	0.21	67	0.42	289	1.81
	90	5	0.03	11	0.07	46	0.29	17	0.11	34	0.21	144	0.90
	95	3	0.02	5	0.03	23	0.15	8	0.05	17	0.11	72	0.45
	98	1	0.01	2	0.01	9	0.06	3	0.02	7	0.04	29	0.18
	99	1	0.00	1	0.01	5	0.03	2	0.01	3	0.02	14	0.09
	99.5	0	0.00	1	0.00	2	0.01	1	0.01	2	0.01	7	0.05
100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	
Grey seal travelling	50	111	0.69	221	1.38	950	5.95	342	2.14	684	4.28	2941	18.41
	75	55	0.35	111	0.69	475	2.97	171	1.07	342	2.14	1471	9.21
	80	44	0.28	88	0.55	380	2.38	137	0.86	274	1.71	1176	7.36
	90	22	0.14	44	0.28	190	1.19	68	0.43	137	0.86	588	3.68
	95	11	0.07	22	0.14	95	0.59	34	0.21	68	0.43	294	1.84
	98	4	0.03	9	0.06	38	0.24	14	0.09	27	0.17	118	0.74
	99	2	0.01	4	0.03	19	0.12	7	0.04	14	0.09	59	0.37
	99.5	1	0.01	2	0.01	10	0.06	3	0.02	7	0.04	29	0.18
100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	
Harbour seal	50	33	1.09	65	2.18	280	9.38	39	1.31	78	2.62	335	11.26
	75	16	0.55	33	1.09	140	4.69	20	0.65	39	1.31	168	5.63
	80	13	0.44	26	0.87	112	3.75	16	0.52	31	1.05	134	4.50
	90	7	0.22	13	0.44	56	1.88	8	0.26	16	0.52	67	2.25
	95	3	0.11	7	0.22	28	0.94	4	0.13	8	0.26	34	1.13
	98	1	0.04	3	0.09	11	0.38	2	0.05	3	0.10	13	0.45
	99	1	0.02	1	0.04	6	0.19	1	0.03	2	0.05	7	0.23
	99.5	0	0.01	1	0.02	3	0.09	0	0.01	1	0.03	3	0.11
	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Collision Risk

- The orange shaded cells in the table indicate where PBR numbers could be breached
- Grey seal- Noted that a higher level of avoidance (90%) is assumed and therefore concludes that PBR will not be breached
- Harbour seal- Noted that if avoidance were to fall below 97% for 86 turbine scenario, PBR may be breached.



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	99	1	0.00	1	0.01	5	0.03	2	0.01	3	0.02	14	0.09
	99.5	0	0.00	1	0.00	2	0.01	1	0.01	2	0.01	7	0.05
	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
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	99.5	0	0.01	1	0.02	3	0.09	0	0.01	1	0.03	3	0.11
	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

