



Department of

# Agriculture, Environment and Rural Affairs

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## HABITATS REGULATIONS ASSESSMENT

Islandmagee Gas Storage Project  
Discharge consent TC 041/20\_1  
Abstraction Licence AIL/2012/0033  
Marine Licence Application ML28\_12

Habitats Regulations Assessment

In accordance with Regulation 43(1) of the Conservation (Natural Habitats, etc) (Northern Ireland) 1995 (as amended), DAERA has considered whether the project, plan or proposal either alone or in combination (neither being directly connected with or necessary to the management of the site) is likely to have a significant effect on the Natura 2000 site.

As part of that consideration, DAERA has:

Applied the precautionary approach set out in European Commission Guidance: "Managing Natura 2000 Sites"<sup>1</sup> and by the European Court of Justice in C-127/02, Waddenzee, paragraphs 56 and 59.2

*"The authorisation of a plan or project may only be granted if the Competent National Authority is certain that it will not have any adverse effect on the integrity of the site concerned. That is where no reasonable scientific doubt remains as to the absence of such effect."*

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Web link references for the above:

1. European Commission Guidance: "Managing Natura 2000 Sites"  
[http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision\\_of\\_art6\\_en.pdf](http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf)
2. European Court of Justice in C-127/02, Waddenzee, paragraphs 56 and 59  
<http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:62002J0127:EN:PDF>
3. The Conservation (Natural Habitats, etc.) (Amendment) Regulations (Northern Ireland) 2007  
<http://www.legislation.gov.uk/nisr/2007/345/regulation/14/made>

**STAGE 1: ASSESSMENT OF SIGNIFICANT LIKELY EFFECTS**

**Stage 1(a): Identifying relevant consent application and sites potentially affected**

Provide detail of the relevant discharge consent application.

<p><b><i>Description of discharge consent, water abstraction and marine construction applications.</i></b></p>	<p>An application for discharge consent was submitted on 25<sup>th</sup> October 2012 and a consent to discharge was issued on 14<sup>th</sup> November 2014</p> <p>A review submission for this consent was made on 24<sup>th</sup> February 2020 by Islandmagee Energy Limited (the applicant), relating to the discharge from a brine pumping station as part of a gas storage facility. Brine is to be discharged into the North Channel (Irish Sea) off Castle Robin Bay.</p> <p>An application for an abstraction licence was first submitted on 24<sup>th</sup> October 2012, and a licence granted on 14<sup>th</sup> November 2014. A submission to review this licence was made by Islandmagee Energy Limited on 24<sup>th</sup> February 2020.</p> <p>An application for a marine construction licence was first submitted on 22<sup>nd</sup> October 2012. An updated application for a marine licence was submitted by Islandmagee Energy on 16<sup>th</sup> December 2020.</p> <p>The proposed development will create a new high pressure natural gas storage facility beneath Larne Lough. A gas plant will be constructed to inject gas into the caverns and to dry gas for export to the gas network. On this basis, the proposed development is not directly connected with or necessary to the management of any site as a UK National Site Network site (referring to the first test contained in the first sentence of Article 6(3) of the Habitats Directive), and as such the proposed development is subject to appropriate assessment.</p> <p>This proposal includes a marine licence for the construction of 7 caverns under the seabed of Larne Lough capable of storing 500 million cubic metres of natural gas. Construction involves solution mining of caverns from a salt layer more than 1km below the seabed using pressurized and heated seawater abstracted from the North Channel on the seaward side of the Islandmagee peninsula. It is proposed to discharge the concentrated brine effluent produced from this process back into the sea off Islandmagee, again being piped across Islandmagee and discharged via pipes and diffuser heads on the seabed.</p> <p>Part of the above-ground elements of the proposed development included the construction of a sea water and brine pumping facility (leaching plant). This will be a building to house the pumping equipment and brine tanks which will pump sea water into the wells and pump the waste brine back to sea via an outfall pipe. The proposed brine outfall discharge location (via two diffusers) is 450m offshore (27m water depth) at consent 345076 403469 and</p>
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345091 403482(see Map 1A). The maximum quantity of brine to be discharged at this location is stated to be 24,000 m<sup>3</sup>/day at a rate of 277 litres/second.

The nature and composition of the raw effluent is stated to be salinity at 260 PSU at the discharge point, reducing to 36 PSU within 100 metres of the discharge point (Brine Dispersion Modelling (RPS, 2019).

Table 1 below is a list of the Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015 which are likely to be present in the discharge effluent. These will be discussed further in Section 1b – Assessing likely significant effects.

<b>Substance*</b>	<b>Max (ug/l)</b>	<b>Min (ug/l)</b>	<b>Mean (ug/l)</b>
Cadmium (Total and dissolved & compounds)	<b>0.36</b>	<b>0.07</b>	
Mercury (Total and dissolved & compounds)	<b>0.02</b>	<b>0.02</b>	
Arsenic (Dissolved)	<b>1.80</b>	<b>0.90</b>	<b>1.17</b>
Boron (Total) (mg/l)	<b>3.81</b>	<b>3.60</b>	<b>3.68</b>
Chromium (Total and dissolved)	<b>1.0</b>	<b>1.0</b>	<b>1.0</b>
Copper (Total and dissolved)	<b>1.70</b>	<b>0.80</b>	<b>1.35</b>
Lead	<b>2.20</b>	<b>0.50</b>	<b>1.52</b>
Nickel (Total and dissolved)	<b>3.40</b>	<b>1.10</b>	<b>2.05</b>
Zinc (Total and dissolved)	<b>4.40</b>	<b>1.10</b>	<b>2.65</b>

*Table 1: \*The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015*

This overarching Departmental Habitats Regulation Assessment (HRA) will comprise assessment of three licensing requirements by the applicant:

1. The licensing of marine construction within the marine area (Marine and Coastal Access Act (2009));
2. A review of licensing of water abstraction and impoundments (Water Abstraction and Impoundment (Licensing) NI Regulations (2006) as amended);
3. A review of licensing of discharges to the water environment (Water (NI) Order (1999)).

Each of the three licenses are fundamental elements of the project and will be essential to the final decision on the authorisation of the proposed operations.

This Habitat Regulations Assessment has been prepared by DAERA and examines firstly whether or not the proposed Islandmagee Gas Storage Facility (IGSF) is likely to have a significant effect on any site in the UK's national site network. Where a likely significant effect is identified an appropriate assessment is required in view of the conservation objectives. In

	<p>view of the findings of that assessment, and subject to the derogation provisions, a plan or project can only be consented where it has been ascertained that it will not adversely affect the integrity of the site concerned.</p>
<p><b>Reference (if available)</b></p>	<p>The review of Consent to Discharge reference is TC 041/20_1</p> <p>The review of Abstraction Licence reference is AIL/2012/0033</p> <p>The Marine Licence reference is ML 28_12</p> <p>The associated with planning reference is F/2010/0092/F</p>
<p><b>Identification of designated sites potentially affected by the issuing of permissions.</b></p>	<p>This stage of the assessment considers sites designated under European Council Directives 92/43/EEC and 2009/147/EC. All consents considered must be screened against all such sites in which a pathway of impact can be <b>reasonably established</b> between the risk and the receptor.</p> <p>To determine if the marine construction, seawater abstraction brine discharge or decommissioning, will have an impact on the designated sites and their qualifying interests, the source-pathway-receptor model is used.</p> <p>The risk to the environment depends on three factors being in place:</p> <ol style="list-style-type: none"> <li>1. A source or risk: an activity which has the potential to interact with the environment;</li> <li>2. A pathway: for the source or risk to get into the environment of the receptor;</li> <li>3. A receptor: something that is going to be affected by the source or risk.</li> </ol> <p>The construction phase has terrestrial, underground and marine elements. The seawater abstraction is directly from the marine environment. The proposed effluent comprises brine and is to be discharged directly into the marine environment. Risks have been identified in order to determine an appropriate radius for screening in sites at or near the development proposal site. A screening radius has been assigned to each risk.</p> <p><b>Risks during Construction phase, seawater abstraction, brine discharge and decommissioning include:</b></p> <p><b>Collision Risk</b></p> <ul style="list-style-type: none"> <li>• There are potential collision risks from physical structures and moving vessels. Impacts will be greatest in the immediate vicinity of the structures. Mobile species are at risk. <u>Screening radius 100km.</u></li> </ul> <p><b>Habitat loss</b></p> <ul style="list-style-type: none"> <li>• Seabed within sites will be disturbed during construction and covered by structures. Brine discharge can alter habitats and can travel under</li> </ul>

	<p>the influence of tides and sea state. Species from adjoining sites may lose feeding opportunities. <u>Screening radius 100km.</u></p> <p><b>Sediment plumes</b></p> <ul style="list-style-type: none"> <li>• Seabed disturbance can result in increased turbidity and creation of sediment plumes smothering habitat and may reduce foraging in mobile species. <u>Screening radius 100km.</u></li> </ul> <p><b>Noise/Disturbance</b></p> <ul style="list-style-type: none"> <li>• During construction of infrastructure there may non-impulsive noise during drilling and from vessel traffic. Noise may also be generated by the disturbance in the water column due to the abstraction and discharges themselves. This may cause temporary displacement from foraging areas and potential barrier effect for marine mammal transit. <u>Screening radius 100km for marine mammal sites.</u></li> </ul> <p><b>Seawater abstraction</b></p> <ul style="list-style-type: none"> <li>• Potential impacts from the water abstraction include sea life becoming entrained on the intake structures so posing a direct risk to animals and loss of prey. <u>Screening radius 100km.</u></li> </ul> <p><b>Liquid effluent and spillages</b></p> <ul style="list-style-type: none"> <li>• Sediment laden run-off. Fuel and oils. Waste, including oil coated drill cuttings. Pollution events most likely to impact sites in immediate vicinity and seabird colonies further afield. <u>Screening radius 20km.</u></li> </ul> <p><b>Brine discharge &amp; Escape of flammable and/or environmentally hazardous storage product</b></p> <ul style="list-style-type: none"> <li>• Imperfect cavern sealing and abandonment could potentially lead to discharges and escapes of hazardous products. <u>Screening radius 20km</u></li> </ul> <p>Risks may apply directly to designated site features within the immediate vicinity of the development. However mobile species such as birds and marine mammals from sites some distance away may visit the area and depend on it for feeding or transit.</p> <p>All sites with qualifying interests that could potentially be impacted by any consented discharge from the proposed development were identified within a 20km radius* are listed below. This included two Ramsar site designations.</p> <ul style="list-style-type: none"> <li>• Proposed East Coast (NI) Marine SPA [UK9020320]</li> <li>• North Channel SAC [UK0030399]</li> <li>• Larne Lough SPA [UK9020042]</li> </ul>
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	<ul style="list-style-type: none"> <li>• Larne Lough Ramsar [UK12013]</li> <li>• The Maidens SAC [UK0030384]</li> <li>• Belfast Lough SPA [UK9020101]</li> <li>• Belfast Lough Ramsar [UK12002]</li> <li>• Belfast Lough Open Water SPA [UK9020920]</li> <li>• Outer Ards SPA [UK9020271]</li> <li>• Strangford Lough SPA [UK9020111]</li> <li>• Strangford Lough SAC [UK0016618]</li> <li>• Copeland Island SPA [UK9020291]</li> </ul> <p>These are shown in Map 2. Sites for consideration include Special Protection Areas (SPA), Special Areas of Conservation (SAC). Note that Antrim Hills SPA [UK9020301] has been excluded as no impact can be reasonably established between the risk and the receptor even though it is within 20km.</p> <p><i>*NIEA would normally screen at 2km, however due to the sensitive nature of this project in the local community it was decided to extend the radius to 20km, a distance of 15km is derived from UK guidance (Scott Wilson et al, 2006).</i></p> <p>In addition to these sites, five additional sites beyond the 20km search radius were considered due to the mobile species associated with site selection and because there is potential for underwater noise to have an impact beyond the 20km value used for the discharge. These are:-</p> <ul style="list-style-type: none"> <li>• Ailsa Craig SPA [UK9003091]</li> <li>• Skerries and Causeway SAC [UK0030383]</li> <li>• Treshnish Isles SAC [UK0030289]</li> <li>• Inner Hebrides and the Minches SAC [UK0030393]</li> <li>• North Anglesey Marine SAC [UK0030398]</li> </ul>
<p><b><i>Why each site has been designated and its conservation objectives.</i></b></p>	<p>Full details of all sites considered, along with their selection feature(s) and conservation objectives are shown in Table 2.</p>
<p><b><i>Sites where risks can be excluded on the basis of objective information without the need for further assessment.</i></b></p>	<p>Some sites were looked at in terms of distance from the proposed discharge and abstraction points and marine construction footprint. The Sea Mammal Research Unit (SMRU) have suggested a 100km foraging radius for populations of both Grey Seal and Harbour Porpoise, with a 50km radius for Harbour/Common Seal (SMRU, 2017). The actual swimming distance that a seal would have to undertake to get from Strangford Lough SAC is at least 65km (RPS, 2019). On this basis, Strangford Lough SAC has been screened out. Similarly, Skerries and Causeway SAC, Treshnish Isles SAC, Inner Hebrides and the Minches SAC and North Anglesey Marine SAC are approximately 75km, 95 km, 100km and 115km respectively from the proposed discharge location. It is not considered that the Harbour Porpoise or Grey Seal populations from these areas will be significantly impacted from</p>

the discharge, abstraction or marine construction. One Harbour Porpoise site and one Grey Seal site have remained screened in due to a range of risks, pathways and receptors relating to mobile marine mammals. Assessment of these closer sites has confirmed that it has been appropriate to exclude similar but more distant sites.

Many of the SPAs designated for bird species are at a distance from the proposed discharge, abstraction points and marine construction. Whilst it is possible that many of these species could forage in proximity to the brine discharge and sea water abstraction location, neither the extent of the plume of brine, nor the activity of abstracting or marine construction is considered significant enough to impact sites such as Ailsa Craig SPA, Belfast Lough SPA, Belfast Open Water SPA, Copeland Islands SPA, Outer Ards SPA or Strangford Lough SPA. On this basis, all these sites have been screened out from further assessment. Several sites which share similar designation features have remained screened in so a range of risks, pathways and receptors are assessed that relate to marine habitats and bird species. Assessment of these closer sites has confirmed that it has been appropriate to exclude similar but more distant sites.

The following sites have been screened out of any further assessment:

- Belfast Lough SPA
- Belfast Lough Ramsar
- Belfast Lough Open Water SPA
- Outer Ards SPA
- Strangford Lough SAC
- Strangford Lough SPA
- Copeland Islands SPA
- Ailsa Craig SPA
- Skerries and Causeway SAC
- Treshnish Isles SAC
- Inner Hebrides and the Minches SAC
- North Anglesey Marine SAC

At this stage of the process any likely significant effects cannot be ruled out on the qualifying interests of the five remaining sites.

The following sites have been screened in for further assessment:

- Proposed East Coast (NI) Marine SPA
- North Channel SAC
- Larne Lough SPA
- Larne Lough Ramsar
- The Maidens SAC



<p><b>Habitat and Species Profiles</b></p>	<p>This section of the assessment looks at the specific qualifying interests or site selection criteria for the ‘screened in’ sites. Any Annex I habitats or Annex II species are listed below. These will form the focus for the next stage of the assessment.</p> <p><b>Annex I (Habitats)</b></p> <p>The remaining Annex I habitats which cannot be excluded for the possibility of likely significant effects are:</p> <ul style="list-style-type: none"> <li>• Sand banks which are slightly covered by sea water all the time (The Maidens SAC).</li> <li>• Reefs (The Maidens SAC).</li> </ul> <p><i>Sand banks which are slightly covered by sea water all the time:</i></p> <p>Sandbanks which are slightly covered by sea water all of the time are classed as an Annex I habitat under the EU Habitats Directive (habitat code 1110). They are sublittoral sandbanks, permanently submerged. Water depth is seldom more than 20m below Chart Datum. Non-vegetated sandbanks or sandbanks with vegetation belonging to the <i>Zosteretum marinae</i> and <i>Cymodoceion nodosae</i>.</p> <p>Around the entire UK shoreline, this habitat type’s condition assessment was <i>unfavourable -inadequate</i>. This means the habitat is in a situation where a change in management or policy is required to return the habitat to favourable status but there is no danger of disappearance in the foreseeable future (EUNIS, 2020).</p> <p><i>Reefs:</i></p> <p>Reefs are classed as an Annex I habitat under the EU Habitats Directive (habitat code 1170). They are submarine, or exposed at low tide, rocky substrates and biogenic concretions, which arise from the sea floor in the sublittoral zone but may extend into the littoral zone where there is an uninterrupted zonation of plant and animal communities. These reefs generally support a zonation of benthic communities of algae and animal species including concretions, encrustations and coralline concretions.</p> <p>Around the entire UK shoreline, this habitat type’s condition assessment was <i>unfavourable -inadequate</i>. This means the habitat is in a situation where a change in management or policy is required to return the habitat to favourable status but there is no danger of disappearance in the foreseeable future (EUNIS, 2020).</p> <p><b>Annex II &amp; Ramsar (Species)</b></p>
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The remaining Annex II species which cannot be excluded for the possibility of likely significant effects are:

- Great-crested Grebe (Proposed East Coast (NI) Marine SPA)
- Red-throated Diver (Proposed East Coast (NI) Marine SPA)
- Sandwich Tern (Proposed East Coast (NI) Marine SPA, Larne Lough SPA)
- Common Tern (Proposed East Coast (NI) Marine SPA, Larne Lough SPA/Ramsar)
- Roseate Tern (Larne Lough SPA/Ramsar)
- Arctic Tern (Proposed East Coast (NI) Marine SPA)
- Manx Shearwater (Proposed East Coast (NI) Marine SPA)
- Eider (Proposed East Coast (NI) Marine SPA)
- Light-bellied Brent Goose (Larne Lough SPA/Ramsar)
- Harbour porpoise (North Channel SAC)
- Grey seal (The Maidens SAC)

### **Bird Species Profiles**

This section provides an overview of the qualifying interest bird species from all screened in sites under consideration, including current conservation status and abundance.

Table 4 presents an overview of the qualifying interests (bird species) and their current conservation status in UK and Ireland. Common Eider has been included in the UK and Ireland Red Lists of Birds of Conservation Concern. The remaining species are all Amber-listed on the latest Irish Birds of Conservation Concern (BoCC). Two species (Great Crested Grebe and Red-throated Diver) are Green-listed on the UK BoCC lists. However the Amber rating will be used as it is a more recent assessment and it is best to take a precautionary approach

#### *Great Crested Grebe*

Great Crested Grebes breed on large, shallow eutrophic loughs, and along canals and slow flowing rivers – wetlands with emergent vegetation bordered by open water are generally selected. Nests are a large mound of aquatic vegetation and are usually well concealed within reeds. They feed on fish and other small aquatic animals.

Winter distribution is widespread in Ireland with greatest concentrations in the north midlands and northeast and birds from the continent join the resident population. Outside the breeding season Great Crested Grebes are often solitary with some birds moving to the coast through the winter. Occasionally, large congregations form for short periods. Birds start returning to breeding areas from mid-February.

Belfast Lough Open Water SPA 5 year mean (1991/92-1995/96) held 2466 non-breeding individuals (it sits within East Coast (NI) Marine pSPA). In

recent years the population of Great Crested Grebe on Belfast Lough Open Water SPA has declined. For the period 2008/09 – 2012/13, the mean Great Crested Grebe numbers were 737 wintering individuals (<1% of the international biogeographical population). Great Crested Grebe has been retained as a qualifying species for Belfast Lough as the population is still notable (13.4% all-Ireland population) while the site can be of increased importance e.g. as a cold weather refuge.

*Red-throated Diver*

Winter visitor to all Irish coasts from September to April. There is a very small breeding population in County Donegal.

Feeds by diving for small fish such as sprats, sand eels, codling and flatfish. Other food items include fish spawn, frogs, shrimps, molluscs, water insects and annelids.

The designation value for this species in the East Coast (NI) Marine pSPA is 142 non-breeding individuals 5 year mean. Daily movements of Red-throated Divers commuting into Belfast Lough have included a mean of 121 wintering individuals for the period 2010/11-2014/15.

*Terns*

Numbers in breeding colonies can fluctuate considerably from year to year. All four species listed plunge-dive for fish.

*Sandwich Tern*

Summer visitor, wintering in very small numbers. National census data show that numbers of Sandwich terns nesting in Northern Ireland increased between Operation Seafarer and the Seabird Colony Register (SCR) by 80% but then fell by 11% to Seabird 2000. The decline between 1987 and 2000 is reflected by data from five well monitored colonies (Cockle Island, Carlingford Lough, Strangford Lough, Larne Lough and Lower Lough Erne). Comprehensive monitoring of these five colonies between censuses suggest total numbers in Northern Ireland declined after the SCR until the early 1990s, before increasing steadily until 2005, reaching a peak of 3,319 apparently occupied nests (AON). Numbers then declined rapidly until 2013 when just 1299 AON were recorded but have recovered slightly, with 1,863 AON being recorded in 2018 (JNCC, 2020).

*Common Tern*

Summer visitor. The number of common terns breeding in Northern Ireland increased by 55% between the Seabird Colony Register and Seabird 2000 censuses, from 1,096 to 1,704 AON. In 2006, the six largest colonies in the east of Northern Ireland (Cockle Island, Carlingford Lough, Strangford Lough and Copeland Island, Larne Lough and Belfast Lough ), held 2,369 AON (cf. 1,570 in 2000), representing an increase in the national population, although numbers at these colonies declined to 1,119 AON in 2018. A further six colonies, where monitoring is less frequent, held 433 AON in 2018; therefore, all 11 colonies totalled 1,552 AON. The few other extant colonies that were

found during the comprehensive coverage of Seabird 2000 are unlikely to hold more than 400-500 AON in total. Hence, it is likely that the population of breeding common terns in Northern Ireland is now slightly larger than recorded during the last census (JNCC, 2020). However the Northern Ireland Seabird Report (BTO, 2021) indicates significant declines at some colonies.

*Roseate Tern*

Summer visitor. In common with Scotland and England, the Roseate Tern population of Northern Ireland is in decline. Emigration of birds to higher quality breeding sites in the Republic of Ireland was at least part of the reason for the decline. From the mid-1990s, the population fluctuated without showing any prolonged recovery and from 2003 declined again. Since 2009, only one apparently occupied nests (AON) has been recorded each year, except for 2014 when two AON were recorded. Single non-breeding birds have also been recorded at some other sites in recent years (JNCC, 2020).

*Arctic Tern*

Summer visitor. Whilst this species may feed within the wider development area, it is noted that Larne Lough and the vicinity of the proposed outfall location are not considered as breeding territories for this species. However the East Coast (NI) Marine pSPA provides a feeding area for Arctic Tern colonies at Belfast Lough SPA, Outer Ards SPA, Copeland Islands SPA and Strangford Lough SPA. The 5 year mean (2010-2014) was 1351 breeding pairs representing 38.6% of the all-Ireland population.

*Manx Shearwater*

Summer visitor. The first comprehensive estimates of population size of Manx Shearwater in Northern Ireland were obtained during the Seabird 2000 census. Only two colonies are known, both on the Copeland Islands; Big Copeland was estimated to hold 1,766 AOS, with a further 2,867 AOS on nearby Lighthouse Island (total 4,633). The islands were re-surveyed in 2007, when 1,406 AOS were recorded on Big Copeland and 3,444 AOS on Lighthouse Island (total 4,850) indicating that numbers had changed little overall<sup>14</sup>. Changes at the respective islands between these two censuses (-20% on Big Island and +20% on Lighthouse) may be associated with logistical difficulties in surveying this nocturnal, burrow-nesting species (JNCC, 2020). Whilst this species may feed within the wider development area, it is noted that Larne Lough and the vicinity of the proposed outfall location are not considered as breeding territories for this species.

Breeding success was monitored on Lighthouse Island by Copeland Bird Observatory between 2007 and 2013, using study burrows. In the seven years of monitoring, average breeding success on Copeland (0.74 chicks/AOB) was usually a little higher than at other sites in the UK (0.62 chicks/AOS, JNCC, 2020), although extremely wet weather in 2007 resulted in a success rate of just 0.38 chicks per pair. There is no recent population or productivity data. Mainly feed on fish.

*Common Eider*

Resident along rocky coasts in the north and north-west of Ireland. They occur in shallow inshore coastal waters, diving in waters up to 20 m depth, feeding predominantly on mussels, other molluscs, crustaceans and echinoderms.

Eider nest colonially on offshore islets, along low-lying coast, usually where the threat of mammalian predation is minimal. Eider seldom occur far from the sea throughout the year. They breed around the coast of Scotland and northern England and along the north and northwest coasts of Ireland. Up to 100 pairs have been estimated in Ireland. The East Coast (NI) Marine pSPA had a five year mean (2010/11-2014/15) of 3126 non-breeding individuals representing more than 90% of the all-Ireland population.

*Light-bellied Brent Goose*

Winter migrant from high-Arctic Canada. Most occur in Ireland between October and April. This population winters almost entirely in Ireland, with small numbers in parts of Britain and France.

During the winter, it feeds mostly on eel-grass, which grows on muddy estuaries, and also on grasslands, usually when coastal supplies have been depleted at estuarine sites.

Common winter visitor. Highest numbers (c.30,000) are seen at Strangford Lough in Northern Ireland in October, where most congregate on arrival. Thereafter they move to other estuarine sites.

**Marine Mammal Species Profiles**

Species details of the only two Annex II mammals/cetaceans within the sites screened in are outlined below. Table 3 presents an overview of their current conservation status.

*Harbour Porpoise:*

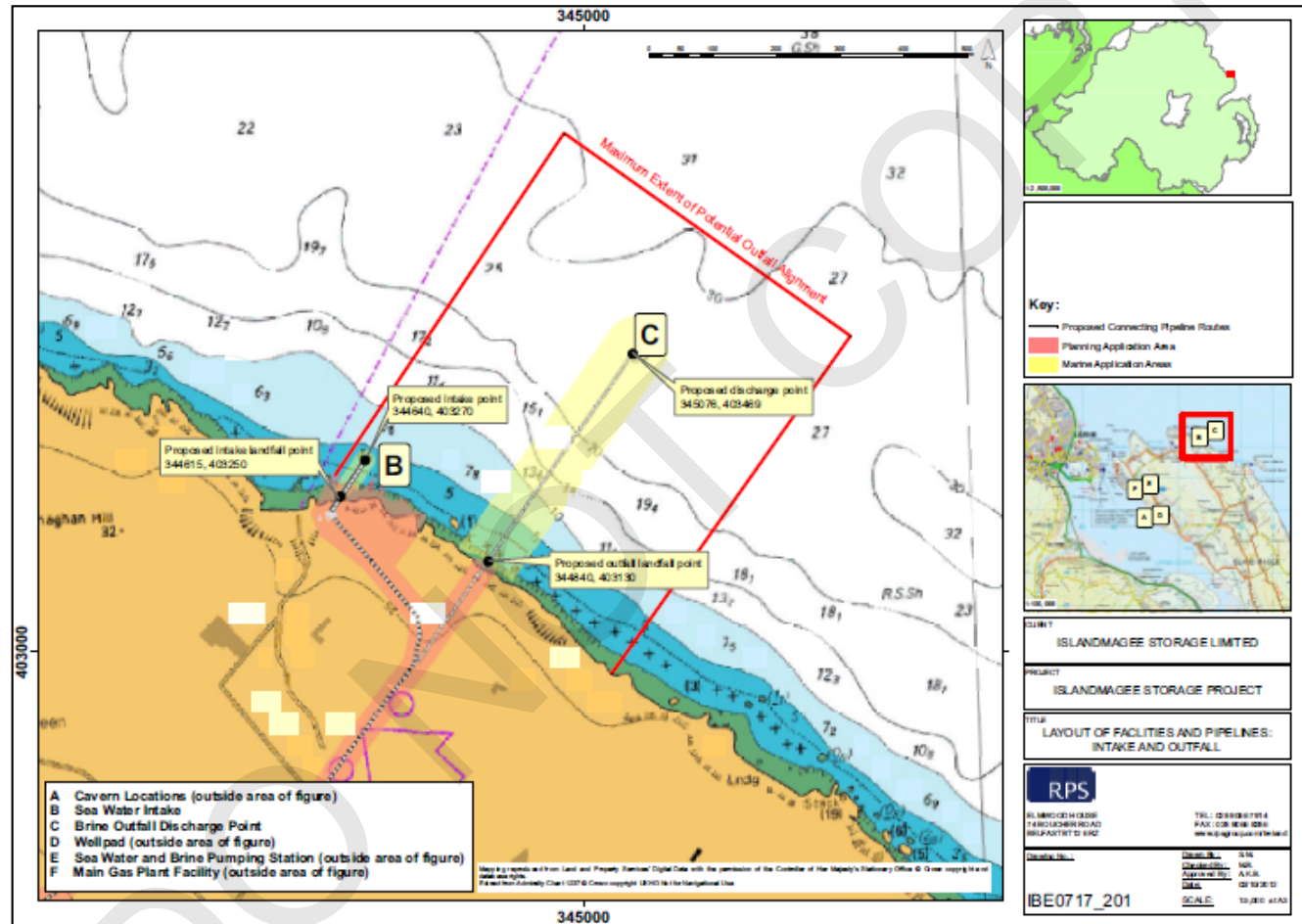
Present all year round. The Harbour Porpoise is the cetacean that is most commonly seen in local waters and it is also the most widely distributed cetacean in northern Europe.

The Harbour Porpoise is a social species that travels in small groups of two to five members, but larger groups can occur.

The Harbour porpoise eats mainly smooth, non-spiny fish, such as herring, pollack, hake, cod and sardines. Other sea creatures including cephalopods and shrimp are also eaten.

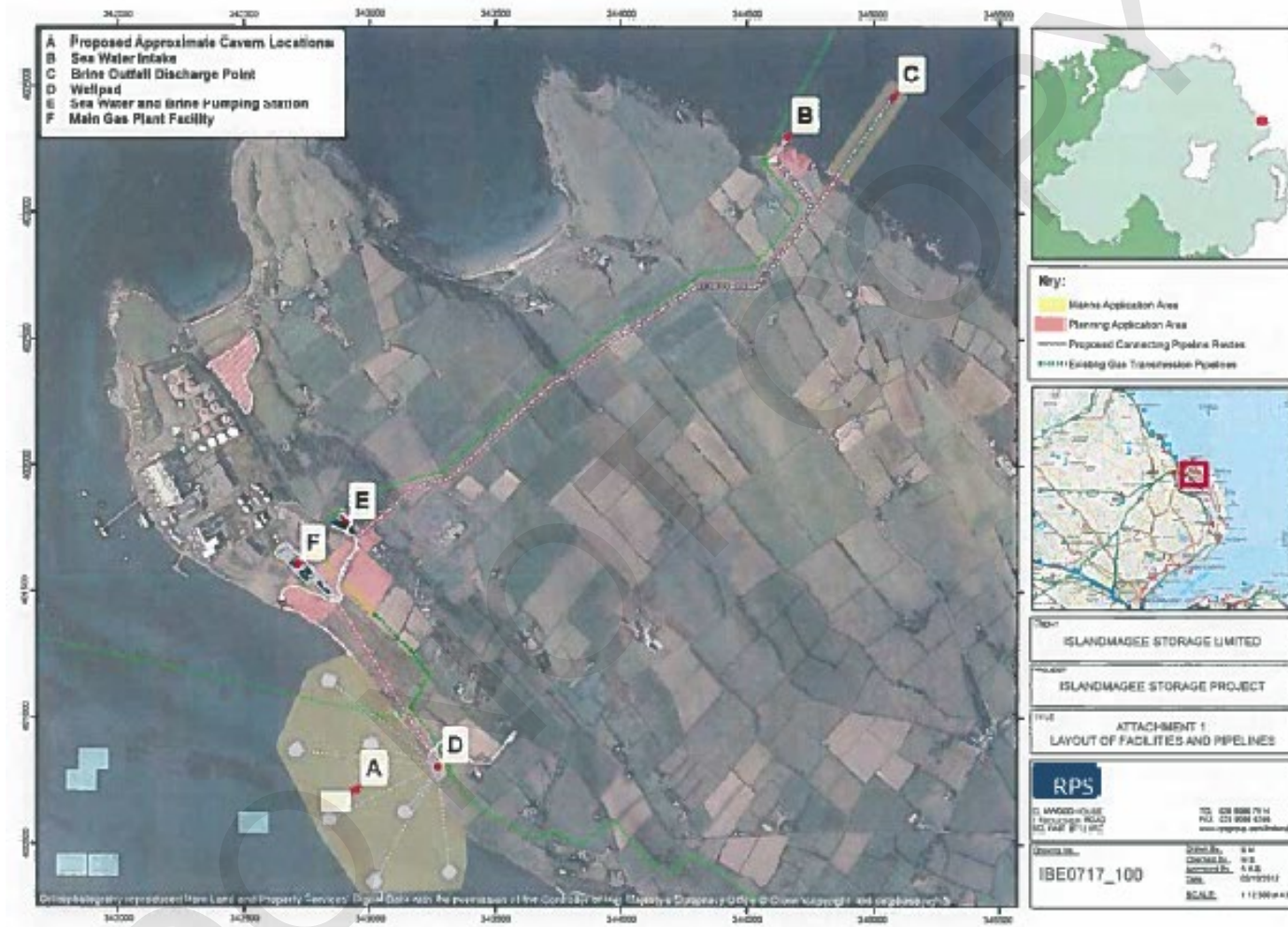
The main threats are considered to be lack of food, entanglement in fishing nets, noise and chemical pollution, hunting, and boat traffic. According to IUCN's (International Union for Conservation of Nature) Red List, the global number for this species is no fewer than 700,000 individuals. Harbour

	<p>porpoises are classified currently as least concern (LC) on the list of threatened species.</p> <p><i>Grey seal:</i></p> <p>The grey seal is amongst the rarest of seals in the world. Present in local waters all year round. When pups are born they have thick, creamy-white fur, called 'lanugo', which moults and is replaced by their adult coat when they are about two to four weeks old (Animalia 2020). September and October are the months when young pups are most likely to be encountered on the Northern Ireland coastline.</p> <p>Grey seals are diurnal animals, being active during the day and sleeping at night. They gather in large groups for mating, pupping and moulting. They do not eat during the breeding period, drawing from their blubber for nutrition. They also gather together in small groups on land to rest. When foraging, however, they dive alone or with a small group. A behaviour that is commonly seen is 'bottling' when the seal is in a vertical position in the water with only its head up above the surface. Grey seals can be quite curious about humans and boats, and will approach vessels and divers. Care must be exercised when observing seals on land as they may be aggressive, particularly during the breeding season. These seals do not migrate but they disperse widely after the mating season.</p> <p>They are also threatened by chemical and oil pollution and often become entangled in fishing nets, which can be fatal. Grey seal numbers are increasing today and it is classified as Least Concern (LC).</p>
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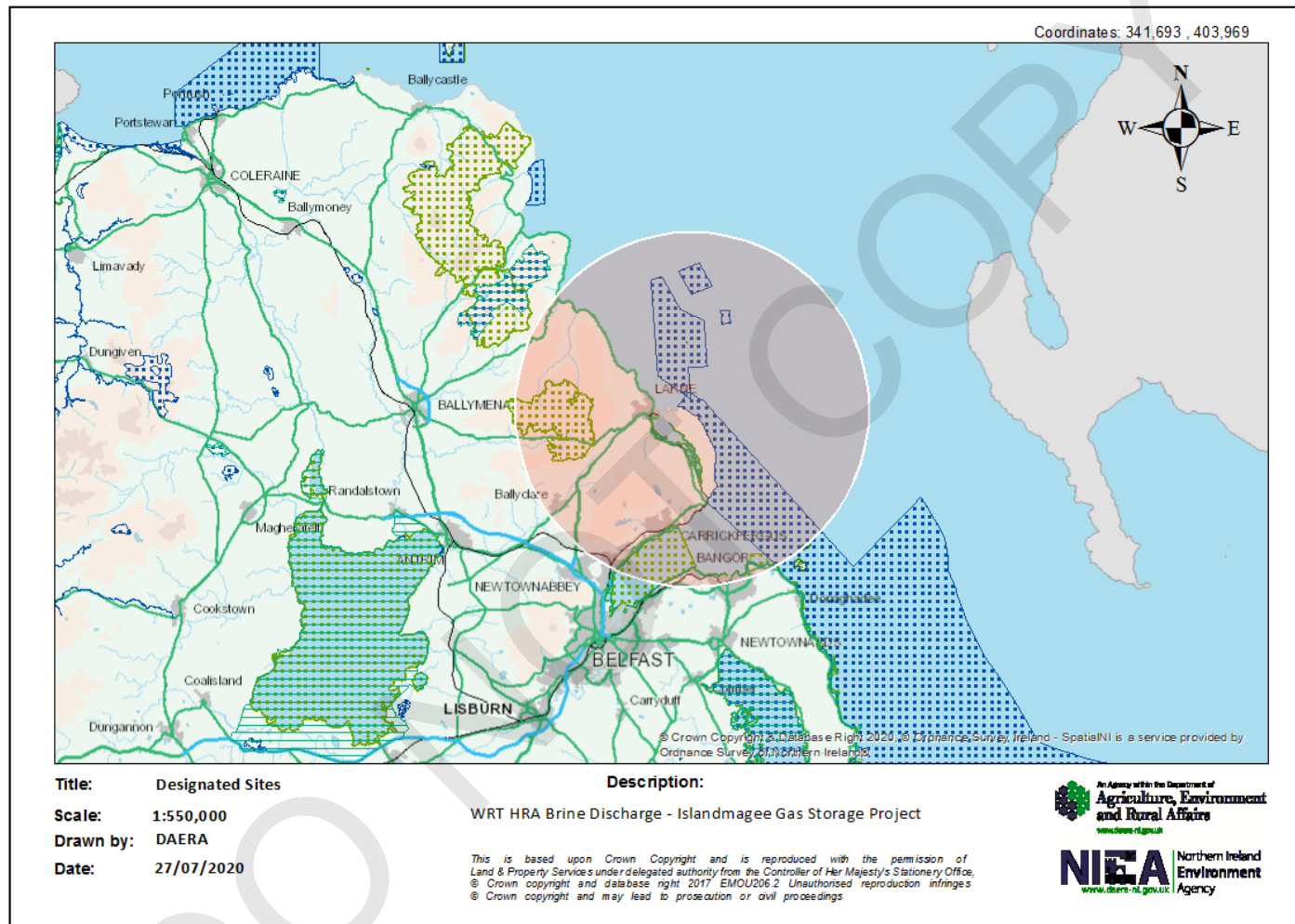
Map 1A: Location map of proposed abstraction and discharge points (Source: RPS)





Map 1B: Location map of proposed caverns, abstraction and discharge points (Source: RPS)





Map 2: Location of UK national site network sites in proximity to proposed discharge and abstraction locations (20km radius circle).

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
Proposed East Coast (NI) Marine SPA [UK9020320]	The site lies within the pSPA boundary	<ul style="list-style-type: none"> <li>- Great Crested Grebe</li> <li>- Red-throated Diver</li> <li>- Sandwich Tern</li> <li>- Common Tern</li> <li>- Arctic Tern</li> <li>- Manx Shearwater</li> <li>- Eider Duck</li> </ul>	<ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species and</li> </ul> <p>To ensure that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>• Population of the species as a viable component of the site</li> <li>• Distribution of the species within site</li> <li>• Distribution and extent of habitats supporting the species</li> <li>• Structure, function and supporting processes of habitats supporting the species</li> </ul>
North Channel SAC [UK0030399]	The site lies within the SAC boundary and the marine construction site is within and adjacent to the SAC.	<ul style="list-style-type: none"> <li>- Harbour porpoise</li> </ul>	<p>To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:</p> <ul style="list-style-type: none"> <li>- 1. The species is a viable component of the site.</li> <li>- 2. There is no significant disturbance of the species.</li> <li>- 3. The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.</li> </ul>

## Habitats Regulation Assessment

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
<p>Larne Lough SPA/Ramsar [UK9020042]</p> <p>(including subsumed Swan Island SPA)</p>	<p>Some marine construction is within the SPA. 39 m W from well pad and 3.2 km from brine outfall discharge point (as the crow flies)</p> <p>5 km from the seawater intake brine outfall discharge point across open water (closest distance near coast)</p>	<ul style="list-style-type: none"> <li>- Sandwich Tern</li> <li>- Roseate Tern</li> <li>- Common Tern</li> <li>- Light-bellied Brent Goose</li> </ul>	<ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species</li> <li>• Fledging success sufficient to maintain or enhance population</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species and</li> </ul> <p>To ensure that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>• Population of the species as a viable component of the site</li> <li>• Distribution of the species within site</li> <li>• Distribution and extent of habitats supporting the species</li> <li>• Structure, function and supporting processes of habitats supporting the species.</li> </ul>
<p>The Maidens SAC [UK0030384]</p>	<p>1.01/1.71 km NE from brine outfall and abstraction locations (as the crow flies) across open water.</p>	<ul style="list-style-type: none"> <li>- Sandbanks which are slightly covered by sea water all the time</li> <li>- Reefs</li> <li>- Grey seal</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain and enhance, as appropriate the extent of the reefs.</li> <li>• Allow the natural processes which determine the development, structure, function and distribution of the habitats associated with the reefs, to operate appropriately.</li> <li>• Maintain the extent and volume of sandbanks which are slightly covered by seawater all the time, subject to natural processes.</li> <li>• Allow the natural processes which determine the development, structure and extent of sandbanks which are slightly covered by sea water all the time, to operate appropriately</li> <li>• Maintain and enhance, as appropriate, the viability, distribution and diversity of typical species within this habitat.</li> <li>• Maintain (and if feasible enhance) population numbers and distribution of Grey Seal.</li> <li>• Maintain and enhance, as appropriate, physical features used by Grey Seals within the site.</li> </ul>

# Habitats Regulation Assessment

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
Belfast Lough SPA [UK9020101]  Belfast Lough Ramsar Site [UK12002]	12.3 km S / 19.3 km S from the abstraction and brine outfall discharge points across open water (as the crow flies)	<ul style="list-style-type: none"> <li>- Redshank</li> <li>- Common Tern</li> <li>- Arctic Tern</li> <li>- Bar-tailed Godwit</li> <li>- Black-tailed Godwit</li> </ul>	<ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species;</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species and</li> <li>• To ensure that the following are maintained in the longterm:                             <ul style="list-style-type: none"> <li>– Population of the species as a viable component of the site</li> <li>– Distribution of the species within site</li> <li>– Distribution and extent of habitats supporting the species</li> <li>– Structure, function and supporting processes of habitats supporting the species</li> </ul> </li> </ul>
Belfast Lough Open Water SPA [UK9020290]	12.5 km S / 19.0 km S from the abstraction and brine outfall discharge points across open water (as the crow flies)	<ul style="list-style-type: none"> <li>- Great Crested Grebe</li> </ul>	<ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species;</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species and</li> <li>• To ensure that the following are maintained in the longterm:                             <ul style="list-style-type: none"> <li>– Population of the species as a viable component of the site</li> <li>– Distribution of the species within site</li> <li>– Distribution and extent of habitats supporting the species</li> <li>– Structure, function and supporting processes of habitats supporting the species</li> </ul> </li> </ul>
Outer Ards SPA [UK9020271]	20.90 km S / 21.18 km S from the abstraction and brine outfall discharge points across open water (as the crow flies)	<ul style="list-style-type: none"> <li>- Arctic tern (<i>Sterna paradisaea</i>) breeding population</li> <li>- Golden Plover</li> <li>- Light-bellied Brent goose</li> <li>- Ringed Plover</li> <li>- Turnstone</li> </ul>	To maintain each feature in favourable condition according to the following feature objectives: <ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species;</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species and</li> <li>• To ensure that the following are maintained in the longterm:                             <ul style="list-style-type: none"> <li>– Population of the species as a viable component of the site</li> <li>– Distribution of the species within site</li> </ul> </li> </ul>

Habitats Regulation Assessment

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
			<ul style="list-style-type: none"> <li>- Distribution and extent of habitats supporting the species</li> <li>- Structure, function and supporting processes of habitats supporting the species</li> </ul>
Strangford Lough SAC [UK0016618]	<p>31.28 km S from the abstraction and brine outfall discharge points (as the crow flies);</p> <p>65km S via open water (closest seal swimming distance near coast)</p>	<ul style="list-style-type: none"> <li>- Coastal lagoons</li> <li>- Large shallow inlets and bays</li> <li>- Annual vegetation of drift lines</li> <li>- Atlantic salt meadows</li> <li>- Mudflats and sandflats not covered by seawater at low tide</li> <li>- Perennial vegetation of stony banks</li> <li>- Common seal</li> <li>- Reefs                             <ul style="list-style-type: none"> <li>- <i>Salicornia</i> and other annuals colonising mud and sand</li> </ul> </li> </ul>	<p>To maintain (or restore where appropriate) the:</p> <ul style="list-style-type: none"> <li>• Large shallow inlet and bay</li> <li>• Coastal lagoons</li> <li>• Mudflats and sandflats not covered by sea water at low tide</li> <li>• Reefs</li> <li>• Annual vegetation of drift lines</li> <li>• Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)</li> <li>• Perennial vegetation of stony banks</li> <li>• <i>Salicornia</i> and other annuals colonising mud and sand</li> <li>• Harbour (Common) Seal <i>Phoca vitulina</i></li> </ul> <p>- To favourable condition.</p>
Strangford Lough SPA [UK9020111]	<p>31.28 km S from the abstraction and brine outfall discharge points (as the crow flies);</p> <p>65km S via open water (closest seal swimming distance near coast)</p>	<ul style="list-style-type: none"> <li>- Sandwich Tern</li> <li>- Common Tern</li> <li>- Arctic Tern</li> <li>- Golden Plover</li> <li>- Bar-tailed Godwit</li> <li>- Light-bellied Brent Goose</li> <li>- Shelduck</li> <li>- Knot</li> <li>- Redshank</li> <li>- Great Crested Grebe</li> <li>- Cormorant</li> <li>- Greylag Goose</li> <li>- Wigeon</li> <li>- Gadwall</li> </ul>	<ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species;</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species and</li> <li>• To ensure that the following are maintained in the longterm:                             <ul style="list-style-type: none"> <li>- Population of the species as a viable component of the site</li> <li>- Distribution of the species within site</li> <li>- Distribution and extent of habitats supporting the species</li> <li>- Structure, function and supporting processes of habitats supporting the species</li> </ul> </li> </ul>

Habitats Regulation Assessment

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
		<ul style="list-style-type: none"> <li>- Teal</li> <li>- Mallard</li> <li>- Pintail</li> <li>- Shoveler</li> <li>- Goldeneye</li> <li>- Red-breasted Merganser</li> <li>- Coot</li> <li>- Oystercatcher</li> <li>- Ringed Plover</li> <li>- Grey Plover</li> <li>- Lapwing</li> <li>- Dunlin</li> <li>- Curlew</li> </ul> Turnstone	
Copeland Island SPA [UK9020291]	31.28 km S (as the crow flies across open water) from the abstraction and brine outfall discharge points.	<ul style="list-style-type: none"> <li>- Arctic tern (<i>Sterna paradisaea</i>) breeding population</li> <li>- Manx Shearwater (<i>Puffinus puffinus</i>) breeding population</li> </ul> <p style="text-align: center;"><i>Non-qualifying species of interest</i></p> <ul style="list-style-type: none"> <li>- Eider (<i>Somateria mollissima</i>) breeding population</li> <li>Common Gull (<i>Larus canus</i>) breeding population</li> </ul>	<p>To maintain each feature in favourable condition according to the following feature objectives:</p> <ul style="list-style-type: none"> <li>• To maintain or enhance the population of the qualifying species;</li> <li>• To maintain or enhance the range of habitats utilised by the qualifying species;</li> <li>• To ensure that the integrity of the site is maintained;</li> <li>• To ensure there is no significant disturbance of the species; and</li> </ul> <p>To ensure that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>• Population of the species as a viable component of the site;</li> <li>• Distribution of the species within site;</li> <li>• Distribution and extent of habitats supporting the species;</li> <li>• Structure, function and supporting processes of habitats supporting the species.</li> </ul> <p>For Manx shearwater component objectives include:</p> <ul style="list-style-type: none"> <li>• To ensure no significant decrease in population against national trends;</li> <li>• To ensure fledging success is sufficient to maintain or enhance the</li> </ul>

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
			<p>population.</p> <p>For Arctic tern component objectives include:</p> <ul style="list-style-type: none"> <li>• To ensure no significant decrease in population against national trends;</li> <li>• To ensure fledging success is sufficient to maintain or enhance the population.</li> </ul> <p>For habitat extent the following component objectives are listed:</p> <ul style="list-style-type: none"> <li>• To maintain or enhance the area of natural or semi-natural habitats used or potentially used by feature bird species, (breeding areas: 201.2ha) subject to natural processes.</li> </ul> <p>Maintain the extent of main habitat components subject to natural processes.</p>
Ailsa Craig SPA [UK9003091]	56.89 km NE (as the crow flies) from the abstraction and brine discharge outfall points.	<ul style="list-style-type: none"> <li>- Gannet (<i>Morus bassanus</i>), breeding population</li> <li>- Guillemot (<i>Uria aalge</i>), breeding population</li> <li>- Herring Gull (<i>Larus argentatus</i>), breeding population</li> <li>- Kittiwake (<i>Rissa tridactyla</i>), breeding population</li> <li>- Lesser black-backed gull (<i>Larus fuscus</i>), breeding population</li> <li>- Seabird assemblage, breeding</li> </ul>	<ul style="list-style-type: none"> <li>• To avoid deterioration of the habitats of the qualifying species (listed left) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and</li> <li>• To ensure for the qualifying species that the following are maintained in the long term: <ul style="list-style-type: none"> <li>– Population of the species as a viable component of the site</li> <li>– Distribution of the species within site</li> <li>– Distribution and extent of habitats supporting the species</li> <li>– Structure, function and supporting processes of habitats supporting the species</li> <li>– No significant disturbance of the species</li> </ul> </li> </ul>