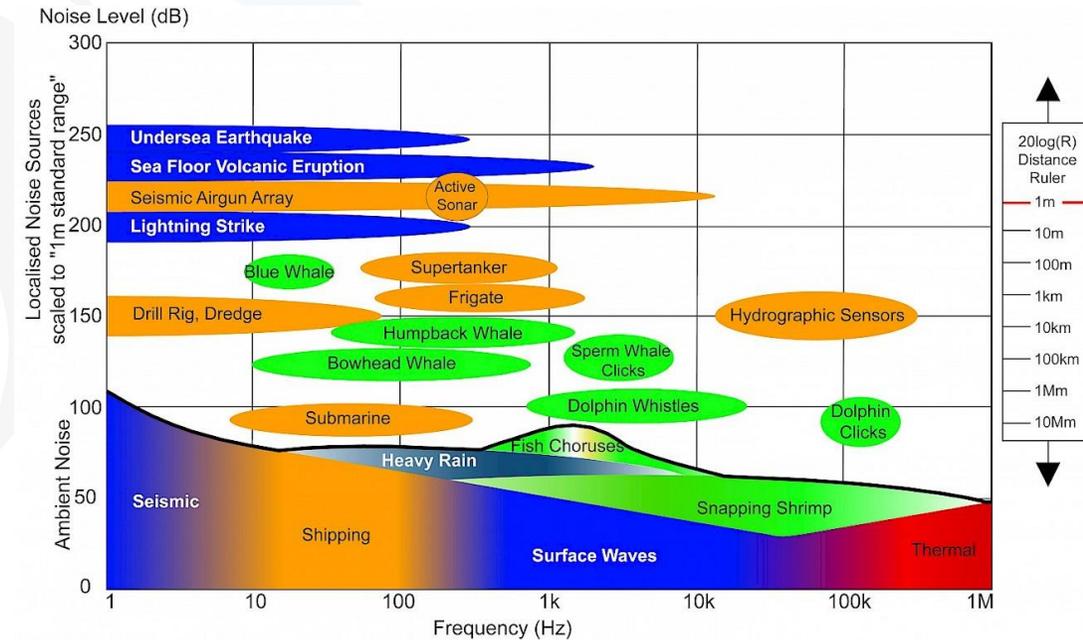
Collision Risk

- Collision Risk for common seal for full 86 turbine array deemed significant
 - Mitigation measure to employ Scotland's Survey, Deploy and Monitor policy to better understand avoidance rates.
 - This learning would inform potential requirement for future mitigation.
 - Therefore concluded in the EIA as not significant
- Important to note that worst case scenario is assumed in this impact assessment to cover for uncertainties in assessment of collision risk



Underwater noise

- Background underwater noise data was collected
- Bathymetric, oceanographic and geo-acoustic data is also gathered
- This allowed acoustic propagation modelling to be done
- This showed the distance to which the additional noise of the development (pile driving, turbine operation and vessel movements) would travel
- This showed the ranges from the development at which the noise may impact marine mammals
- Various studies are cited to show the levels of sound that may cause disturbance, damage (and possibly be lethal) to marine mammals



Underwater noise

- Vessel noise, drilling noise, turbine operation assessed separately under headings:
 - Lethal injury
 - Hearing damage
 - Changes in behaviour
- The noise produced would not be of large enough magnitude to cause lethal injury or hearing damage
- Noise propagation modelling showed that only those mammals within 1m of the drilling would exhibit behavioural reaction. As the drilling would be protected by a conductor sleeve, this would not occur
- With vessel noise, mild behavioural effect could occur 14-18m from the vessels. Strong avoidance would take place at <1m from vessels

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Medium	Minor	Minor	Not significant

Underwater noise

- Turbine operation
 - Assessed as cumulative phases of the development
 - 12 x 2.4 MW turbines
 - 36 x 2.4 MW turbines
- All assessed as not significant

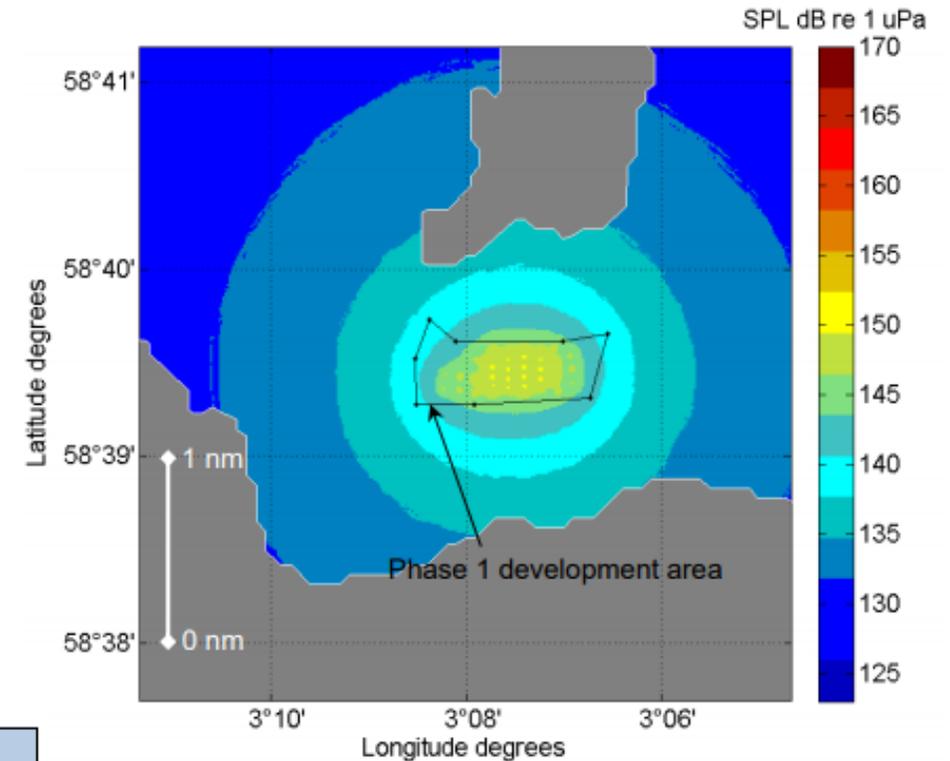


Figure 11.7: Effect of cumulative acoustic footprint for 36 x 2.4MW

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Medium	Minor	Minor	Not significant