UK National Site Network site	Distance from site	Selection feature	Conservation objectives
Skerries and Causeway SAC [UK0030383]	64.12km NW from the abstraction and brine outfall discharge points (as the crow flies);  70 km NW via open water (closest porpoise swimming distance near coast)	<ul style="list-style-type: none"> <li>- Sandbanks which are slightly covered by sea water all the time</li> <li>- Reefs</li> <li>- Submerged or partially submerged sea caves</li> <li>- Harbour porpoise</li> </ul>	To maintain (or restore where appropriate) the: <ul style="list-style-type: none"> <li>• Reefs</li> <li>• Sandbanks which are slightly covered by sea water all the time, and</li> <li>• Submerged and partially submerged sea caves</li> <li>• Harbour porpoise (<i>Phocoena phocoena</i>) to favourable condition.</li> </ul>
Treshnish Isles SAC [UK0030289]	95 km N from the abstraction and brine outfall discharge points (as the crow flies) across open water	<ul style="list-style-type: none"> <li>- Reefs</li> <li>- Grey seal</li> </ul>	To avoid deterioration of the qualifying habitat (reefs) thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and  To ensure for the qualifying habitat that the following are maintained in the long term: <ul style="list-style-type: none"> <li>• Extent of the habitat on site</li> <li>• Distribution of the habitat within site</li> <li>• Structure and function of the habitat</li> <li>• Processes supporting the habitat</li> <li>• Distribution of typical species of the habitat</li> <li>• Viability of typical species as components of the habitat</li> <li>• No significant disturbance of typical species of the habitat</li> </ul> To avoid deterioration of the habitats of the qualifying species (grey seal) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and



UK National Site Network site	Distance from site	Selection feature	Conservation objectives
			<p>To ensure for the qualifying species that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>• Population of the species as a viable component of the site</li> <li>• Distribution of the species within site</li> <li>• Distribution and extent of habitats supporting the species</li> <li>• Structure, function and supporting processes of habitats supporting the species</li> </ul> <p>No significant disturbance of the species</p>
<p>Inner Hebrides and the Minches SAC [UK0030393]</p>	<p>100km from the abstraction and brine outfall discharge points (as the crow flies).</p>	<p>- Harbour porpoise</p>	<ol style="list-style-type: none"> <li>1. To ensure that the Inner Hebrides and the Minches SAC continues to make an appropriate contribution to harbour porpoise remaining at favourable conservation status.</li> <li>2. To ensure for harbour porpoise within the context of environmental changes, that the integrity of the Inner Hebrides and the Minches SAC is maintained through 2a, 2b and 2c: <ul style="list-style-type: none"> <li>- (2a) Harbour porpoise within the Inner Hebrides and the Minches are not at significant risk from injury or killing.</li> <li>- (2b) The distribution of harbour porpoise throughout the site is maintained by avoiding significant disturbance.</li> <li>- (2c) The condition of supporting habitats and the availability of prey for harbour porpoise are maintained.</li> </ul> </li> </ol>
<p>North Anglesey Marine SAC [UK0030398]</p>	<p>115km from the abstraction and brine outfall discharge points (as the crow flies)</p>	<p>- Harbour porpoise</p>	<p>To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters</p> <p>In the context of natural change, this will be achieved by ensuring that:</p> <ul style="list-style-type: none"> <li>• Harbour porpoise is a viable component of the site;</li> <li>• There is no significant disturbance of the species; and</li> </ul> <p>The condition of supporting habitats and processes, and the availability of prey is maintained.</p>

**Table 2: UK National Site Network sites and their conservation objectives (amber-cell sites screened in, green-cell sites screened out)**

<b>Species Name</b>	<b>Scientific Name</b>	<b>UK Conservation Status Article 17 Jan 2013 – Dec 2018</b>
Harbour Porpoise	<i>Phocoena phocoena</i>	<b>Unknown</b> due to lack of trend data for SACs and wider UK population
Grey Seal	<i>Halichoerus grypus</i>	<b>Favourable</b>

**Table 3: Qualifying interests (Marine Mammals and Cetaceans) and current conservation status as reported against Article 17 (Source: JNCC).**

<b>Species Name</b>	<b>Scientific Name</b>	<b>UK Trend – Article 12 UK 2019 Report</b>	<b>BoCC 4 UK 2015</b>	<b>BoCC Ireland 2020-2026</b>
Great Crested Grebe	<i>Podiceps cristatus</i>	Decreasing (-17.4%) 2005-2016	<b>Wintering</b>	<b>Breeding &amp; Wintering</b>
Red-throated Diver	<i>Gavia stellata</i>	Decreasing (-27%) 2005-2016	<b>Wintering</b>	<b>Breeding &amp; Wintering</b>
Sandwich Tern	<i>Sterna sandvicensis</i>	Increasing (+12%) <sup>1</sup>	<b>Breeding</b>	<b>Breeding</b>
Common Tern	<i>Sterna hirundo</i>	Decreasing (-7%) 2004-2015	<b>Breeding</b>	<b>Breeding</b>
Roseate Tern	<i>Sterna dougallii</i>	Increasing (+11%) 2001-2016	<b>Breeding</b>	<b>Breeding</b>
Arctic Tern	<i>Sterna paradisaea</i>	Increasing (+52%) 2004-2015	<b>Breeding</b>	<b>Breeding</b>
Manx Shearwater	<i>Puffinus puffinus</i>	Unknown	<b>Breeding</b>	<b>Breeding</b>
Common Eider	<i>Somateria mollissima</i>	Decreasing (-18%) 2005-2016 (Breeding +17%)	<b>Wintering</b>	<b>Breeding &amp; Wintering</b>
Light-bellied Brent Goose*	<i>Branta bernicla hrota</i>	Increasing (+30%) <sup>2</sup>	<b>Wintering</b>	<b>Wintering</b>

**Table 4: Qualifying interests (Birds) and current Birds of Conservation Concern (BoCC) in UK and Ireland - Species are assessed against objective criteria to be placed on Green, Amber or Red lists – indicating an increasing level of conservation concern**

\*Canadian population

<sup>1</sup> Not listed in Article 12 Report. Data from Seabird Monitoring Programme (JNCC (2020). Seabird Population Trends and Causes of Change: 1986–2018 Report (<https://jncc.gov.uk/our-work/smp-report-1986-2018>). Joint Nature Conservation Committee, Peterborough. Updated 10 March 2020

<sup>2</sup> Not listed in Article 12 Report. Data from Wetland Bird Survey (Frost, T.M., Austin, G.E., Calbrade, N.A., Mellan, H.J., Hearn, R.D., Stroud, D.A., Wotton, S.R. & Balmer, D.E. (2018). *Waterbirds in the UK 2016/17: The Wetland Bird Survey*. BTO, RSPB and JNCC, in association with WWT. British Trust for Ornithology, Thetford. 40 pp.)

**Stage 1(b): Assessing likely significant effects**

Is the permission or plan/project directly connected with or necessary to the management of the site for nature conservation?

<p><b>Assessing likely significant effect- brine discharge, abstraction and marine construction 'alone'.</b></p> <p>The next stage of the test is to assess the likely significant effect of the applications on all sites progressed for further assessment. Three important steps are considered here.</p>	
<p><b>Step 1:</b> <b>Are there any hazards?<sup>1</sup></b></p>	<p><b>Hazards for each feature will be determined for the Construction phase, Leaching phase, Operational phase and Decommissioning Phase:</b></p> <p><b>Hazards during Construction phase include:</b></p> <p><b>Collision Risk</b></p> <ul style="list-style-type: none"> <li>• The potential impacts for birds and marine mammals from marine construction are collision risk from physical structures and vessels.</li> </ul> <p><b>Habitat loss</b></p> <ul style="list-style-type: none"> <li>• Seabed will be disturbed during construction and covered by structures.</li> </ul> <p><b>Sediment plumes</b></p> <ul style="list-style-type: none"> <li>• Seabed disturbance can result in increased turbidity and creation of sediment plumes and may reduce foraging in mobile species.</li> </ul> <p><b>Noise/Disturbance</b></p> <ul style="list-style-type: none"> <li>• During construction of infrastructure there may non-impulsive noise during drilling and from vessel traffic. This may cause temporary displacement from foraging areas and potential barrier effect for marine mammal transit.</li> </ul> <p><b>Liquid effluent and spillages</b></p> <ul style="list-style-type: none"> <li>• Sediment laden run-off. Fuel and oils. Waste, including oil coated drill cuttings.</li> </ul> <p><b>Hazards during leaching phase include:</b></p> <p><b>Collision risk</b></p> <ul style="list-style-type: none"> <li>• Marker buoys (navigation and/or monitoring)</li> <li>• Fixed structures</li> <li>• Monitoring Vessels</li> </ul> <p><b>Noise/Disturbance</b></p>

<sup>1</sup> Step 1: Is there a potential hazard or mechanism by which the granting of authorisation could affect the interest features of the site either directly or indirectly, alone and/or in combination? Are the interest features sensitive to this hazard?

- Loss of feeding opportunities and barrier effects.

#### **Seawater abstraction**

- Potential impacts from the **water abstraction** include sea life becoming entrained on the intake structures or being injured by screens, plankton and prey species being entrained in the abstracted water and the creation of localised sediment plumes and currents. This in turn may affect the pSPA and SAC feature species by limiting the foraging resource availability. The discharge and abstraction will only be necessary during the solution mining phase of the development and will cease after the caverns are formed. Additional noise may be generated by the physical disturbance of the water column due to abstraction activities.

#### **Brine discharge**

- **Brine effluent** is to be discharged into the North Channel off the coast of Islandmagee for a period of up to 10 years. The brine outfall diffusers will be located in a depth of 27m, approximately 450m offshore. The diffuser arrangement consists of two diffuser ports and pipe sections over 40m in length. The brine will increase the salinity levels of the receiving coastal environment. This is likely to impact the immediate area around the discharge point, on the sea bed and within the water column. The brine plume may also travel along the coast under the influence of the tidal regime and sea state. Additional noise may be generated by the physical disturbance of the water column due to discharge activities.

#### **Habitat loss**

- There will be some habitat loss due to the discharge of the Brine effluent, this is due to the hypersaline discharge. Effects could occur on the seabed and within the water column.

#### **Hazards during operational phase include:**

##### **Noise/disturbance**

- During the gas operations phase the main noise-emitting sources will be limited to the compressors within the main gas plant site. These will be housed within a building designed to meet noise standards which will not disturb sleep.

#### **Hazards during decommissioning phase:**

##### **Brine discharge & Escape of flammable and/or environmentally hazardous storage product**

Imperfect cavern sealing and abandonment could potentially lead to discharges and escapes of products that could have an impact on Larne Lough SPA/Ramsar. There

	could also be disturbance due to vessel and machinery use during decommissioning operations.
<b>Step 2: Exposure to hazard.<sup>2</sup></b>	<p><b>Exposure to hazards for each feature are discussed below for the Construction phase, Leaching Phase, Operational phase and Decommissioning phase:</b></p> <p><b>Exposure to Hazards during Construction Phase:</b></p> <p><b>Collision risk</b></p> <p><u>Collision exposure to flying birds</u></p> <p>The use of tall machinery and plant in association with the construction phase of the proposed development, including a drill rig and cranes, in addition to the installation of a permanent 40m high vent stack have potential to result in significant effects upon wintering and breeding bird populations associated with these sites.</p> <p>The use of a drill rig and cranes will be temporary, lasting for a period of 36 months. The proposed works which will be undertaken within Larne Lough near to the shore adjacent to the existing power station and is backed by relatively steeply sloping ground. The majority of the seabirds and waterfowl associated with the designated sites will favour flights over open water or inter-tidal zones. Manx Shearwater are expected to remain largely offshore in the North Channel. However it is acknowledged that there remains potential for collision associated with some qualifying species during the construction phase.</p> <p>Unlike the drill rig and cranes, the installation of a 40m vent stack has potential to increase the risk of bird collisions on a permanent basis.</p> <p>While in general it is considered that the risk of a LSE arising as a result of collisions associated with the proposed development is low, qualifying bird features are exposed to the hazard from:</p> <ul style="list-style-type: none"> <li>• East Coast (NI) Marine pSPA</li> <li>• Larne Lough SPA/Ramsar</li> </ul> <p><u>Collision exposure to marine mammals</u></p> <p>Potential collisions risk between support vessels and harbour porpoise and/or grey seal are possible, during the construction phase, given their known presence in the area and the nature of the proposals. There is a risk of collision for:</p> <ul style="list-style-type: none"> <li>• Grey Seal from The Maidens SAC</li> <li>• Harbour Porpoise from the North Channel SAC</li> </ul>

<sup>2</sup> Step 2: Is each potential hazard likely to affect the interest features of the site alone/and/or in combination? What is the exposure of the feature to the Hazard?

**Habitat loss - Construction**

The seabed in this area consists of coarser gravels and sands, and this is reflected in the fauna identified in the area. The dominant fauna present in this group include the barnacle *Balanus creanatus* which encrusts on pebbles and larger substrate components, polychaetes *Sabellaria spinulosa*, *Lepidonotus squamatus* and *Lumbrineris aniara* agg., the mollusc *Modiolula phaseolina*, the sipunculid *Nephasoma (Nephasoma) minutum*, and the tunicates *Dendrodoa grossularia* and *Asciacea* spp. Also present in the group are the echinoderms *Amphipholis squamata*.

The conservation objectives of the North Channel SAC state that the supporting habitats and processes relevant to harbour porpoises and their prey are to be maintained.

The brine discharge may cause physico-chemical changes in the water column which could cause habitat loss for water dwelling species and plankton.

Abstraction point

The seawater in-take head will be located in approximately 10m water depth. A 450mm High-Density Polyethylene (HDPE) pipeline will be installed from the intake head to the onshore sump by way of a tunnel and shaft. The 450mm pipeline will be installed through the tunnel following tunnel completion. The shaft will act as a sump and water will be abstracted and pumped across the island from the pump house located at the shaft location.

The principle construction operations within the sublittoral zone (The North Channel SAC and East Coast (NI) Marine proposed Special Protection Area SPA) are as follows:

- a. Reception pit excavation – excavation in seabed prior to backfilling with granular material to allow the tunnelling machine to be advanced into and later recovered.
- b. Tunnel Construction by pipe jacking
- c. Tunnelling machine recovery
- d. Intake head connection
- e. Demobilisation and reinstatement

A 3m x 3m x 2m foundation will be positioned within the seabed. The foundation will be set into a pre-excavated hole within sedimentary seabed deposits such that the top of the foundation will be exposed at existing seabed level. Reception pit excavation works are also required to expose the end of the micro-tunnel for the intake. Once the micro-tunnel end is exposed, and the foundation installed in the seabed, the flanged ends of both pipes can be surveyed to establish position, orientation, and arrangement prior to fabricating tie-in spool. Once the fabricated tie-in spool is diver installed the Intake head foundation and tie-in spool can be back-filled. Anti-scour gabions will be installed above foundation on the seabed. To provide protection to the Intake head connection flange and to minimise the likelihood of seabed disturbance during storm events, rock rip-rap protection is proposed for the seabed immediately adjacent to the intake head up to 2.5m beyond

the intake screens. The intake head feature is 1.5m wide and sits approximately 3.5m above the seabed. A value of 33m<sup>2</sup> is used to assess habitat loss due to the abstraction structure.

#### Brine outfall

The principle construction phase will be within the sublittoral zone and involve:

- Pilot hole drilling
- Reaming / hole opening
- Pipeline installation
- Demobilisation and Reinstatement

To provide protection to the brine outfall diffuser structure, the outfall pipe will be overlaid with concrete block mattresses complete with profiled edge blocks to enhance edge lift stability and provide inherent protection against over-trawling/snagging. Mattresses will be laid double height immediately adjacent to the diffuser heads to provide protection against over trawling/snagging. The concrete mattresses are 3m wide and span approximately 40m along the brine diffuser pipe. The approximate total footprint of the brine outfall pipe and associated concrete protection mattresses is 120m<sup>2</sup> of seabed habitat (based on 40m of pipe x 3m wide concrete mattress).

The permanent loss of approximately 153m<sup>2</sup> (120+33) of benthic habitat will be within the northern extent of the North Channel SAC and East Coast (NI) Marine pSPA (based on brine outfall pipe and seawater intake construction dimensions). Neither site is designated for the presence of Annex I habitat features.

The loss of habitat could result in reduced feeding opportunities for:-

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar
- Grey Seal from The Maidens SAC & Harbour Porpoise from the North Channel SAC

#### **Sediment plumes**

Seabed disturbance can result in increased turbidity and creation of sediment plumes (Todd *et al* 2014). Sediment plumes have the ability to extend the impact of excavation over larger areas that would otherwise remain unaffected physically (Hitchcock and Bell, 2004). Research impacts of suspended solids on marine mammals has shown that effects are short lived generally, lasting a maximum of four to five tidal cycles (Hitchcock and Bell, 2004), and are confined mainly to an area of a few hundred metres from the point of discharge (Newell *et al.*,1998; Hitchcock and Bell, 2004).

Any silt plume associated with the creation of the reception pit is expected to have a temporary but a localised impact on the foraging behaviour of the Harbour Porpoises and Grey Seal due to the reduced visibility in the vicinity of the reception pit. It should be noted that the noise created during the creation of the reception pit in the surrounding water would be likely to induce avoidance behaviour in individuals of this species prior to individuals encountering the discharge plume



itself. Similarly feeding birds may have reduced opportunity to detect prey in a sediment plume.

The presence of sediment plumes could result in reduced feeding opportunities for:

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar
- Grey Seal from The Maidens SAC & Harbour Porpoise from the North Channel SAC

### **Noise/disturbance**

The underwater noise impacts arising in the construction of the seawater intake and the brine outfall will be associated with seabed and sub-sea construction which generate non-impulsive noise. No blasting or pile driving (activities which give rise to impulsive noise) are planned.

The main source of noise during the construction phase will come from the construction of the seawater intake and the brine outfall pipes on the seabed. The construction of these assets requires the use of heavy machinery. Tunnelling, excavation and directional drilling on/below the seabed will represent worst-case noise events during construction. Any other construction activities will be of short duration (see details below) and have a lower impact in terms of underwater noise.

The construction of the seawater intake and brine outfall pipes will be undertaken over an estimated 6 month period. The nature of the construction activities (i.e. tunnelling, excavation and directional drilling on/below the seabed) indicates that the type of noise generated will be non-impulsive noise. The noise will be confined to a geographically-small area i.e. the immediate vicinity of the construction activities. The propagation of construction noise in the water was estimated using a noise model, the results of which were used to estimate the likelihood of significant effects on nearby marine mammals. Drilling and tunnelling are only part of the construction activity associated with the intake and outfall and will operate at full noise output for less than half of the overall construction time (3 months).

Tunnel boring machines with rotating cutter heads produces low frequency sounds (below 1000 Hz). Maximum energy tends to occur around 10 Hz with diminishing energy at increasing frequencies (Richardson et al., 1995). Underwater noise from the micro tunnel boring machine will be located below the seabed and not contribute significantly to underwater noise levels. RPS has data from a 600mm HDD project which when scaled up to 1.5m indicates a peak level of 130 dB re 1  $\mu$ Pa and 111 dB re 1  $\mu$ Pa<sub>2s</sub> SEL at the seabed, which is in the range of background noise levels and lower than noise levels from the ferries entering and leaving Larne.

Table 5 outlines the various construction tasks associated with potential underwater noise effects. The worst-case underwater noise emission will be when the reception pit is being excavated. There is limited data on underwater noise from mechanical excavating operations. Reine *et al* (2014) provide a source level for rock excavation at 164.2 to 179.4 dB re 1  $\mu$ Pa @ 1m. For the purpose of the seawater intake we have



used the higher of these levels in the RPS noise model. The excavation of the pit and recovery of the tunnel boring machine are estimated to take 18 days and worst-case noise levels will be limited to a fraction of this time.

The following marine mammal features are exposed to this hazard:

- Grey Seal from The Maidens SAC
- Harbour Porpoise from the North Channel SAC

In addition to underwater noise there will be aerial noise associated with vehicles, drilling and pipe laying etc. Noise prediction modelling has shown that Environmental Health noise limits will not be exceeded. Nevertheless, features could be exposed to aerial noise namely:

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar

Construction Activity	Extent/Duration	RMS Noise Levels dB re: 1µPa @ 1m (unweighted)
Construction of gas storage caverns (pumps based on land)	7 caverns over a period of 4 years	No significant noise
Construction of seawater intake (Micro-tunnel boring and excavation)	6 months	179 (excavator ripping rock)
Construction of brine outfall (Horizontal Directional Drilling)	6 months	120 (HDD at seabed)
Operation phase (small vessel traffic for site inspections and sampling)	Ongoing occasional	150-155

**Table 5 Construction Tasks with Potential Underwater Noise Impacts**

**Liquid effluent and spillages**

The most direct threat to nearby designated sites would be from spillages of oils and run-offs containing silts and other contaminants. The qualifying features of:

- All five local designated sites could be exposed to these hazards.

**Exposure to Hazards during Leaching Phase:**

**Collision risk**

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar

The installation of a 40m vent stack has potential to increase the risk of bird collisions on a permanent basis.

While in general it is considered that the risk of a LSE arising as a result of collisions associated with the proposed development is low, qualifying bird features are exposed to the hazard from:

- East Coast (NI) Marine pSPA
- Larne Lough SPA/Ramsar

Potential collisions between support vessels and marine mammals are a possible risk during the leaching phase, given their known presence in the area and the nature of the proposals. Moored markers buoys used for navigation or monitoring also present a potential risk for marine mammals. Marine mammal features exposed to collision risk are:

- Grey Seal from The Maidens SAC & Harbour Porpoise from the North Channel SAC

### **Noise/disturbance**

There will be relatively little noise during the cavern excavation phase. Aerial noise will be associated with vehicles and the pumping of sea water. However noise prediction modelling has shown that Environmental Health noise limits will not be exceeded. Underwater noise will arise from service vessels and possibly from seawater pumping.

Features that could be exposed to aerial noise are:

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar

Features that could be exposed to underwater noise are:

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar
- Grey Seal from The Maidens SAC
- Harbour Porpoise from The North Channel SAC

### **Seawater abstraction**

Fish and other marine life, including plankton, will perish if it is swept in with the abstracted seawater. Seawater is to be abstracted from coastal waters within the North Channel SAC and East Coast (NI) Marine pSPA during the leaching phase and will last up to 6 years. The proposed maximum quantity of water to be abstracted is 24,000 m<sup>3</sup>/day (1,000 m<sup>3</sup>/hour). Seawater abstraction will cease after caverns are formed. Abstraction is not required beyond the cavern leaching phase for this authorisation. Any additional abstraction to fill the caverns as part of maintenance and decommissioning will require a new abstraction licence application.

Features that could be exposed to the effects of seawater abstraction are:

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar
- Grey Seal from The Maidens SAC
- Harbour Porpoise from the North Channel SAC

**Brine discharge**

Baseline salinity within the datasets has been observed to fluctuate from 30.5psu to 34.8psu. Calculation of 1 standard deviation across the dataset shows a typical salinity range between 33.9 and 34.5psu and temperature between 8.4 and 12.9°C. For the purposes of the dispersion model, the following background criteria were therefore used: Background Salinity 34.2 PSU and Background Temperature 11.3°C. The predicted reduction in both diversity and biomass of a wide range of marine invertebrates within the brine discharge mixing zone, where maximum salinity is predicted by the dispersion model to exceed 40psu, is considered severe and therefore significant. While the same trends will be evident in the mixing zone where predicted maximum salinity will range from 38-40psu, because the severity of the impact will be much lower, the significance will be minor to moderate. In the modelled maximum salinity zone of 36-38, these same trends will barely be discernible and so the significance of the impact here is considered minor to negligible. In the near background zone, i.e. 34.5-36psu, the impact is expected not to be detectable and therefore of negligible significance.

There is a probability that the hazard (brine discharge) may undermine the conservation objectives of the five local sites:

- **Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar:**

Birds feed on small fish, crustaceans, molluscs, nematodes, and oligochaeta. Many of these are likely to be impacted by the discharge of brine at the outfall location due to potential habitat loss and plume dispersion effects in the surrounding area. In addition, prey availability may be impacted by the seawater abstraction. The birds may be subsequently impacted by changes in the food chain in this locality.

- **Grey Seal from The Maidens SAC & Harbour Porpoise from the North Channel SAC**

Grey seal and the Harbour porpoise are both mobile species. However, it is possible that both these species may be exposed to the potential impacts of the brine discharge, again through food-chain effects. Seals and cetaceans could swim directly through the brine discharge plume and/or could be deterred by its presence and have to swim round it; the significance of the brine discharge in both scenarios should be assessed.

**Exposure to Hazards during Operational Phase:**

**Noise/disturbance**

During the gas operations phase the main noise-emitting sources will be limited to the compressors within the main gas plant site. These will be housed within a building designed to meet noise standards which will not disturb sleep. Given the distance between the site of the proposed development and the breeding locations of the feature bird species of the designated sites (1.25km at the closest point)

	<p>disturbance of breeding seabirds is not expected to be caused by the proposed development.</p> <p>As documented in reports associated with the proposed development recorded data have shown that the shorelines adjacent to the site are not utilised by significant numbers of wintering waterfowl including Light-bellied Brent geese. It is considered therefore that populations of wintering birds, including Brent goose are unlikely to be subject to significant levels of disturbance associated with the operational phase of the proposed development.</p> <p>Similarly marine mammals are unlikely to be disturbed.</p> <p><b>Exposure to hazards during decommissioning phase:</b></p> <p><b>Brine discharge &amp; Escape of flammable and/or environmentally hazardous storage product</b></p> <p>Internationally accepted procedures for cavern abandonment exist. These should be adapted for the caverns that will be created by this project. Exposure of the bird features of Larne Lough to these hazards is unlikely.</p>
<p><b>Step 3: Significance Hazard.<sup>3</sup></b></p>	<p>An important element of any risk assessment is to determine the significance of any impacts. This may be determined by the scale of the impact, the severity of the impact, the likelihood of occurrence, the sensitivity of the receiving environment, and the extent to which any impacts are reversible or manageable.</p> <p>This stage of the assessment involves looking at each of the designated sites that have been highlighted previously and determining if likely effects are considered significant. Sites will either be ‘screened in’ or ‘screened out’ from further assessment.</p> <p><b>The significance of the hazards for each feature are discussed below for the Construction phase, Leaching Phase, Operational phase and Decommissioning phase:</b></p> <p><b>Significance of Hazards during Construction Phase:</b></p> <p><b>Collision Risk</b></p> <p>In the context of this project, the temporary structures which will be present during construction and the permanent vent stack are of moderate height and low reflectivity and their profile is relatively narrow. These features will reduce the likelihood of collision. Other factors further ameliorating the risk include the behaviour and distribution of the selection feature species. Breeding terns will commute through the development area between nest sites and foraging areas. Foraging is almost entirely diurnal, however, and terns are extremely agile in flight. A high risk of collision would therefore not be expected for these species. While migration by terns can involve some nocturnal flight, large-scale arrivals and</p>

<sup>3</sup> Step 3: For each hazard is the potential scale or magnitude of any effect likely to be significant?

departures at night appear unlikely. Light-bellied Brent Geese will forage at night but, as all significant feeding areas are within the southern half of Larne Lough any movements between these would not involve transit through the project area. While there may be some potential risk to Brent Geese of collision during nocturnal migratory flights, recent research suggests that related species have the ability to detect tall structures at distance and take avoiding action even at night (e.g. Plonczkier & Simms 2012).

Flying birds from East Coast (NI) Marine pSPA and Larne Lough SPA/Ramsar are unlikely to collide with either the temporary or permanent structures associated with this project

Potential collisions between support vessels/infrastructure and marine mammals are a possible risk during the operational phase but should be less than for construction and leaching phases. Marine mammal features exposed to collision risk and that should be further assessed are:

- Grey Seal from The Maidens SAC & Harbour Porpoise from the North Channel SAC

#### **Habitat loss - Construction**

##### *North Channel SAC*

Harbour porpoise are known to forage off Islandmagee, however the species are highly mobile with a wide foraging range and an ability to feed on a range of prey sources as such it is considered unlikely that the area (153m<sup>2</sup>) of benthic habitat to be lost (approximately 0.00001% of the SAC) as a result of the proposed development is of significant value for foraging individuals of the species, in the context of the available habitat in the wider area. As such, the area of seabed to be removed to accommodate the construction footprint of the proposed development within this UK National Site Network site is negligible. However, in order to take a precautionary approach, the impact of this project has been assessed with regard to the portion of the SAC which has water depths between 5m and 50m. These depths are known to be favoured by Harbour Porpoises and would represent the depths at which they would often dive to feed at the seabed. Although they can live in deeper waters they would be less likely to dive to the bottom. This represents around a quarter of the site and is in the order of 400km<sup>2</sup> in area (0.00004% of SAC). The potential loss of habitat needs to be assessed fully so it is best to consider that **there could be a likely significant effect from the development for Harbour Porpoise within the North Channel SAC.**

##### *Proposed East Coast Marine SPA and Larne Lough SPA/Ramsar*

The proposed East Coast (NI) Marine SPA is designated for its populations of seabirds and water birds. These bird species are not known to significantly rely on benthic habitat for foraging, and instead largely feed on fish species which are present within the water column and are not therefore reliant on an uninterrupted expanse of seafloor habitat within their wintering range or breeding territories.

It is also noted that the proposed SPA is to cover an area of some 96,668 ha and within the context of this large area, seabed losses (153m<sup>2</sup>/0.000016% of the SPA) associated with the proposals are deemed unlikely to be significant in light of the conservation objectives for the site as all qualifying species are highly mobile, in the case of wintering bird populations and foraging breeding birds. In terms of breeding birds, all nesting habitat comprise terrestrial habitat on islands within the pSPA and the area around the discharge pipe is not a favoured area for feeding.

The area of seabed which will be removed to accommodate the construction footprint of the proposed development within these UK National Site Network sites (approximately 0.000016% of pSPA) is very small but **the permanent loss of 153m<sup>2</sup> of benthic habitat is best considered to be likely to have significant effects and consider further in the Appropriate Assessment.**

**Larne Lough SPA/Ramsar could similarly be impacted by a significant effect** due to habitat loss from this proposed development as it shares species features with East Coast (NI) Marine pSPA.

#### *The Maidens SAC*

None of The Maidens SAC habitat will be adversely affected by the proposal. Grey Seals have large foraging ranges with 100km often used as a working value for assessments. The area of habitat loss for feeding Grey Seals will be extremely small relative to that available within their foraging range. **The permanent loss of 153m<sup>2</sup> of benthic habitat will not result in likely significant effects on the Grey Seal feature.** The impacts on another fish eating marine mammal, the Harbour Porpoise, is assessed within the Appropriate Assessment.

#### **Sediment plumes**

Porpoises feed mainly on small shoaling fish, such as herring, but may also feed upon prey taken at or close to the seabed. As Harbour Porpoises use a series of high frequency clicks for echo-location during navigation and hunting, they are less susceptible to the impacts of suspended sediment plumes during foraging and are routinely found in inshore areas of high natural turbidity (e.g. southern North Sea, Liverpool Bay in the Irish Sea).

Grey Seals have large foraging areas and live in similarly turbid waters as Harbour Porpoises in the North Sea.

The location of the brine discharge diffusers is not an area particularly favoured by the feature bird species of the local SPAs. Brent Geese will be on the inter-tidal coast, Manx Shearwaters will tend to be further offshore and tern species will feed by plunge diving into the surface waters well above the discharge point. Deeper diving birds such as Red-throated Diver, Great Crested Grebe and Common Eider could potentially be temporarily effected but numbers present will be very small and any

periods of turbidity will be so limited in spatial extent and duration that it is unlikely to cause a significant effect.

Construction of the offshore section of the outfall pipe at Islandmagee could be a potential cause of raised suspended solids but it is proposed that this section be constructed by Horizontal Directional Drilling (HDD) as opposed to open trenching. As such, the only source of suspended solids will be at the point where the drilling equipment breaks through the seabed. This will result in a temporary localised suspension of drilling mud and cuttings into the water column. The cuttings will settle out within a few metres of the breakout while the finer particles in the lubricant drilling mud (bentonite) will be dispersed rapidly and widely by the tidal currents eventually settling out. It is not anticipated that this discharge will present any perceptible increase in turbidity beyond the discharge period of 3 hours and confined to the immediate area around the break out point. There will therefore be no resultant impact on fisheries interests in the area due to the release of suspended solids nor on marine mammals.

The level of suspended solids in the brine discharge is expected to be low.

**It is considered that temporary increase in suspended sediments from construction/drilling activities will not cause any likely significant effects upon the feature species of the North Channel SAC (Harbour Porpoise), The Maidens SAC (Grey Seal) or of the East Coast (NI) Marine pSPA and Larne Lough SPA/Ramsar (birds).**

**Noise/disturbance**

Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar  
 Grey Seal from The Maidens SAC  
 Harbour Porpoise from the North Channel SAC

Birds will mainly experience aerial noise and will largely not be subjected the noise from drilling. They are unlikely to experience noises that will impact their hearing in the way that marine mammals could. There is potential for minor disturbance and displacement.

In terms of the potential effects of construction noise, the magnitude of the effect and the sensitivity of the receptors determines the overall impact. Table 6 summarises the sensitivities of marine mammal species with regard to noise thresholds. A permanent threshold shift (PTS) occurs when a permanent auditory injury results in loss of hearing. PTS can result in very significant to profound negative impacts on marine species. A temporary threshold shift (TTS) describes a temporary but recoverable loss of hearing due to exposure to high energy sounds for a short duration or lower energy sounds for a longer duration. The impact of TTS is significant but recoverable. Determining the likelihood of noise sensitive species being exposed to such noise levels helps to categorise the significance of effects on each species. The international guidance on underwater noise threshold levels for



marine mammals is published in Southall *et al* (2019) and provides (inter alia) the following thresholds:

Marine mammal hearing group	TTS onset: SEL (weighted) dB re 1 µPa2s	PTS onset: SEL (weighted) dB re 1 µPa2s
Low Frequency Cetaceans (baleen whales)	179	199
High Frequency Cetaceans (most dolphin species)	178	198
Very High Frequency Cetaceans (Harbour Porpoise)	153	173
Phocid Carnivores (seal species)	181	201
Other Carnivores (otters)	199	219

**Table 6 TTS- and PTS-onset thresholds for marine mammals exposed to non-impulsive noise**

**Marine Mammal Auditory Injury**

Drilling is considered a continuous, non-impulsive noise source and according to NMFS (2018) the onset of auditory injury in marine mammals, defined as a Permanent Threshold Shift (PTS) occurs at different received noise levels, dependent on the hearing ability of the marine mammals.

As shown in Table 6 (above) in the worst-case scenario, the underwater noise generated during the construction of the seawater intake does not have the potential to exceed the PTS or TTS threshold limit for grey seals (see Table 6), and therefore it is not anticipated that the construction related underwater noise will cause any auditory injury to grey seals. However, the construction related underwater noise does have the potential to exceed the harbour porpoise TTS threshold limit and slightly exceed the PTS threshold limit (see Table 6), and therefore, could potentially cause auditory injury.

**Marine Mammal Disturbance**

Behavioural responses to noise are highly variable and are dependent on a variety of animal dependent and environmental factors. Animal dependent factors include past experience, individual hearing sensitivity, activity patterns, motivational and behavioural state at the time of exposure. Demographic factors such as age, sex and presence of dependent offspring can also have an influence. Environmental factors include the habitat characteristics, presence of food, predators, proximity to shoreline or other features. Influenced by these factors, responses can be highly variable, from small changes in behaviour such as longer intervals between surfacing (Richardson, 1995a) or a cessation in vocalisation (Watkins, 1986) to more dramatic escape responses (Götz and Janik, 2016). This variability makes it extremely difficult to predict the likelihood of responses to underwater noise from drilling. Even where



empirical data exist on responses of animals in one particular environment, the context related variability makes it difficult to extrapolate from one study to a new situation.

Marine mammals, particularly cetaceans, are capable of detecting and generating sound (Au *et al.*, 1974; Bailey *et al.*, 2010) and are dependent on sound for many aspects of their lives, i.e. prey-identification; predator avoidance; communication and navigation. Increases in anthropogenic noise may consequently pose a risk within the marine environment (Parsons *et al.*, 2008; Bailey *et al.*, 2010).

It is now recognised that some of the more ubiquitous noise sources, such as ships, can either individually or cumulatively mask communication signals of, and pose a threat to marine mammals (Clark *et al.*, 2009; Ellison *et al.*, 2011; Chen *et al.*, 2017; Simpson *et al.*, 2016, Rolland *et al.*, 2012). The overall increase in oceanic background noise can alter acoustic habitats over large regions in ways which may be detrimental to marine animals that rely on sound for basic life functions (Ellison *et al.*, 2011). It is also now emerging that non-injurious effects can accumulate at the population level (Williams *et al.*, 2015).

Little information is available on likely responses of marine mammals to drilling noise. More information however is available on responses to vessel noise, which may be used as a proxy. The likely behavioural response of marine mammals to continuous non-impulsive noise is avoidance, however some species are known to be attracted to vessel noise (as likely however to be in response to vessel movement as to noise output). Harbour porpoise are particularly sensitive to high frequency noise and are more likely to avoid vessels (Heinanen and Skov, 2015). Other behavioural responses to continuous noise include increased swimming speed, avoidance, increased group cohesion and longer dive duration (Miller *et al.*, 2008). Sensitivity to vessel noise is most likely related to the marine mammal activity at the time of disturbance (ICW, 2006, Senior *et al.*, 2008). For example, resting dolphins are likely to avoid vessels, foraging dolphins will ignore them and socialising dolphins may approach vessels (Richardson *et al.*, 1995).

Harbour porpoise are small cetaceans which makes them vulnerable to heat loss and requires them to maintain a relatively high metabolic rate. This makes them potentially vulnerable to disturbance if they are unable to obtain sufficient levels of prey intake.

The worst-case underwater noise emissions will occur when the reception pit is being excavated which is expected to occur over a short period of time, approximately 18 days. Noise will also arise from horizontal directional drilling and small vessel traffic. Therefore any disturbance is likely to be temporary, and harbour porpoise have wide ranges and alternative foraging habitat available to them. However, although this would be a temporary, recoverable impact, this would still be considered disturbance by means of temporary exclusion from a portion of their habitat within the SAC. **Likely significant effects (LSEs) cannot be excluded in the absence of mitigation.**

Unlike cetaceans, seals store energy in a thick layer of blubber, which means that they are more tolerant of periods of fasting when hauled out and resting between foraging trips, and when hauled out during the breeding and moulting periods. Therefore, they are unlikely to be particularly sensitive to short-term displacement from foraging grounds during periods of noise activity. Juvenile seals may be more sensitive to displacement from foraging grounds due to a smaller body size and higher energetic needs. Unlike for harbour porpoise, the underwater noise generated during the construction of the seawater intake (Micro-tunnel boring and excavation) does not have the potential to exceed the TTS Threshold Limit (see Table 6) for grey seal. **On this basis, it is not anticipated that that the underwater noise generated during construction will cause any likely significant affects upon grey seal, a feature species of The Maidens SAC.**

**As a result of the potential for underwater noise impacts, in the absence of mitigation, there is a possibility of significant effects upon achieving the conservation objectives of the North Channel SAC, designated for Harbour Porpoise, as a consequence of disturbance and displacement resulting from underwater noise caused by the proposed development. Therefore, it is necessary for these possible effects to be assessed further within the Stage Two Appropriate Assessment.**

#### **Liquid effluent and spillages**

The most direct threat to nearby designated sites would be from spillages of oils and run-offs containing silts and other contaminants. The qualifying features of all five local designated sites could be exposed to these hazards. However birds from East Coast (NI) Marine pSPA and Larne Lough SPA/Ramsar are at greatest risk as oils float on water and can directly impact the plumage of birds. Light fuel oils tend to disperse naturally relatively quickly if spilled. Best practice use of fuel, oils and chemicals accompanied by spillage containment measures in place will negate this risk.

#### **Significance of Hazards during Leaching Phase:**

##### **Collision risk**

Potential collisions between support vessels and feature marine mammal species, harbour porpoise and grey seal, are possible during the construction and operational phase given their known presence in the area. In addition there is a risk of collision to qualifying bird features. **There is a likely significant effect in respect of the North Channel SAC, The Maidens SAC, East Coast NI Marine pSPA and Larne Lough SPA/Ramsar.**

##### **Noise/disturbance**

Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar  
Grey Seal from The Maidens SAC

Harbour Porpoise from the North Channel SAC

During the creation of the caverns, water pumps will continuously circulate water and brine. These pumps will be housed in a building designed to meet noise standard for a permanent installation, despite the equipment being only for temporary use during construction.

There are no underwater noise impacts due to the operation of the seawater intake. Any noise from pumps located onshore will be significantly attenuated in the connecting pipelines. It is anticipated that the operational noise from the seawater intake will be no greater than baseline levels and below those arising from ferry traffic (for further information refer to Section 6 of the Marine Environmental Conditions Report).

Similarly, there are no projected underwater noise impacts due to the operation of the brine outfall diffuser. Any noise from pumps located onshore will be significantly attenuated in the pipeline and the diffuser. It is anticipated that the operational noise from the brine outfall will be close to baseline levels and below those arising from ferry traffic.

The leaching phase of the project will require occasional physical inspections of the underwater pipelines and water quality sampling, including the servicing of monitoring buoys. Shipping traffic arising from these activities will be limited and will not exceed underwater noise levels arising from fishing activities, e.g. trawling or pot hauling.

**Seawater abstraction**

Seawater is to be abstracted from coastal waters within the North Channel SAC and East Coast (NI) Marine pSPA during the leaching phase and will last up to 6 years. The proposed maximum quantity of water to be abstracted is 24,000 m<sup>3</sup>/day (1,000 m<sup>3</sup>/hour). Seawater abstraction will cease after caverns are formed. Abstraction is not required beyond the cavern leaching phase for this authorisation. Any Abstraction requirements as part of maintenance and decommissioning will require an application for a new abstraction licence.

Abstraction may entrain sea life within the intake infrastructure and could have a likely significant effect on the following features:-

- Birds from East Coast (NI) Marine pSPA, Larne Lough SPA/Ramsar
- Grey Seal from The Maidens SAC
- Harbour Porpoise from the North Channel SAC

**LSEs due to prey removal cannot be excluded for the leaching phase in the absence of mitigation and therefore, it is necessary to conduct a Stage Two Appropriate Assessment.**

**Brine discharge**

The maximum quantity of brine to be discharged at the outfall location is stated to be 24,000 m<sup>3</sup>/day at a rate of 277 litres/second.

The nature and composition of the raw effluent is stated to be salinity at 260 PSU at the discharge point, reducing to 36 PSU within 100 metres of the discharge point (Brine Dispersion Modelling (RPS, 2019)). This gives a modelled area of 9038m<sup>2</sup> (as shown in Table 7), where the benthic habitat could be impacted by the brine discharge. This represents 0.00056% of SAC and approximately 0.00225% of the sub-50m habitat.

No.	Salinity Range (PSU)	Area_m2	Salinity (PSU)	Area_m2
1	34.25 - 34.50	11527268.2	>34.25	11812829.4
2	34.50 - 34.75	165336.3	>34.50	285561.3
3	34.75 - 36.00	113929.8	>34.75	120225.0
4	36.00 - 36.50	3552.1	>36.00	6295.2
5	36.50 - 38.00	2743.0	>36.50	2743.0

**Table 7: Salinity ranges within specified zones (Colours relate to coloured lines in Maps 13 and 14).**

The brine discharge also has an impact on the water column. However, at its maximum the plume envelope represents a negligible proportion of the available habitat within the water column of the North Channel.

The proposed scale of discharge and water abstraction is likely to be significant within the receiving environment and zone of influence for the duration of the activity, which is believed to be for a period of up to 10 years. Should the predicted solution mining period be extended, both the Consent to Discharge and Abstraction Licence will need to be reviewed. Therefore the discharge of brine is only for the solution mining of the caverns and no further discharge beyond the construction of the caverns is within the scope of this assessment.

The brine discharge location is within the boundary of the North Channel SAC and the East Coast (NI) Marine SPA. **Based on the brine discharge modelling the effects associated with changes in water quality and the ecological structure and function of these sites therefore represents an unlikely significant effect. However in order to be precautionary and allow for locally reported eddies and the possibility of modelling errors, the effects associated with changes in water quality and the ecological structure and function of these sites will be considered as a likely significant effect.**

**The potential for impacts on prey availability also represent a risk of likely significant effect for the Larne Lough SPA/Ramsar and The Maidens SAC due to the mobile nature of the bird and seal qualifying features.**

**Significance of Hazards during Operational Phase:**

**Noise/disturbance**

During the gas operations phase the main noise-emitting sources will be limited to the compressors within the main gas plant site. These will be housed within a building designed to meet noise standards which will not disturb sleep. Given the distance between the site of the proposed development and the breeding locations of the feature bird species of the designated sites (1.25km at the closest point), **there is no possibility of significant effects upon achieving the conservation objectives of these UK National Site Network sites designated for their breeding seabirds, as a consequence of disturbance and displacement caused by the proposed development.**

As documented in reports associated with the proposed development recorded data have shown that the shorelines adjacent to the site are not utilised by significant numbers of wintering waterfowl including light-bellied Brent geese. It is considered therefore that populations of wintering birds, including Brent goose are unlikely to be subject to significant levels of disturbance associated with the operational phase of the proposed development. **There is therefore no possibility of likely significant effects upon these UK National Site Network sites designated for their breeding and wintering birds, as a consequence of disturbance caused by the proposed development.**

Larne Lough is not frequented by significant numbers of marine mammals and any that do occur should be unaffected by the gas compression operations. It is considered that populations of marine mammals, including Grey Seal and Harbour Porpoise are unlikely to be subject to significant levels of disturbance associated with the operational phase of the proposed development. **There is therefore no possibility of likely significant effects upon these UK National Site Network sites designated for Grey Seal and Harbour Porpoise, as a consequence of disturbance caused by the proposed development.**

**Significance of Hazards during Decommissioning Phase:**

**Brine discharge & Escape of flammable and/or environmentally hazardous storage product**

Internationally accepted procedures for cavern abandonment exist. These should be adapted for the caverns that will be created by this project. Exposure of the bird features of Larne Lough to these hazards is unlikely and will lead to no significant effect.

Any additional abstraction or discharge requirements as part of the decommissioning phase will require additional licence/consent applications, whose impacts will be assessed in their own right.

	<p><b><u>Summary of Likely Significant Effect (LSE) Conclusions</u></b></p> <p>From the findings of the screening exercise, the possibility of LSEs upon four UK National Site Network sites and one Ramsar cannot be discounted in the absence of further evaluation and analysis or the application of mitigation measures. This conclusion was reached without having to consider the proposed development in combination with any other plan or project.</p> <ul style="list-style-type: none"> <li>• The possibility of likely significant effects from the brine discharge, as a consequence of changes to <b>Water Quality and Habitat Deterioration</b>, cannot be discounted for Larne Lough SPA/Ramsar, East Coast (NI) Marine pSPA, North Channel SAC and Maidens SAC without further evaluation.</li> <li>• The possibility of likely significant <b>Seawater Abstraction</b> effects cannot be discounted for Larne Lough SPA/Ramsar, East Coast (NI) Marine pSPA, North Channel SAC and Maidens SAC without further evaluation.</li> <li>• The possibility of likely significant <b>Underwater Noise and Disturbance</b> effects during construction cannot be discounted for the North Channel SAC without further evaluation.</li> <li>• The possibility of likely significant <b>Habitat Loss</b> cannot be discounted for North Channel SAC and East Coast (NI) Marine pSPA.</li> <li>• The possibility of likely significant <b>Collision Impact</b> effects cannot be discounted for Larne Lough SPA/Ramsar, East Coast (NI) Marine pSPA, The Maidens SAC and North Channel SAC without further evaluation.</li> </ul>
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<p><b><i>In-combination assessment.<sup>4</sup>Brine discharge, abstraction and marine construction.</i></b></p> <p>Article 6(3) of the Habitats Directive requires that in-combination effects with other plans or projects are considered. The current applications will also be considered in combination with other plans and projects which may be affecting the site(s).</p>	
<p><b><i>Identify likely effects:</i></b></p>	<p>The likely effects from the current application to discharge brine into the North Channel off Islandmagee would be to change water salinity and composition at the point of discharge and beyond (associated with plume direction and concentration), and associated impacts on the marine food chain.</p> <p><u>Industrial Consents</u> A review of other discharge consents was undertaken and are shown on Map 3.</p>

<sup>4</sup> Step 4: In-combination assessment.

The results returned 157 discharge consents issued within the search area since the 1980s. The vast majority of these relate to sewage effluent or site drainage from individual houses, housing developments or petrol filling stations into Larne Lough. These are considered as part of the baseline and do not need to be included in an in-combination assessment.

Four were highlighted of some significance to be considered as part of the in-combination assessment. They are as follows:

North Channel:

- Food processing (shell fishery) (208/05) – depuration effluent, Islandmagee, Larne.
- Caterpillar (NI) Ltd. (438/08/02) – emergency overflow from a pumping station, Old Glenarm Road, Larne.

Larne Lough:

- McKenzies (NI) Ltd. (2352/17/1) – site drainage from a waste metal recycling facility, Port of Larne Business Park.
- Larne and District Game Angling Association (56/05) – discharge from a hatchery, Shaneshill Road, Larne.

There are no pending new applications or consent reviews within the area.

#### Abstraction and Impoundment Licences

A review for abstraction and impoundment licensing was also undertaken. The results are shown on Map 4. Only 5 applications were related to abstractions directly from the North Channel or Larne Lough.

These are considered as part of the baseline and do not need to be included in an in-combination assessment.

They are as follows:

North Channel:

- AIL/2012/0033 (previous application for gas storage application)

The abstraction for the Kilroot power station (AIL/2007/2014) is outside the search radius, but is included in this assessment as part of the baseline.

Larne Lough:

- AIL/2007/0070 (Ballylumford power station)
- AIL/2010/0006 (Larne Lough Nurseries)
- AIL/2016/0010 (Gaelectric CAES NI Ltd.)