Cumulative impacts

- List of projects identified which, together with project could result in cumulative impacts
- Installation and Construction & Decommissioning:
 - Due to temporary nature of this phase, and timing of other projects- no cumulative impacts considered
- Operation and Maintenance:
 - Cumulative impact of loss of habitat and species was assessed. Due to **low diversity communities, dominated by sessile fauna**, this is considered to be minor and therefore non significant.
 - Cumulative impact of collision risk to marine mammals was assessed. **Potentially significant cumulative collision risk with operational tidal turbines for all species of marine mammal and basking shark (Brims)**
 - Socio Economic impacts were assessed. **Potentially significant positive cumulative effects were identified (Brims)**

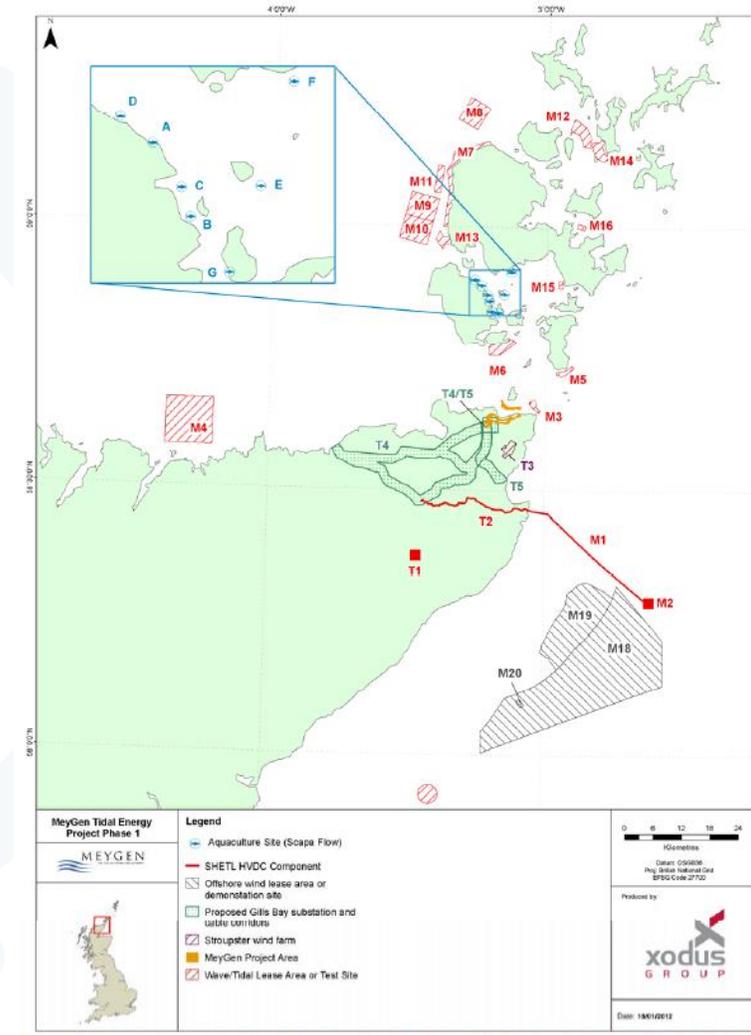


Figure 8.1: Locations of projects considered in cumulative impact assessment (reference numbers correspond to Table 8.3)

Mitigation measures

- Survey, deploy and monitor strategy adopted
- Baseline survey to fully define the habitat types and presence of species
 - – Detailed cable route surveys to avoid sensitive habitats
- Installation layout clearly defined and communicated (e.g. kelp clearance)
- Minimisation as far as practicable the depth and diameter of the turbine foundation piles
- Non-toxic lubricants used
- All vessels will adhere to all relevant guidance (including the IMO guidelines)
- Cable protection management measures in place to minimise rock placement and hence minimise seabed disturbance
- Marine standard anti fouling coatings on turbines and associated infrastructure only to be used where necessary

Conclusions

- Standard mitigation measures were employed with additional mitigation measures where necessary/ appropriate
- Site selection to avoid species and habitats of conservation importance/significance
- Early, regular and efficient communication with regulator and other key consultees is key
- Scotland's Survey, Deploy and Monitor policy was instrumental in justifying the project and in the years since, the monitoring undertaken has led to significant learning on collision risk for marine mammals around tidal turbines



Group Exercise

- What do you think the key environmental impacts of a large tidal array might be?
- What do you think can be done to reduce the uncertainty of these impacts?
- What do you think are the most important steps in the EIA process?