	<p>There are no new pending licences or licence reviews within the area.</p> <p><u>Marine Licensing</u></p> <p>A review of all marine licences was undertaken. The following applications were considered the most significant in this assessment:</p> <ul style="list-style-type: none"><li>• ML10_17 (Coastal Defence Work at Blue Circle Island)</li></ul> <p>These are considered as part of the baseline and do not need to be included in an in-combination assessment.</p> <p>No new or review applications are in the area</p> <p><u>Planning Applications</u></p> <p>A review of all planning applications was undertaken. The following applications were considered the most significant in this assessment:</p> <ul style="list-style-type: none"><li>• LA02/2018/0166/F (Ballylumford Harbour Remedial Works)</li><li>• LA02/2018/1139/F (Ferris Bay WWTW)</li><li>• LA02/2019/0027/F (Ballylumford WWTW)</li><li>• LA02/2017/1125/F (Coastal Defence Work at Blue Circle Island)</li></ul> <p>All of these projects have been approved by the Planning Authority and have already been constructed. These are considered as part of the baseline and do not need to be included in an in-combination assessment.</p> <p>LA02/2021/0664/PAN (Ballylumford Power Station) – Proposal of Application Notice.</p> <p>The potential impact of the above PAN has been considered and unlikely to be any adverse impact to the designated sites (East Coast Marine pSPA/Larne Lough SPA/Larne Lough ASSI) - the existing old substation will be replaced with a new smaller one located between the existing substation and the power station. The works are confined to the Ballylumford industrial site. There does not appear to be any interaction with the marine environment from the proposal.</p> <p><u>Industrial Pollution and Radiochemical Inspectorate</u></p> <p>A review for all IPRI licences was undertaken. The results are shown on Map 6.</p> <p>A total of four licences have been issued within the search area:</p> <ul style="list-style-type: none"><li>• P0125/06A (AES Ballylumford – 2006);</li></ul>
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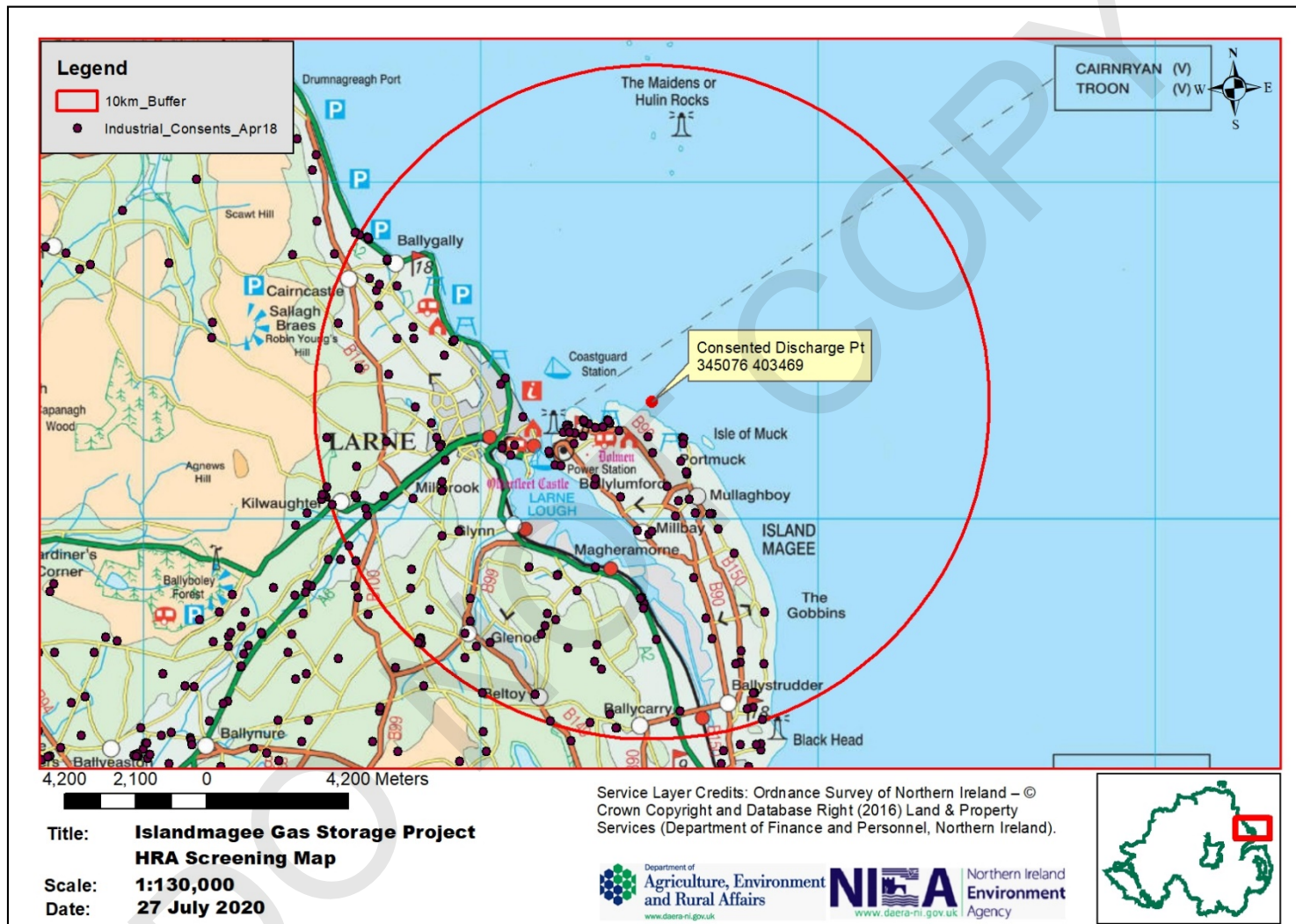


	<ul style="list-style-type: none"> <li>• P0542/16A (McKenzies (Aluminium) Ltd., Larne – 2017);</li> <li>• P0317/09A (NI Water – sludge thickening plant, Larne – 2010);</li> <li>• P0394/12B (Anderson Haulage Ltd., - 2012).</li> </ul> <p>These are considered as part of the baseline and do not need to be included in an in-combination assessment.</p> <p>The PPC permit for the Kilroot power station (PO 0288/08A) is outside the search radius, but is included in this assessment as part of the baseline.</p> <p>No new or review applications are in the area</p>
<b><i>What type of in-combination effect is envisaged?</i></b>	<p>An assessment of possible in-combination effects has been undertaken. The cumulative assessment concluded that due to the nature of these projects, these projects will not result in cumulative effects when considered in combination with the Islandmagee Gas Storage Project</p>

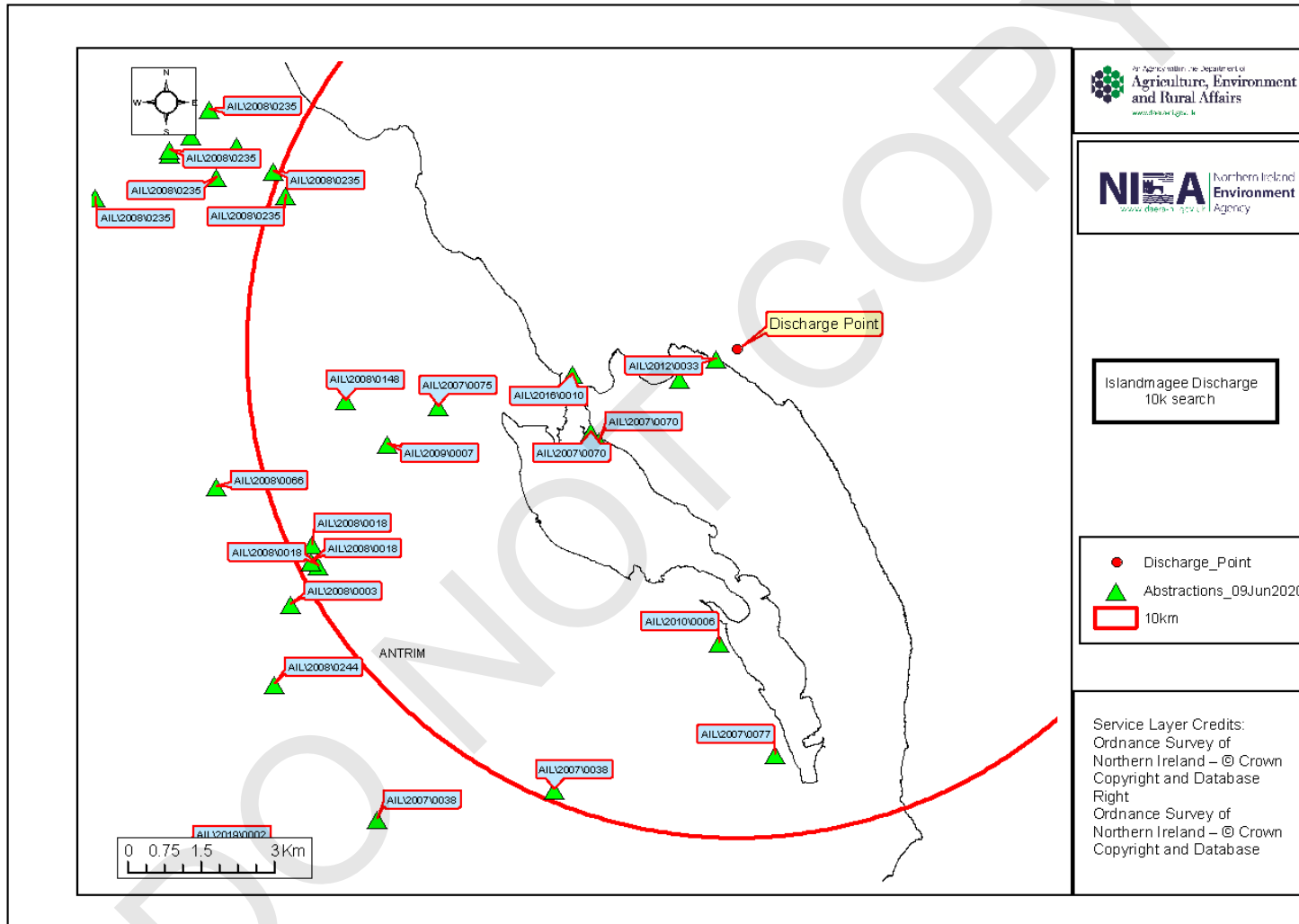
**Stage 1(c): Assessment of likely significant effects: Recorded Outcome Brine discharge and abstraction**

The outcome of the screening stage is that:

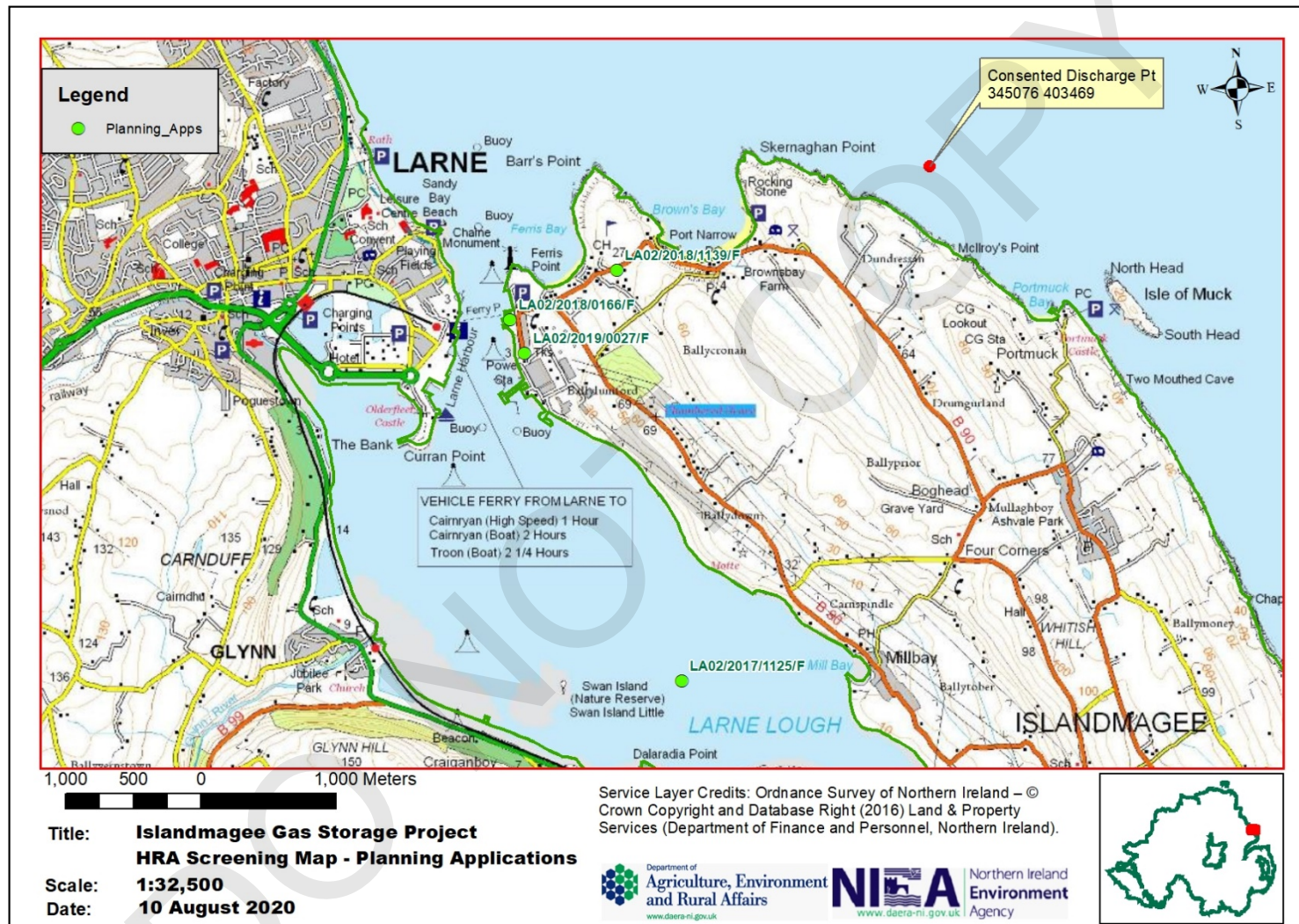
<b><i>Consent is likely to have significant effect (either alone or in combination).</i></b>	<p>After considering all the current information available, it is likely that the issuing of a discharge consent, abstraction licence and marine construction licence will have a likely significant effect on the qualifying interests of the sites 'alone'.</p> <p>The application must progress onto Stage 2 – Appropriate Assessment.</p>
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Map 3: Spatial Search for Industrial Consents

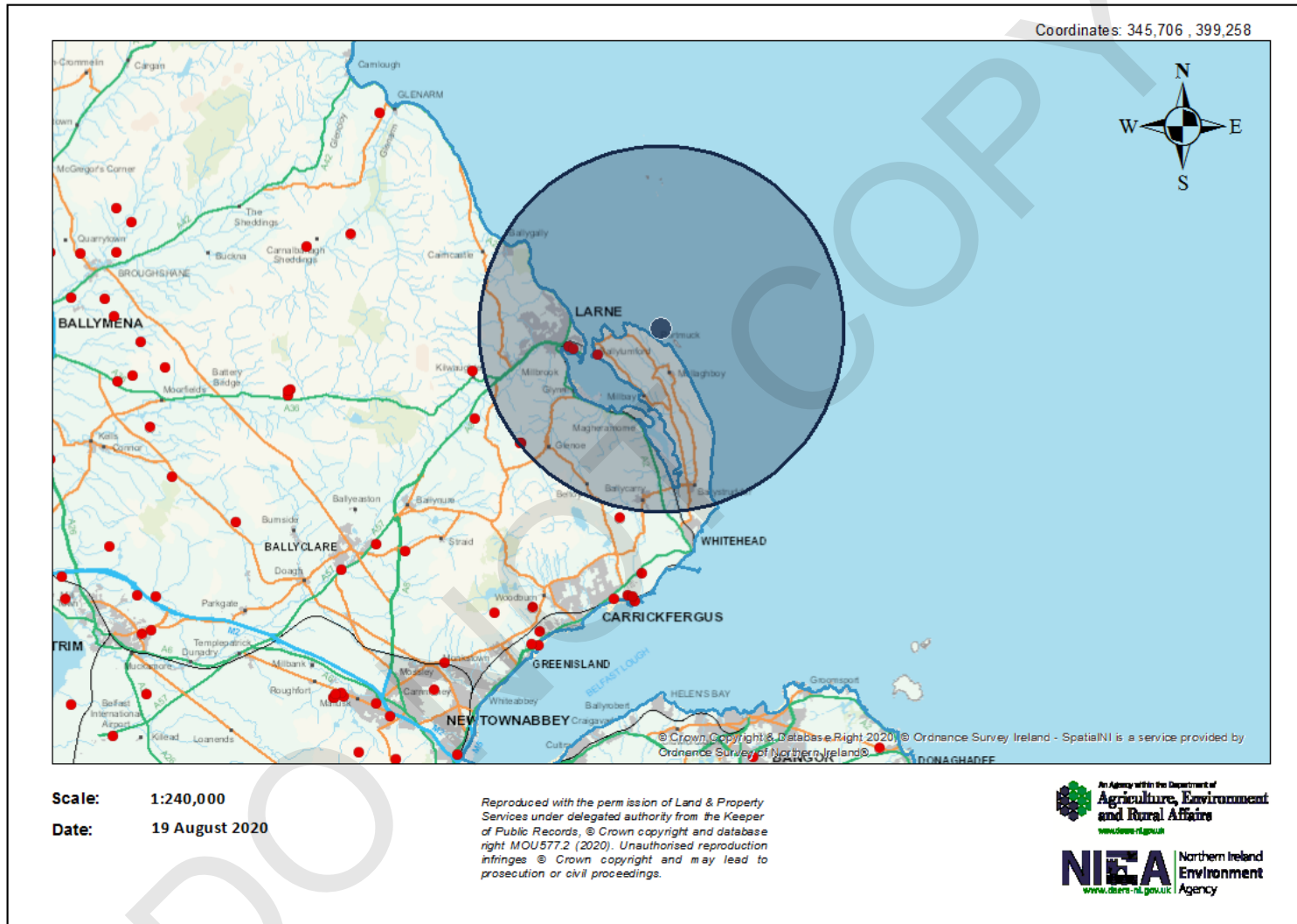


Map 4: Spatial Search for Abstraction/Impoundment Licences.

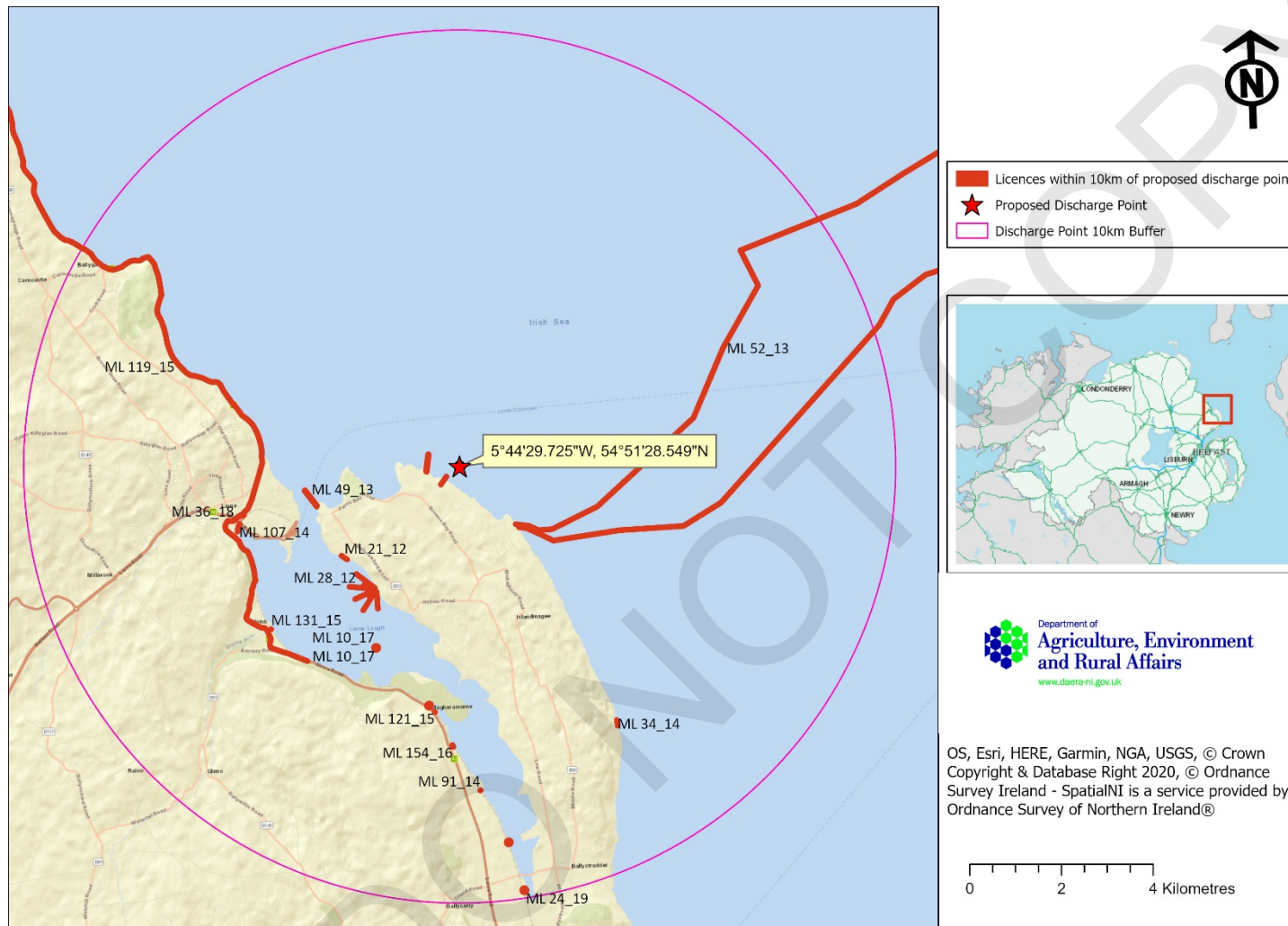


Map 5: Spatial Search for Planning Applications.





Map 6: Spatial search for IPRI Licences.



Map 7: Spatial search for Marine Licences.

**STAGE 2a: APPROPRIATE ASSESSMENT**

**Step 1: Scope of the Assessment<sup>5</sup>.**

<b><i>The effect mechanisms subject to assessment</i></b>	<p>A likely significant effect has been identified in respect of the following effect mechanisms:</p> <ul style="list-style-type: none"> <li>● <b>Brine Discharge (water quality and habitat deterioration)</b></li> <li>● <b>Seawater Abstraction</b></li> <li>● <b>Underwater Noise and Disturbance During Construction</b></li> <li>● <b>Habitat Loss</b></li> <li>● <b>Collision Impacts</b></li> </ul>
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**Step 2: Description of the consent and associated effect mechanisms.**

<b><i>How might the potential effect mechanisms undermine the achievement of the conservation objectives?</i></b>	<p>Potential effect mechanisms which could undermine achievement of the conservation objectives are considered in further detail below.</p> <p><b>Brine Discharge (water quality and habitat deterioration)</b></p> <p>The discharge of brine from the proposed Islandmagee gas storage facility has a likely significant effect on the qualifying interests of several UK National Site Network sites.</p> <p>These are:</p> <ul style="list-style-type: none"> <li>● North Channel SAC</li> <li>● Proposed East Coast (NI) Marine SPA</li> <li>● Larne Lough SPA/Ramsar</li> <li>● The Maidens SAC</li> </ul> <p>The potential effect mechanisms are in relation to salinity increases composition at the point of discharge, and also beyond (in line with plume direction and concentration). This may lead to the mortality of immobile species in close proximity to the outfall, and potential changes to the ecological structure and functioning of habitats and the water column affected by the plume.</p> <p><i>North Channel SAC and the Maidens SAC</i></p> <p>The disposal of brine into the North Channel would lead to a change in water salinity and composition at the point of discharge, and also beyond (in line with plume direction and concentration). This may lead to the</p>
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<sup>5</sup> This should be agreed with colleagues in NED.

mortality of immobile species in proximity to the outfall and changes to the habitats and water column in the immediate vicinity.

The loss of species and habitats in the vicinity could have consequential effects on the food chain and ecosystem, such as decreases in breeding success and survival of predatory species. Most marine species experience a relative narrow salinity range (33-35 psu) and under normal conditions any seasonal fluctuations are usually gradual. Typically, these fluctuations occur because of changes in seawater temperature, freshwater input from estuaries or evaporation in enclosed water bodies.

When the salinity of the brine discharge exceeds ambient seawater salinity it becomes denser and therefore would tend to sink towards the seabed. For bottom dwelling organisms exposed to this high salinity concentration, the ability to regulate the body's osmotic pressure with that of its surrounds is disrupted. Saltwater organisms physiologically must conserve water and stem the influx of salts, if the salinity gradient is beyond the animal's ability to regulate the result is likely to be death of those organisms (particularly sessile animals) unable to escape or those sensitive to osmotic change. Less sensitive organisms (generally more mobile) would experience increased respiration and excretion rates. Moreover, since the concentration of salinity is likely to fluctuate over relatively short periods of time and space, the potential effects on those species unable to move away are likely to be detrimental and presumed lethal.

A shadow Habitats Regulation Assessment was undertaken by RPS in December 2019 for the entire gas storage project. There was also hydrodynamic modelling of the brine discharge undertaken. These sources of information have been used to inform the current Habitats Regulation Assessment.

A 100m impact zone has been highlighted in environmental assessments. This refers to the area that will experience most significant impacts from the brine discharge. To aid the assessment process, several maps were requested showing the 100 m impact zone superimposed on results from benthic survey reports.

In addition, the location of the discharge has the potential to alter the ecological structure and function of the area of the SAC affected by the discharge and the associated plume dispersal.

The discharge will be into water depths known to be favoured by Harbour Porpoise and in addition the North Channel SAC is relatively narrow here so any potential barrier effects to the movement of mobile species needs to be considered in addition to loss of opportunity for feeding. The brine will not cause direct mortality of marine mammals (Harbour Porpoise, Grey Seal) as significant dilution will occur with a short distance of the discharge



vents. Any marine mammals entering the most concentrated part of the plume will be exposed for a short duration and any direct impact will not have a Likely Significant Effect.

#### East Coast (NI) Marine SPA and Larne Lough SPA

The disposal of brine into the North Channel would lead to a change in water salinity and composition at the point of discharge, and also beyond (in line with plume direction and concentration). This may lead to the mortality of immobile species in proximity to the outfall with subsequent effects on the food chain.

The effects associated with the brine discharge may undermine the achievement of the conservation objectives as follows:

- The SPA feature objectives for the East Coast (NI) Marine SPA and Larne Lough SPA to maintain or enhance the population of the qualifying species and the objective to maintain the structure, function and supporting processes of the habitats supporting the species.
- The conservation objectives of the North Channel SAC to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters. Specific objectives apply to maintain prey availability and also to maintain the harbour porpoise as a viable component of the site.
- The feature objectives of the Maidens SAC in respect of maintaining the population and numbers of grey seal.

#### Seawater abstraction

Another mechanism which might undermine the achievement of the conservation objectives is the entrainment of fish, invertebrates and plankton within the water intake infrastructure. This would have the effect of limiting the food resource availability for bird and mammal populations. This effects is relevant to:

- The SPA feature objectives for the East Coast (NI) Marine SPA and Larne Lough SPA to maintain or enhance the population of the qualifying species and the objective to maintain the structure, function and supporting processes of the habitats supporting the species.
- The conservation objectives of the North Channel SAC to maintain prey availability.
- The feature objectives of the Maidens SAC in respect of maintaining the population and numbers of grey seal.

### **Underwater Noise and Disturbance during Construction**

The potential for likely significant effects has been identified in respect of the North Channel SAC only:

The construction of the seawater intake/brine outfall will last for approximately 6 months, however, as previously stated the worst-case underwater noise emission will occur when the reception pit is being excavated. The excavation of the pit and recovery of the tunnel boring machine are estimated to take 18 days and worst-case noise levels will be limited to a fraction of this time.

The physical works required during the decommissioning phase to remove subsurface equipment will require a vessel and machinery. These works will generate temporary underwater noise which has potential to cause disturbance to the feature marine mammal species, Harbour Porpoise.

There is no possibility of likely significant effects upon the UK National Site Network sites designated for their breeding and wintering birds or Grey Seal, as a consequence of disturbance caused by the proposed development during the construction and operational phase or decommissioning phase.

There is potential for temporary displacement within proximity to the excavation works which may undermine the conservation objectives to ensure that there is no significant disturbance of the species.

#### **Habitat Loss**

The loss of habitat from within a designated SAC and pSPA represents a risk to the conservation objectives in respect of spatial extent of habitats and supporting habitats.

#### **Collision Impacts**

Construction cranes and the drill rig will be lit at night for safety reasons. It is additionally proposed that the vent stack be lit to reduce risk of bird collisions. Lighting will preferably be green as this has been shown to disorientate migrating birds less than red light (Poot *et al.*, 2008). Alternatively, white strobes which flash once every 2-3 seconds have been shown to repel birds and produce far fewer collisions than do solid or blinking red lights to which birds may be attracted on foggy, misty nights (Manville, 2000, Poot *et al.*, 2008). Red-lights shall be avoided on tall structures where possible.

Support vessels will be in operation during the seawater intake and outfall construction. There is potential for collisions between marine mammals and vessels. Collision impacts are relevant to the conservation objectives in respect of population maintenance.

	<p><b>Monitoring of impacts</b></p> <p>An Environmental Monitoring Programme (EMP) would be required as a condition of a marine licence and discharge consent to ensure that all computational modelling predictions together with the various environmental assessments presented in the project Environmental Statement and associated documents are an accurate reflection of the actual environmental impacts of the brine discharge. The EMP offers additional safeguards by setting trigger levels above which cavern construction works may be halted or slowed to ensure the environmental impact of the brine discharge remains within Consent conditions. The EMP would be subject to agreement with DAERA following discussions with the Science and Technical Advisory Group. The Science and Technical Advisory Group will continue to provide oversight and governance of the scientific aspects of the project and the various DAERA regulatory teams would ensure compliance with any licence or consent conditions.</p>
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**Step 3: Characteristics of the site.**

Considering the effect mechanisms (from Step 2 above) subject to appropriate assessment, gather relevant information covering:

<p><b><i>The ecological structure and function of the site(s) in question.</i></b></p>	<p>This section looks at the characterisation of each European site in order to ascertain current condition in relation to site conservation objectives.</p> <p><b>North Channel SAC</b></p> <p>The North Channel SAC is around the size of County Fermanagh, and has been identified for the protection of harbour porpoise. The site includes locations where some of the largest groups of harbour porpoise have been observed around Northern Ireland.</p> <p>Habitats within the site consist mainly of coarse or sandy sediments, with patches of rock and mud. Water depths reach a maximum of 150 m along the eastern boundary, but much of the site lies between 10m and 40 m. The site covers important winter habitat for harbour porpoise and extends from the coast into offshore waters.</p> <p>The most expansive area of the site extends from the Outer Ards coastline to mid water boundaries with Scotland and the Isle of Man. A narrow extension runs from The Copelands to the Islandmagee coast; the width being determined by the fact that supporting data was gathered from land-based watch points. Harbour Porpoises are present all year round but higher densities have been noted in winter and it is</p>
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	<p>the importance of the site in winter that has qualified the site for designation.</p> <p>Recently designated site; proposed January 2017, designated as SAC February 2019.</p> <p><i>Main threats and current site condition</i></p> <p>The highest ranked pressures for Harbour Porpoises in UK waters are Bycatch, Contaminants, Underwater Noise, Collision and Removal of Prey. Some of these pressures are difficult to manage at site level as the species is highly mobile.</p> <p>In the absence of historical baseline data it is difficult to currently assign a condition status to the site. However, winter densities fall within the top 10% in UK waters and some pressures such as Bycatch, Underwater Noise and Collision are a lower risk than some other UK SACs designated at the same time for Harbour Porpoise.</p> <p>Ecological functioning of the SAC and the north-south passage of Harbour Porpoise through the North Channel will need to be considered within the assessment.</p> <p><b>Larne Lough SPA (and Larne Lough Ramsar)</b></p> <p><i>Site Description</i></p> <p>The sea lough extends from Larne town, southwards to Ballycarry bridge and beyond. The lough is nearly bisected by Magheramourne dump, created from quarry spoil. The lough includes the extensive inter-tidal mudflats, together with more limited sand, gravel and boulder beaches. The tidal lagoon at Glynn is also included. Adjoining habitat within the site includes saltmarsh and transitional habitats together with limited wet grassland. Swan Island (natural) and Blue Circle Island (artificial) are important tern and gull nesting sites.</p> <p><i>Main threats and current site condition</i></p> <p>Of the listed main threats, pressures and activities with impacts on the site or site features, <i>Habitat quality – open water and inter tidal</i> is relevant here. The main threat comes from alteration of habitat quality through diminution of water quality, invasive species or changes in coastal processes. The lough is enriched, notably through sewage discharge from Ballystrudder and Ballycarry. This has the potential to alter inter-tidal habitat.</p> <p>The most recent site condition reporting (2020) indicates that all qualifying interests are in favourable condition. (NIEA internal communication).</p>
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	<p><b><i>The Maidens SAC</i></b></p> <p><i>Site Description</i></p> <p>The Maidens proposed SAC is a group of rocky reefs detached from the coast, north east of Larne, Northern Ireland. The Maidens (or Hulin Rocks) are identified on the Admiralty Charts as a group of small rocky reefs either awash or just emergent. In only two cases are they large enough to be termed islands and to carry buildings, namely the West Maiden, which has a disused lighthouse and the East Maiden, which supports the present lighthouse. As well as the main reef plateau of East and West Maiden, there are also four other reef areas that form a part of the proposed SAC: North Klondyke Shoal which is a large submerged reef or shoaling, approximately 9 km north of West Maiden; Outer Klondyke Pinnacle, a submerged pinnacle 6km east of West Maidens; an unnamed small deep reef 8km north west of West Maiden; and Hunter Rock 5km to the south of West Maiden. The primary reason for the proposed designation of The Maidens as an SAC is for the Annex I habitat Reef. Most of the reef area of The Maidens is bedrock reef with a smaller proportion of stony reef. From the multibeam echo sounding (MBES) survey analysis, combined with video tow ground truthing, some of the area has been classified as ‘rock with sand infill’. It is suggested that most of this ‘rock with sand infill’ should be classed as Annex I Reef as the ground truthing suggests that the mobile sand veneer would cover and uncover that reef area. A small area to the south of East Maiden island has been shown by diving surveys to be shallow stable sandy gravels (partially sheltered by East and West Maiden islands) that includes maerl and other long lived species and this small area has therefore been classed as Annex I Sandbanks slightly covered by seawater all of the time. Like Annex I Sandbanks slightly covered by seawater all the time, Annex II Grey seals are not the primary feature of The Maidens proposed SAC. However, these relatively remote rocks, islands and the waters surrounding them in the North Channel are important for providing haul-out sites, resting sites and foraging areas for Grey seals, with a maxima count of 70 adults recorded in a July 2000 survey. Recent surveys in 2009 confirmed use of the site for both pupping and breeding.</p> <p><i>Main threats and current site condition</i></p> <p>Of the listed main threats, pressures and activities with impacts on the site or site features, <i>Habitat quality – discharge of commercial effluent or sewage</i> is relevant here. Commercial effluent has the potential to cause deterioration of qualifying habitats and communities, through pollution or nutrient enrichment, which may cause subsequent changes in community structure. Contaminants may enter species food chains, including those that are persistent and those that tend to bioaccumulate and biomagnify. Lipophyllic contaminants such as organohalides are of</p>
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particular concern as they tend to accumulate within fatty tissue and are remobilised during lactation in seals. Contamination of female seals by hydrocarbon residues may be detrimental to suckling pups.

The most recent site condition reporting indicates that the habitat feature *reefs* is favourable. *Sandbanks* and grey seal have both not been assessed. (NIEA internal communication).

***Proposed East Coast (NI) Marine SPA***

This is a proposed new site and has yet to be formally designated. The boundary adjoins the following existing Special Protection Areas – Larne Lough SPA Belfast Lough SPA Outer Ards SPA Copeland Islands SPA Strangford Lough SPA It also subsumes the existing Belfast Lough Open Water SPA The boundary also adjoins the following existing Ramsar sites – Larne Lough Ramsar Belfast Lough Ramsar Outer Ards Ramsar Strangford Lough Ramsar.

*Site Description*

The East Coast (Northern Ireland) Marine Special Protection Area includes coastal and near shore waters from Ringfad near Carnlough, Co. Antrim in the north, the marine area of Larne Lough, the marine area of Belfast Lough, waters around the Copeland Islands and offshore of the Ards Peninsula to Cloghan Head, near Ardglass in the south. The SPA covers a diverse range of seabed habitats, from extensive coastal fringing reefs of various lithologies to the fine silt of inner Belfast Lough. To the north of Belfast Lough, fringing reef is notable, with substantial areas of coarse sediments and boulders and cobbles offshore from Islandmagee. Further north, towards Ballygally and Carnlough, the glacial till dominates the seabed but also with important areas harbour maerl, a coralline algae (mostly *Phymatolithon calcareum*), known for its associated high biodiversity and for acting as a scallop nursery ground. Rippled sands and gravels are also notable between the relic drowned drumlins that are present off much of the ‘Glens of Antrim’ coastline. Bedrock outcrops with near vertical sides are found at the Maidens; these reefs and the surrounding sand banks are form part of the designated Maidens SAC. Within Belfast Lough muds grade into muddy sands toward the outer Lough, with extensive areas of cobbles and shell debris overlying the muddy sand. Part of the muddy sand in the outer Lough is bioturbated by Dublin Bay prawn (*Nephrops norvegicus*), and also harbour the Seapen *Virgularia mirabilis*. Topographically complex reef areas surround the Copeland Islands. To the south of Belfast Lough, the seabed off the Ards Peninsula is dominated by stony reef and mixed sands and gravels (often with a notable silt content). The gravelly sands support commercially harvestable seed mussel in geographically limited areas (affected by local hydrography), and further offshore support a

	<p>scallop fishery (<i>Pecten maximus</i>). Mobile bedforms, such as extensive sand waves and banks, are found at Rigg Bank and extending south of the bank. Offshore of Belfast Lough and off the Maidens Islands the seabed within the site reaches a depth of 125m.</p> <p><i>Main threats and current site condition</i></p> <p>Of the listed main threats, pressures and activities with impacts on the site or site features, Habitat quality – open water is relevant here. The main threat comes from alteration of habitat quality through diminution of water quality or invasive species. The site has historically been impacted by industrial and sewerage effluent. It is also vulnerable to pollution incidents from both industry and shipping. There is no current site condition report as it has not been designated. (NIEA internal communication).</p>
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**Step 4: Detailed assessment of potentially adverse effects.**

<p><b><i>In view of the conservation objectives, undertake an assessment which addresses the 'key question' of what will happen if the marine construction licence, discharge consent or abstraction licence is issued and is that consistent with maintaining or restoring favourable conservation status?</i></b></p>
<p><b>Brine Discharge (water quality and habitat deterioration)</b></p> <p>Much of the literature is based on studies of brine discharges into coastal environments from desalination plants, particularly from the Mediterranean region. There is also limited empirical data to support statements regarding the environmental effects of brine discharge, with few observing the authentic effect of discharge on marine communities around discharge outlets (Skinner, 2008). There was limited specific research undertaken on brine discharges specifically from the process of creating underground gas chambers. One study looked at environmental, ecological and toxicological research, including monitoring and assessment of water quality and ecological attributes in the receiving environment. (Roberts <i>et al.</i>, 2010).</p> <p>In most cases, the intensity of the plume appears to diminish rapidly and is usually no greater than 2ppt above background salinity within 20m of the outlet. Plumes that extended over hundreds of metres, tended to be only slightly greater than background levels, usually less than 0.5ppt at most. Reverse osmosis processes are common and tend to result in only ambient temperature plumes (Dweiri and Badran, 2003).</p> <p>Mathematical models have suggested that brine plumes tend to be carried further alongshore than offshore in areas of prevailing currents (Shao and Law, 2009). The authors suggest that a consequence is that the coastal fringe is likely to be the most susceptible to deleterious effects of brine. Other authors (Purnama and Al-Barwani, 2006) suggest that increase in salinity may</p>



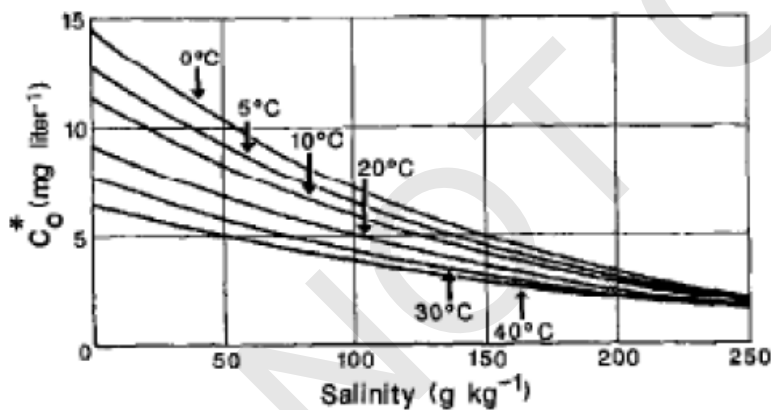
vary around discharges over tidal cycles, with the greatest impacts seen on incoming tides, which act to concentrate brine around outfalls.

### Temperature

The temperature of discharged brine is much higher than ambient seawater temperature. The distribution and extent of the temperature alteration also depends on the location of plant (desalination) discharge. If it is in a well-flushed environment, it is more efficient and effective than the brine discharges near to waterbodies salinity (Roberts et al., 2010).

### Dissolved Oxygen and Total Alkalinity

There is an inverse relationship between salinity and dissolved oxygen. The relationship is relatively complex and dependent upon the ionic composition of the saline solutions. The diagram below provides a good approximation and shows how dissolved oxygen available to marine organisms would drop off as salinity increases and reduced the amount of dissolved oxygen that can be carried by the water (Hyder Consulting, 2011).



Source: Sherwood *et al.* (1991)

Hypoxia can cause serious harm to aquatic organisms. This may lead to increased biomass due to the disposal of entrained organisms (California Coastal Commission, 2004). However, in reverse osmosis processes, temperature is not varied much, so major changes in dissolved oxygen due to heating is unlikely. There has been some limited discussion regarding changes in total alkalinity as a result of brine discharges. Alkalinity contained within the brine discharge increases the amount of calcium carbonate and calcium sulphate of seawater to twice its normal level. The pH range in the marine environment is also changing due to other impacts, with brine input considered negligible (Skinner, 2008).

It is widely recognised that extreme brine discharge, as it constitutes a hypersaline layer that sinks towards the seabed due to density differences, has the potential to heavily impact local marine biota (von Medeazza, 2005). Changes in salinity influence the propagation activity of the marine species and that consequentially affect their development and growth rate. Larval stages are very crucial transition periods for marine species and increasing salinity disrupts that

period significantly (Neuparth et al., 2002). Some marine species may not survive the sudden augmentation of salinity because of brine disposal (Haurwith *et al*, 2008). In terms of the extent of effects, brine plumes have the affinity to extend further along the seafloor than the water surface which contributes to greater exposure of benthic organisms (Roberts et al., 2010).

#### *Halogenated Compounds*

A further potential mechanism by which the hypersaline plume could have adverse effects on marine ecology is production of toxic halogenated compounds as hypersaline meets seawater (Hyder Consulting, 2011). From the scientific literature, a salinity level greater than 40 psu is considered lethal to most marine organisms. The tolerance of plankton to over 40 psu, for example, is very poor and can result in either a dramatic drop in growth rates or death (APEC MRC Working Group 2003). In addition, littoral algae are unable to tolerate changes up to 1.5 times normal levels. The sensitivity of benthic animals is greater when they are larvae or juvenile forms. Robinson *et al.* (2003), for example, noted that polychaete and bivalve larvae exhibit a behavioural change by either not settling or migrating horizontally to a less stressful environment.

#### *Food web effects*

It is important to consider the food web at the discharge location, especially when qualifying interests for the designated sites include Harbour porpoise, Grey Seal, and seabird species such as Great Crested Grebe, Red-throated Diver, Sandwich Tern, Common Tern, Arctic Tern, and Manx Shearwater.

Decaying matter, algae and protozoa are bottom of the food web for species including nematodes, oligochaeta, molluscs and echinoderms. Fish are the next trophic level, followed by birds and marine mammals. Biological records from the nearby Dundressan dive site (NBN Atlas, 2020) indicate that the seabed community includes crabs, anemones, tubeworms, starfish and scallops, with 151 species recorded at the site. Starfish are considered to be the primary predators of the scallop spat.

Organisms inhabiting depressions in hard and soft substrata may be differentially exposed. Research has indicated that the production and growth of marine organisms is severely affected by brine discharge (in the desalination process) (Ahmed and Anwar, 2012). The organisms are interrelated with each other, so any distraction of their local population has an extreme impact on all marine life in the area.

Exposure to brine discharges has been shown to lead to detectable ecological inputs in seagrass habitats, and to phytoplankton, invertebrate and fish communities in areas surrounding outlets. Seagrasses appear to experience impacts following relatively small increases of only 1-2 ppt. Brine discharges over soft bottom habitats may alter the structure and diversity of infaunal communities (Ruso et al., 2007). Research has also found increased dominance of nematodes adjacent to brine discharges, and reduced diversity and abundance of polychaetes up to 400 metres from a discharge (Del-Pilar-Ruso et al., 2008).

Benthic diatom communities may also be reduced in richness and abundance, as well as lower containing chlorophyll-a concentration than in un-impacted areas (Crocket, 1997). Impacts to plankton communities may be minimised in areas of strong tidal flow and tidal mixing and are generally limited to the point of discharge only (Azis et al, 2003). It must be noted that some studies did not detect any effects of discharges on seagrasses and microbenthic organisms such as fish, crabs, echinoderms, molluscs and polychaete worms (Raventos, et al, 2006).

Turbulent coastal environments with continual flushing are predicted to be less susceptible to detrimental impacts of (desalination) brines than lower-energy systems, and habitats with strong tidal influence (Hopner and Windelberg, 1996). Whilst it does seem logical that well-flushed environments may experience reduced intensity and duration of exposure to effluents of any type, there is a strong possibility that the ecological impacts (of desalination plants) will resist prediction along simplistic lines. Furthermore, areas known to support important biological resources should be avoided.

#### Benthic Habitats and Brine Modelling

Baseline salinity data obtained from AFBI and NIEA indicate that background salinities in the area around the proposed outfall location range between 30.5psu and 34.8psu. For the purposes of the hydrodynamic and brine dispersal modelling undertaken by RPS, a background figure of 34.2 psu was used. The proposal allows for the positioning of two diffuser ports pointing upwards at 20m centres. This geometry is intended to facilitate mixing in the receiving environment.

The rate of brine discharge will increase as the number of caverns are constructed under Larne Lough. RPS (2019) suggest an initial start-up rate of 250m<sup>3</sup>/hr to a maximum rate of 1000m<sup>3</sup>/hr. The associated concentration of brine at first contact with the seabed is believed to be in the region of 50.5psu – 37.6psu, with salinities greater than 36.0psu modelled to occur within 100m from the diffuser ports under normal operations. This has been termed the 'impact zone' (RPS, 2019). Furthermore, the model output suggests that salinity levels greater than 40 psu are only predicted to extend for approximately 10-15m from the diffuser location (see Map 9). Map 9 shows the Maximum Brine Plume Envelope, which also included a period of very small neap tides with tidal ranges approaching 1m (RPS 2019). The extent of the modelled plume is clearly predicted to extend along an elliptical axis hugging the shoreline.

Surveys of the benthic habitats were undertaken by RPS as part of the planning application process for the proposed gas storage facility. Data was obtained from underwater camera footage along trawl lines and supplemented by dive sites and grab samples. Maps 10-13 show the extent of survey effort in proximity to the proposed outfall location. The 'impact zone' is also visible on these maps.

The output from benthic surveys is mapped and shown in Map 14. The maximum salinity values from the plume is shown in Table 7 and should be viewed along with Map 15. Salinity levels are shown in two formats: area within the salinity range, and areas greater than a certain salinity value.

It can be seen that the proposed outfall location is within the habitat type *Flustra foilacea* (a bryozoan) and *Hydrallmania falcata* (a hydroid) on tide-swept circralittoral mixed sediment with a diverse epibenthos, although it extends to a similar habitat type, albeit with a poor epibenthos. Maximum salinity values between the range of 38psu to 34.5psu are predicted within these habitat types, covering an area of 120,225m<sup>2</sup>. The remaining habitats are modelled to experience maximum salinity values between 34.5psu and 34.75psu.

Hyder Consulting (2011) adopted the following salinity criteria in relation to the Preesall gas storage project. To simplify the assessment of impacts on marine ecological receptors and to ensure that a precautionary risk-based approach is taken.

1. 40+ psu:

Exposure to salinity 40+ psu, for greater than several minutes is likely to be lethal to all marine organisms unable to escape (e.g. sessile fauna and plankton). Organisms that are more mobile will show some behavioural response (e.g. displacement, avoidance, migration and burrowing) or experience increases in metabolism if slow to respond. The area of seabed exposed to 40+ psu over the long-term is likely to become abiotic and generally denuded of benthic life

2. <40 and ≥ 36 psu:

Exposure to salinity <40 and ≥36 psu, for greater than 1 hr, may cause mortality to more sensitive species, displacement and avoidance behaviour in mobile species, increases in metabolic rate and alterations to growth in sensitive sessile species. The area of seabed exposed to <40 and ≥36 psu over the long-term is likely to support a modified fauna comprising those benthic species better adapted to these elevated salinities

3. <36 psu zone:

Exposure to <36 psu would have minimal effect on the marine environment and should function normally, providing salinity levels do not vary beyond the 'normal' range (33-35 psu). In the short term, areas of the seabed closest to the envelope of elevated salinity would contain 'displaced' organisms. Long-term impacts are considered to be minimal.

Using this approach, it would be most favourable if salinity levels were kept to 36psu and below for as large an area as possible.

*Ecological evaluation*

Whilst seabed impacts of increased salinity from the brine are not modelled to exceed 40psu within the impact zone, any such levels if they do occur will be confined to a very small area in the immediate vicinity of the diffusers. There is an area where levels are modelled to be between 36psu and 38psu. This area is approximately 9,038m<sup>2</sup> (0.9038ha) and represents a small fraction of the overall areas of the individual designated sites. For the purposes of this assessment this impact zone is treated as though it is a total habitat loss.

The location of the diffusers within strong tidal currents (450m offshore) and the position of the diffusers into the water column to aid dispersal, is considered best environmental practice within the industry. The tidal range and velocities are also believed to aid dispersal of the plume.

**Seabed losses associated with the proposals are deemed unlikely to be significant in light of the conservation objectives for the sites as all potentially impacted species features are highly mobile.**

Further proposed mitigation measures by the applicant include ongoing real-time monitoring of water quality parameters during the operational phase. A network of monitoring buoys will be located within 100m of the brine diffuser ports. An Environmental Monitoring Plan will be required as part of the authorisations and this will need to be approved by DAERA before discharge commences. **In the absence of mitigation there is a risk to the integrity of the North Channel SAC and the East Coast (NI) Marine SPA within which the brine discharge occurs, and Larne Lough SPA/Ramsar and The Maidens SAC which are linked through mobile species features. Based on a mitigated impact zone of 100m radius (31429m<sup>2</sup>) there is not a significant risk to the features of any UK National Site Network site.**

*Effects on functioning of the SAC and north-south passage of harbour porpoise through the North Channel.*

Harbour Porpoise are known to have a preference for shallower waters and JNCC report 544 (Heinänen and Skov, 2015) provides the following information in respect of the Celtic and Irish Seas (emphasis added):

### *3.3 Celtic Sea/Irish Sea MU*

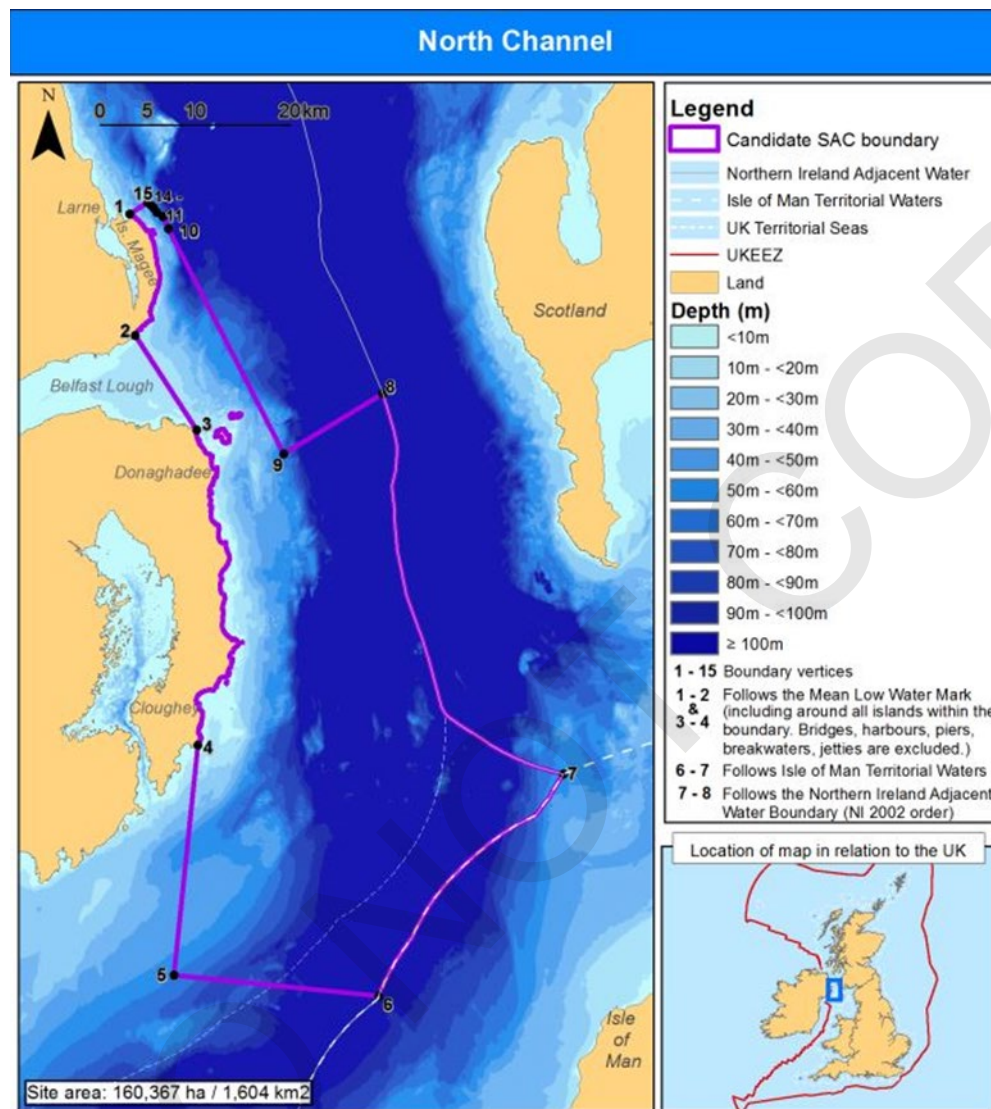
*The model results for the summer season in the Celtic and Irish Seas indicate that water depth, surface sediments, current speed and eddy potential all play a major role as determinants of the distribution of harbour porpoises in this management unit. In the winter season, water depth and current speed are the major determinants with some influence from surface salinity...*

*...The responses to water depth indicate that high densities of harbour porpoise are associated with the shallowest areas (areas shallower than 40m) in summer and high probability of presence in the same areas in winter...*

A study (van Beest *et al* 2018) of environmental drivers of Harbour Porpoise fine-scale movements in Danish waters suggests that they prefer to dive to depths of between 5 and 50m. They are capable of diving deeper than this; however when feeding in deeper waters they are less likely to feed at the seabed.

The boundary of the North Channel SAC was largely determined by survey data demonstrating high relative densities of Harbour Porpoise in winter months. The narrow strip running from the Copeland Islands, across the mouth of Belfast Lough and along the Islandmagee coast was justified for inclusion by land based data. In order to take a precautionary approach the impact of this project has been assessed with regard to the portion of the SAC which has water depths between 5m and 50m (Map 8). This represents around a quarter of the site and is in the order of 400km<sup>2</sup> in area. The area impacted by the project will be less than 0.002% of this prime

porpoise habitat (based on an impact zone of 100m radius (31429m<sup>2</sup>). Although an area of up to 100m radius will be significantly altered by the brine discharge, the greatest effects will be at the seabed and mobile fish prey will potentially still be able to traverse across the water column above this zone. A map showing water depth in the North Channel SAC is provided below.



Includes data provided by UKHO, Open StreetMap, Defra and JNCC. © Crown Copyright © OpenStreetMap contributors. All rights reserved. Not to be used for navigation. © JNCC 01/2017

Map 8. North Channel SAC designated for Harbour Porpoise. Note shallower sub-50m seabed occupying approximately one quarter of the site (c400km<sup>2</sup> of habitat)

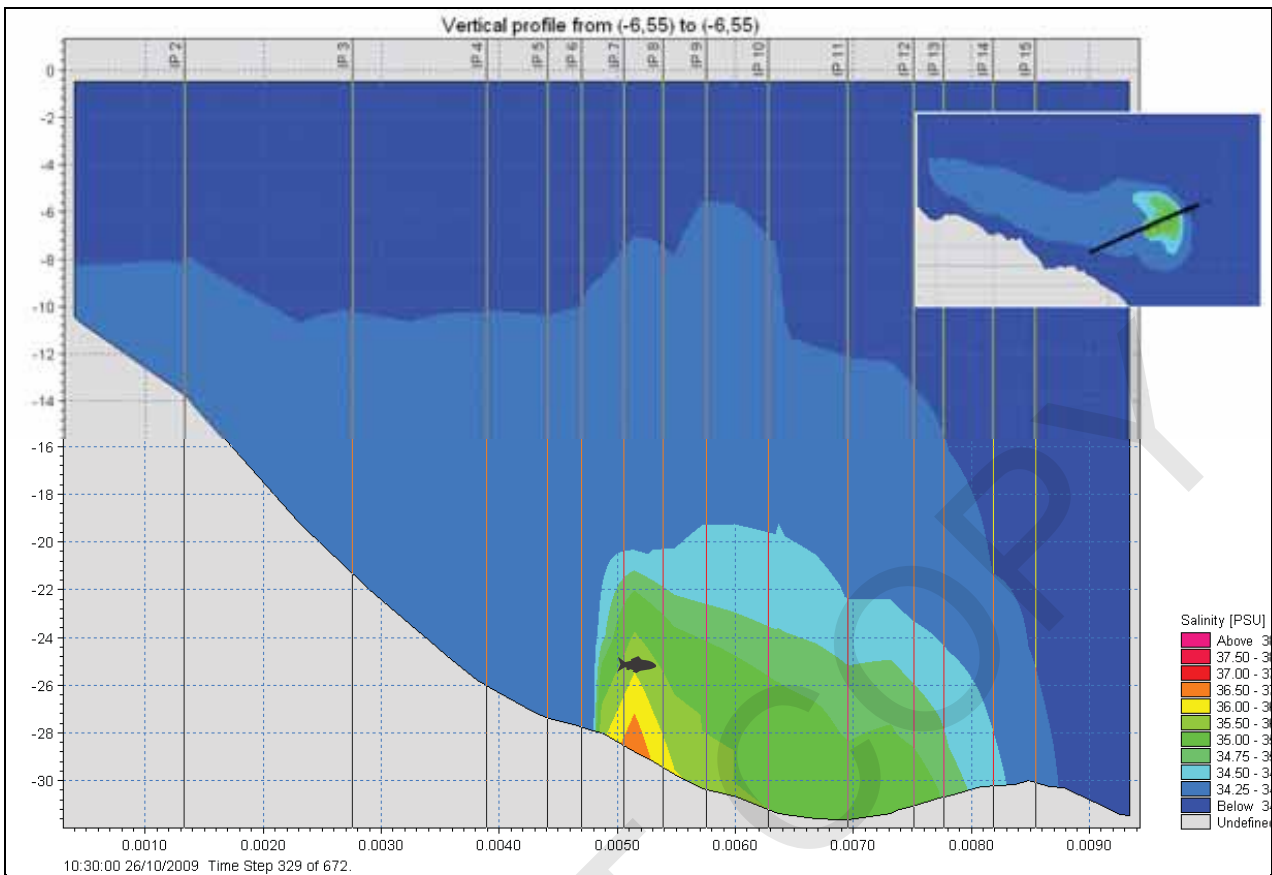


Figure 1. Vertical Profile of the Salinity distribution at low tide during a Neap Tide Cycle with fish symbol sized to represent Harbour Porpoise swimming at depth of about 20m from surface (Note: horizontal distances are not the same scale as vertical distances) Source: Figure 9.30 from Environmental Impact Statement – RPS.

Figure 1 has been selected to represent a worst case scenario for harbour Porpoises swimming through the North Channel SAC in the vicinity of the brine discharge point. Tidal flows will be slow at low tide and water depth will be at a minimum. The high salinity brine flowing from the diffusers will tend to sink towards the seabed due to its relatively higher density. This means that even in the near vicinity of the discharge pipe much of the seawater in the water column above it will experience only minor increases in salinity levels. The North Channel SAC is only 2km wide at the location of the discharge pipe; Harbour Porpoises will be expected to retain access to the full width of the surface and middle layer depths of this 2km wide strip despite the presence of the brine. Even in the bottom layer the brine is diluted rapidly within a few metres of the diffusers. Any salinity increase in excess of the range normally experienced in seasonal variations is expected to be restricted to the initial mixing zone, which is an area less than 100m from the outfall. During flood and ebb tides the lens of high density seawater at the bottom layer will be reduced. The brine discharge is not expected to significantly impede passage of Harbour Porpoises through this section of North Channel SAC. In addition, Harbour Porpoises are not constrained to the SAC and although there may be disturbance factors such as shipping, there is ample opportunity for Harbour Porpoises to commute to other areas of sea, including SACs in Scotland and Wales.

Discharge brine will be 260PSU; seals and cetaceans are not expected to suffer any direct impacts from the brine which will undergo significant dilution upon entering the sea.



**The brine discharge will have no significant effect on the functioning of the SAC for north-south passage of Harbour Porpoises in the wider North Channel.**

#### **Seawater Abstraction**

A shadow Habitats Regulation Assessment was undertaken by RPS in December 2019. It lists the following mitigation measures in relation to the reduction in foraging resource available to pSPA and SAC feature species:

1. The maximum seawater abstraction will be 1000m<sup>3</sup>/hr. The structure is designed to limit the intake velocity to 0.15m/s (0.54km/h) which will minimise impingement of fish and invertebrate organisms onto the fine mesh screens (EPA, 2014). This represents an intake speed the same as the lowest tidal velocity reducing the risk of impingement of small fish or other organisms. The cross sectional area of the intake screens and the pump rate will be set to protect fish life, allowing fish to take avoiding action. In order to ensure an even flow across the surface of the fine screens, the screens are placed a sufficient distance away from the abstraction pipes.
2. The screens are engineered with a mesh diameter of 12mm which further reduces the possibility of fish entrainment. This size is selected to exclude the majority of marine biota, however, smaller organisms (plankton) will become entrained in the intake water and this may represent a small amount of prey loss for larger marine animals. This is considered to represent a small proportion of available prey for predominantly mobile species and therefore unlikely to be of significance.

Two local power stations have seawater abstraction licences; Ballylumford, at the entrance to Larne Lough, has a licence to abstract up to 1,200,000m<sup>3</sup> per day and Kilroot, on the shores of Belfast Lough, has a licence to abstract up to 1,440,600m<sup>3</sup> per day. The combined total is 2,640,600m<sup>3</sup> per day and adding 24000m<sup>3</sup> per day from the Islandmagee gas storage project increases this total by 0.91%. The seawater abstraction flow rate of 0.15m/s is considerably slower than the 0.3m/s flow rate of 0.3m/s considered as best practice for power stations (Environment Agency, 2010a) will result in an insignificant loss of prey for the local feature species.

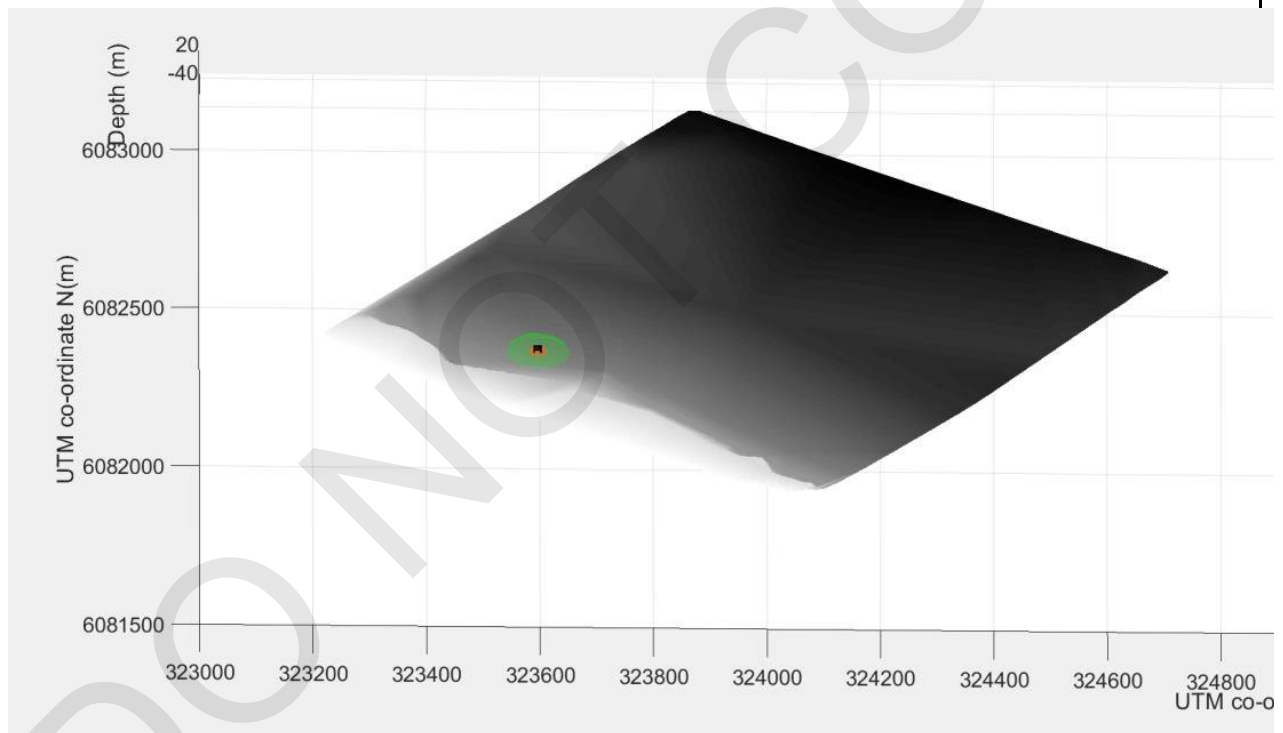
**With mitigation measures in place, it is considered that seawater abstraction poses no risk to the integrity of any UK National Site Network sites.**

#### **Underwater Noise and Disturbance During Construction**

Noise modelling was carried out on the worst-case noise level sources at the seawater intake and the brine outfall locations. As can be seen in Table 8 the underwater source levels are quite low intensity and barely exceed the injury thresholds set out in Table 6. This means that the impact radius will be quite small in extent. An illustration of this is reproduced below (Figure 2) taken from Figure 6.5 of the RPS Marine Environmental Conditions Update Report (2019).

Species	Criteria		PTS Impact Zone Surface
	PTS Onset (metres)	TTS Onset (metres)	Disturbance (metres)
Low Frequency Cetaceans (baleen whales)	-	-	60
High Frequency Cetaceans (most dolphin species)	-	-	60
Very High Frequency Cetaceans (Harbour Porpoise)	-	16	60
Phocid Carnivores (seal species)	-	-	-
Other Carnivores (otters)	-	-	-
Fish Eggs and Larvae	-	-	-
Mortality PTS in adult Fish	-	-	-

**Table 8 Underwater Noise Modelling Threshold Zones**



**Figure 2 Underwater noise level - Maximum extent of disturbance during pit excavation**

The modelling results are presented in Figure 2 which shows the extent of the disturbance (green) and temporary injury (amber) zones for Harbour Porpoise. The impact zone is shown to scale with a 12m x 12m jack up barge at the excavation site. The disturbance zone extends to 60m and the temporary injury zone is limited to 16m from the noise source. It is clear that the disturbance temporary injury zone is quite small and will have limited environmental impact. This impact will have a maximum duration of 18 days.

The sub-seabed drilling site is located at the northern extreme of the North Channel SAC. The SAC is approximately 1,600 km<sup>2</sup> in size, and therefore, there is a large expanse of marine habitat for any harbour porpoises that could potentially be displaced on a temporary basis.

However, this would still be considered disturbance by means of temporary exclusion from a portion of their habitat within the SAC. As there is potential for temporary injury within close proximity to the excavation works, mitigation measures must be prescribed.

JNCC Report No. 654; *Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland)* was used to consider the impact of disturbance in the North Channel SAC. Thresholds used are 20% of the site disturbed in one day and 10% of the site disturbed in a season. The drilling disturbance has a footprint of 0.0113km<sup>2</sup> representing 0.0007% of the SAC and 0.003% of the favoured sub-50m depth habitat. The small noise footprint and short duration make this activity insignificant from a disturbance perspective.

The construction of the seawater intake will last for approximately 6 months, however, as previously stated the worst-case underwater noise emission will occur when the reception pit is being excavated. The excavation of the pit and recovery of the tunnel boring machine are estimated to take 18 days and worst case noise levels will be limited to a fraction of this time.

#### **Habitat Loss**

##### *North Channel SAC*

Harbour porpoise are known to forage off Islandmagee, however the species are highly mobile with a wide foraging range and an ability to feed on a range of prey sources as such it is considered unlikely that the area of benthic habitat to be lost (approximately 153m<sup>2</sup> 0.000095% of the SAC) as a result of the proposed development is of significant value for foraging individuals of the species, in the context of the available habitat in the wider area.

##### *Proposed East Coast Marine SPA*

It is also noted that the proposed SPA is to cover an area of some 96,668 ha and within the context of this large area, seabed losses associated with the proposals are deemed unlikely to be significant in light of the conservation objectives for the site as all qualifying species are highly mobile, in the case of wintering bird populations and foraging breeding birds. In terms of breeding birds, all nesting habitat comprise terrestrial habitat on islands within the pSPA. 153m<sup>2</sup> of lost habitat represents 0.000016% of the SPA.

As such, the area of seabed (153m<sup>2</sup>) to be removed to accommodate the construction footprint of the proposed development within this UK National Site Network site is negligible and therefore it is considered that there is no risk to site integrity as a result of habitat loss associated with the proposed development.

#### **Collision Impacts**

The use of tall machinery and plant associated with the construction and operational phases of the proposed development, including a drill rig and cranes, in addition to the installation of a

permanent 40m high vent stack have potential to result in significant effects upon bird populations.

The potential for significant construction phase effects associated with bird collision to arise is considered to be minimal due, in part to the temporary nature of the construction phase which will involve the use of a drill rig and cranes for a period of 36 months only. However it is acknowledged that, there remains potential for collision associated with qualifying species during the construction phase. As there is a potential for collision mitigation measures must be prescribed to avoid a risk to the site integrity of Larne Lough SPA/Ramsar.

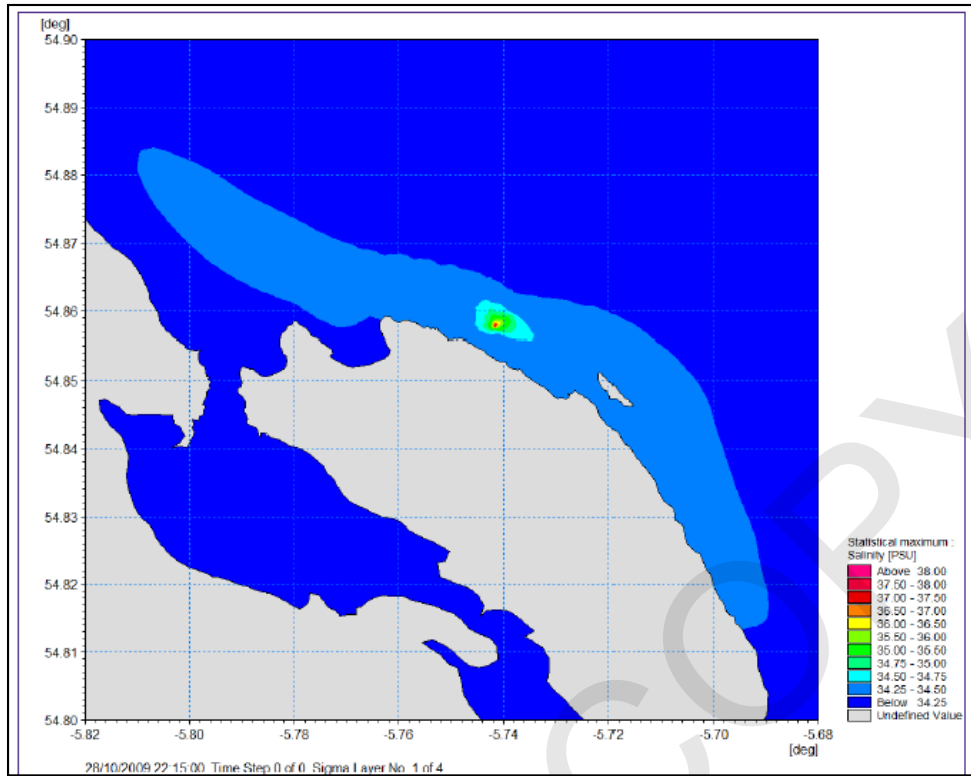
Construction cranes and the drill rig will be lit at night for safety reasons. It is additionally proposed that the vent stack be lit to reduce risk of bird collisions. Lighting will preferably be green as this has been shown to disorientate migrating birds less than red light (Poot *et al.*, 2008). Alternatively, white strobes which flash once every 2-3 seconds have been shown to repel birds and produce far fewer collisions than do solid or blinking red lights to which birds may be attracted on foggy, misty nights (Manville, 2000, Poot *et al.*, 2008). Red-lights shall be avoided on tall structures where possible.

Support vessels will be in operation during the seawater intake and outfall construction. This will be over a period of about 6 months. This vessel activity will not add significantly to the levels of vessel traffic already occurring with this SAC e.g. Larne, Belfast, Bangor, Carrickfergus and Portavogie port/marina/harbour traffic. The probability of a collision with a marine mammal is very low and therefore does not pose a risk to site integrity for North Channel SAC and The Maidens SAC.

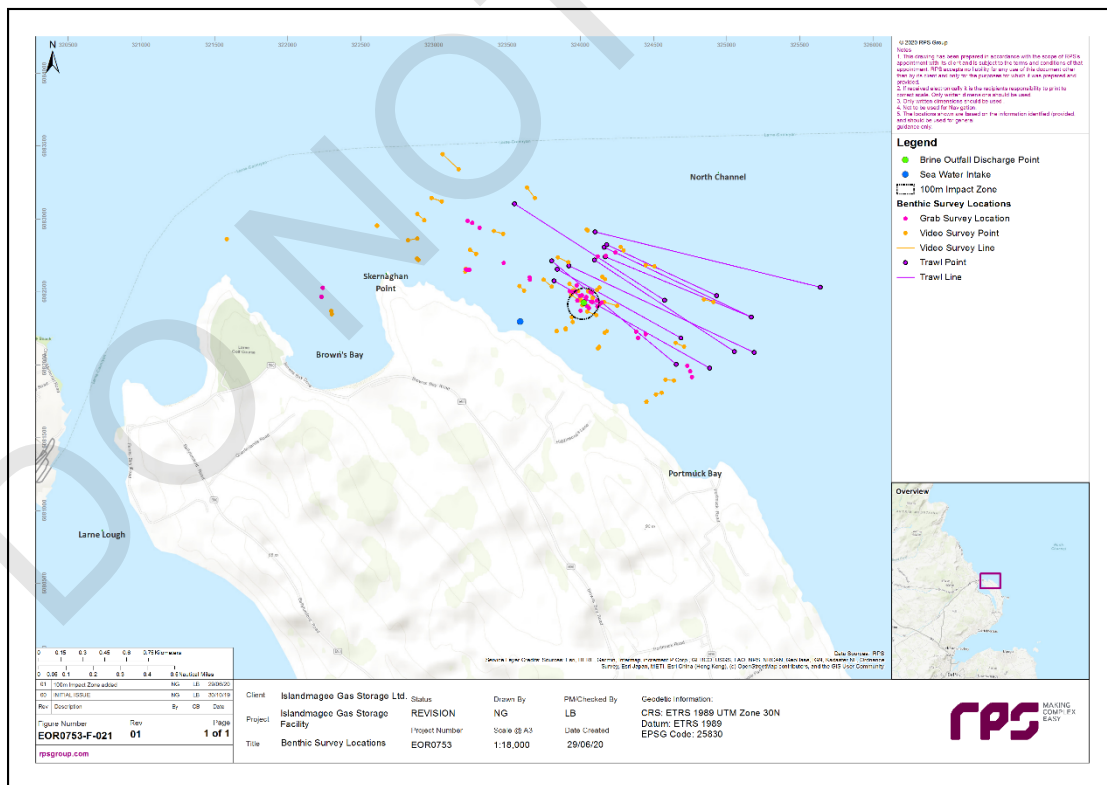
The impact footprints for the main effect mechanisms are summarised in table 9 for the designated sites within which they occur.

<b>Impact Footprint</b>	<b>North Channel SAC 1604km<sup>2</sup></b>	<b>East Coast Marine pSPA 96668ha (967km<sup>2</sup>)</b>
Marine construction 153m <sup>2</sup>	0.00001% (0.00004% sub-50m habitat)	0.000016%
Modelled brine 36PSU 9038m <sup>2</sup> (unmitigated)	0.00056% (0.00225% sub-50m habitat)	0.00093%
Mitigated Impact Zone 100m radius (max impact) 31429m <sup>2</sup> /0.314km <sup>2</sup>	0.002% (0.008% sub-50m habitat)	0.00325%
Underwater noise disturbance 60m radius 11314m <sup>2</sup> /0.0113km <sup>2</sup> )	0.0007% (0.003% sub-50m habitat)	N/A

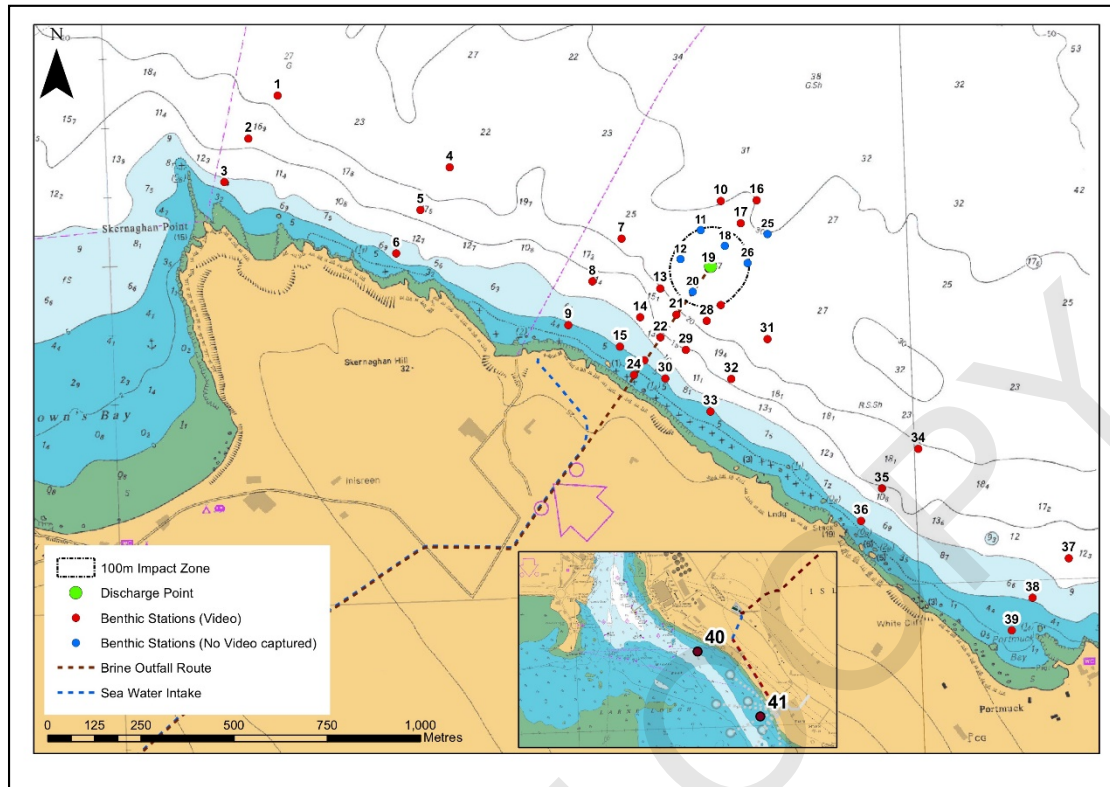
*Table 9: Summary table of impact areas for main effect mechanisms*



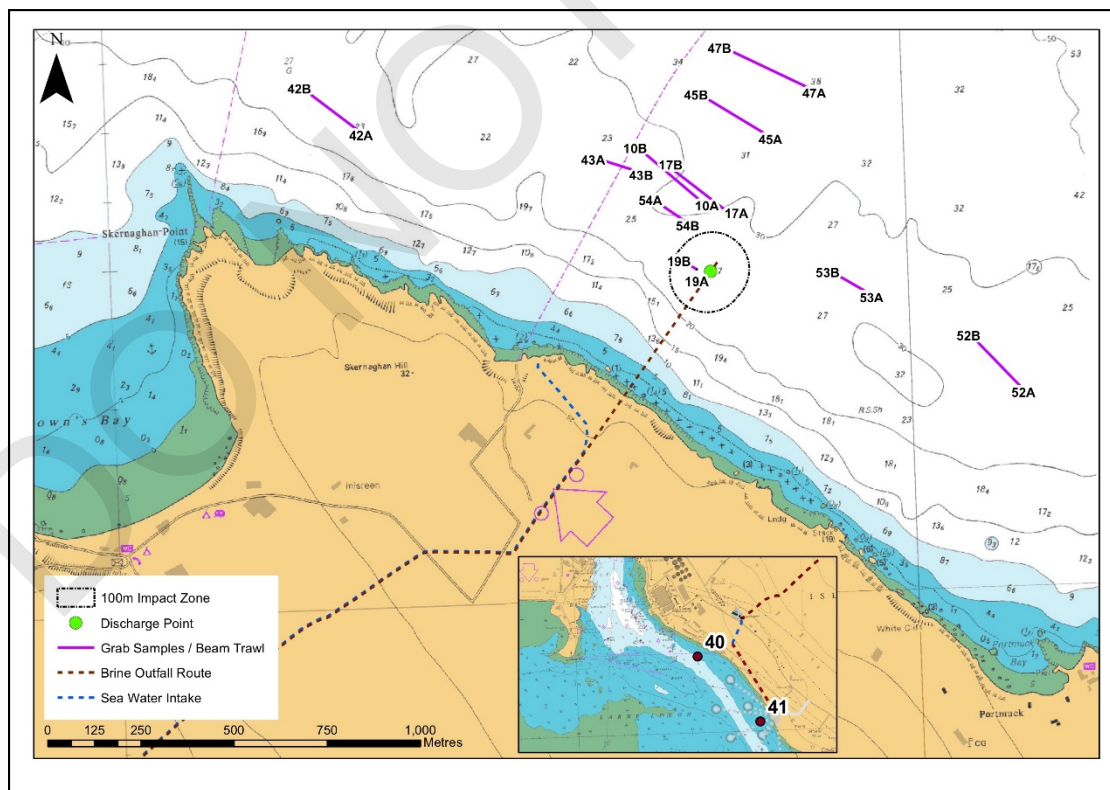
Map 9: Maximum salinity during a Spring-Neap tidal cycle (1,000m3/hr discharge) (Source: RPS (2019))



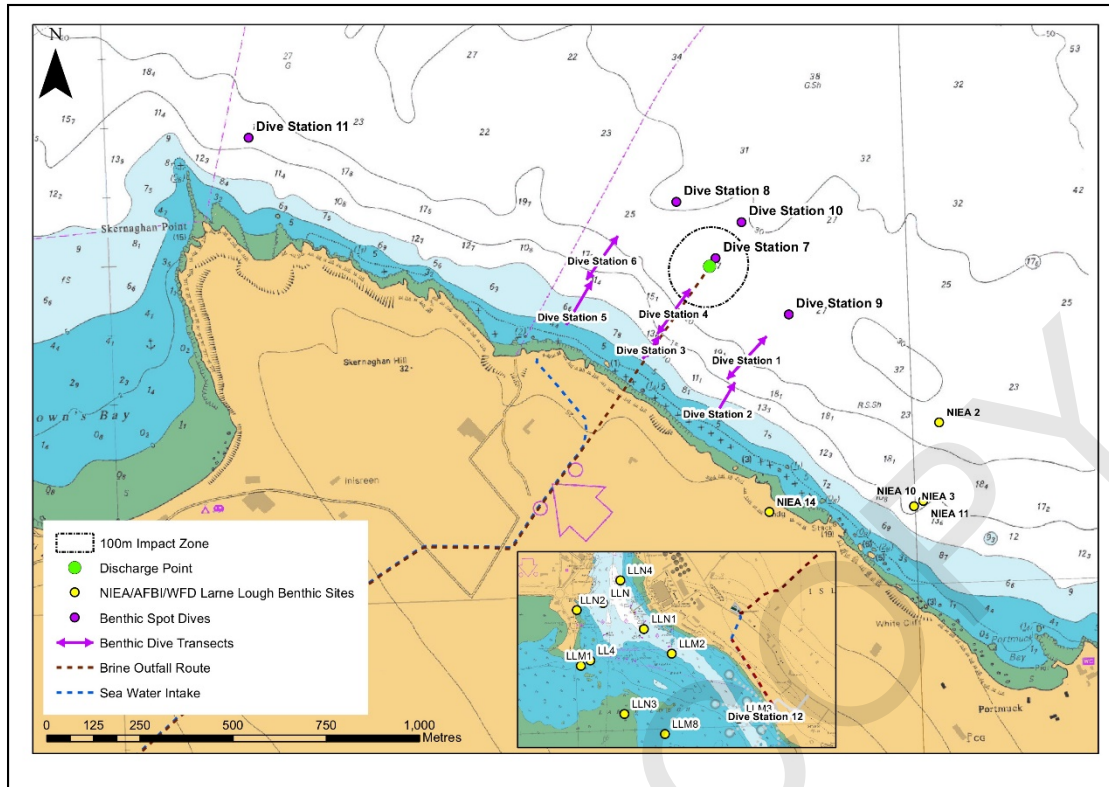
Map 10: Benthic survey locations (Source: RPS 2019)



Map 11: Benthic video stations (Source: RPS (2019))

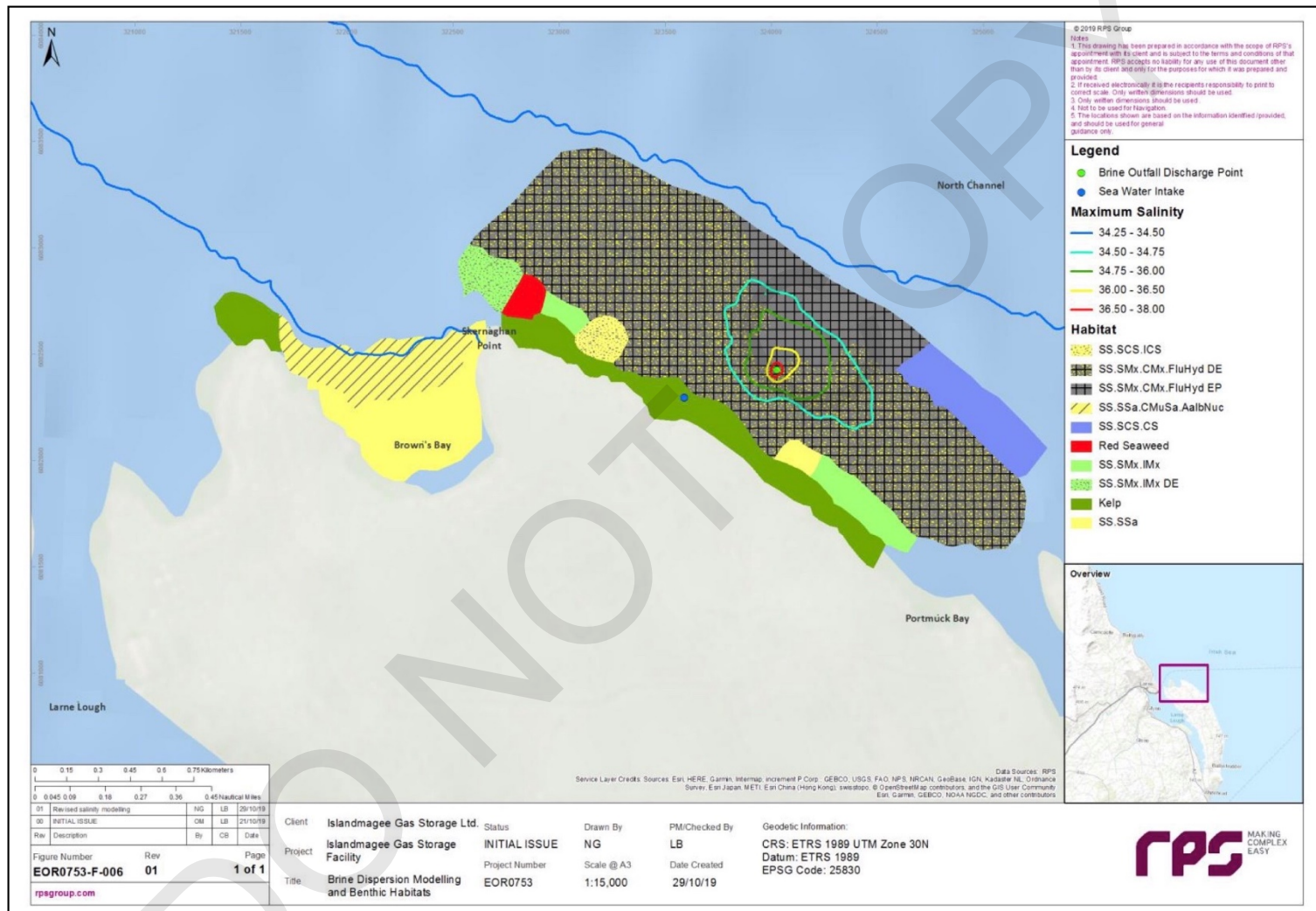


Map 12: Grab sample locations (Source: RPS (2019)).

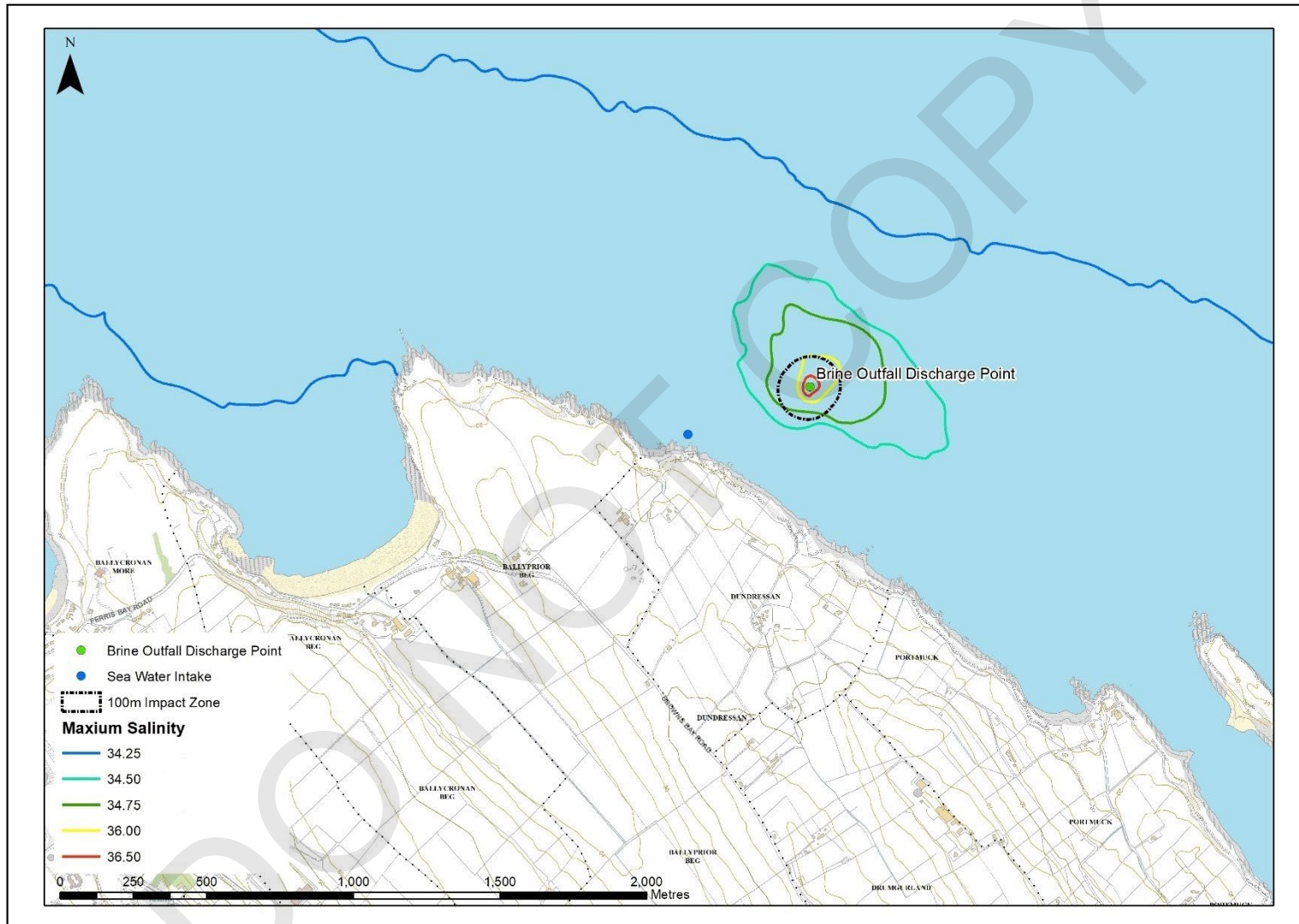


Map 13: Benthic dive sites (Source: RPS (2019))





Map 14: Benthic habitats with modelled maximum salinity values at seabed.



Map 15: 100m impact zone (Source: RPS)

**STAGE 2b: INTEGRITY TEST**

***What are the implications for the UK National Site Network sites of the Marine Construction Licence, discharge consent/abstraction licence being issued and what that might mean for the maintenance or restoration of favourable conservation status?***

For the effect mechanisms progressed through to appropriate assessment, the detailed assessment in Stage 2a (step 4) of this record has identified that:

- Brine discharge (water Quality and habitat deterioration) - **There is a risk to site integrity in the absence of mitigation measures for the following sites: North Channel SAC and the East Coast (NI) Marine SPA within which the brine discharge occurs, and Larne Lough SPA/Ramsar and The Maidens SAC which are linked through mobile species features.**
- Seawater Abstraction - **There is a risk to site integrity in the absence of mitigation measures for the following sites: North Channel SAC and the East Coast (NI) Marine SPA within which the seawater abstraction occurs, and Larne Lough SPA/Ramsar and The Maidens SAC which are linked through mobile species features.**
- Underwater Noise and Disturbance during construction - **There is a risk to site integrity in the absence of mitigation measures for the following sites: North Channel SAC.**
- Habitat Loss – the scale of habitat loss is not considered to represent a risk to site integrity. **There is no adverse effect to the integrity of any of the UK National Site Network site.**
- Collision Impact - **There is a risk to site integrity in the absence of mitigation measures for the following sites: Larne Lough SPA/Ramsar**

Having undertaken the appropriate assessment, sufficient information has been gathered to allow an informed assessment as to the implications for the designated sites if this proposed project is authorised. Within this section consideration is given to measures which can be adopted to mitigate any impacts on qualifying interests and how these may facilitate favourable conservation status.

Furthermore, Regulation 46(2) applies the provisions of regulation 43(5) and (6), and read as follows:

*‘43 (5) ‘In the light of the conclusions of the assessment, and subject to regulation 44, the authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the UK National Site Network site’.*

*43(6) ‘In considering whether a plan or project will adversely affect the integrity of the site, the authority shall have regard to the manner in which it is proposed to be carried out or to any*

*conditions or restrictions subject to which it proposed that the consent, permission or other authorisation should be given'.*

The developer has proposed mitigation into the construction phase which has to be considered.

#### Water quality and brine discharge

The existing planning consent for the Islandmagee Gas Storage Facility (F/2010/0092/F) included a number of conditions and informatives relating to the prevention of pollution:

- There shall be no discharge of suspended solids or any other deleterious matter to watercourses.
- During construction, release of suspended solids to all surface waters will be controlled by interception (e.g. silt traps) and management of site run-off. Any surface water run-off must be treated to ensure that it is free from suspended solids, oil or any other polluting materials.
- During construction, silty water shall be treated using silt trays/settlement ponds and temporary interceptors and traps will be installed until such time as permanent facilities are constructed.
- All fuels, lubricants and hydraulic fluids will be kept in secure bunded areas away from watercourses. The bunded area will accommodate 110% of the total capacity of the containers within it. Containers will be properly secured to prevent unauthorized access and misuse.
- As part of the Environmental Management Plan (EMP) to be drawn up at detailed design stage, an effective spillage procedure will be put in place with all staff properly briefed. Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of off-site in an appropriate manner.
- Fuelling and lubrication will not be conducted within 15m of the nearest storage areas, machinery depots and site offices will not be located within 15m of the nearest watercourse.
- Foul drainage from the site offices and facilities will be properly treated and removed to a suitable treatment facility.
- Spill kits will be made available and all staff will be properly trained on correct use.
- Disposal of raw or uncured waste concrete will be controlled to ensure that watercourses or other sensitive areas will not be impacted.
- Petrol and oil interceptors will be used to prevent contaminants entering the Lough and tidal ponds.
- All or any areas proposed as disposal/storage/recovery sites will be subject to ecological assessment as part of any applications for planning permission, waste permits or waste licenses.

The developer has proposed mitigation into the design and operation of the process which has to be considered.

- Brine outfall location;
- Diffuser jets;
- Ramp-down in discharge rate;

- Brine salinity control;
- Achieving EQS for non-salt compounds

The proposed outfall location for the brine discharge is 450m offshore within 27m water depth. Hydrodynamics in this part of the North Channel, along with output from the brine modelling undertaken by RPS, indicate sufficient dispersal of the brine plume at this location. As part of design mitigation, the developer proposes two 6 inch Tideflex diffuser pods pointing vertically upwards at 20m centres. This diffuser geometry is considered best practice and will allow for the best conditions, along with tidal flow, to facilitate mixing within the water column.

In addition, the rate of brine discharge is scheduled to increase in stages over time as the number of caverns increases. The range is from 250m<sup>3</sup>/hr at the initial start-up, up to a maximum level of 1000m<sup>3</sup>/hr. The proposed design of the brine leaching facilities allows for three potential discharge scenarios: 250m<sup>3</sup>/hr, 500m<sup>3</sup>/hr and 1,000m<sup>3</sup>/hr.

Considering this setup, it is predicted that the salinity of the brine at first contact with the seafloor will be between 50.5psu and 37.6psu (RPS, 2019). This results from salinity values in the region of 260psu at the discharge point. It is also anticipated that maximum salinities in excess of 36psu are not predicted to occur more than 100m from the diffusers under normal operations. Salinity levels greater than 40psu are only predicted to occur within 15m from the diffuser location. These measures would imply a relatively small area of seabed to be directly impacted by the brine discharge. There are safeguards built into the design of the leaching system that will ensure that brine discharge is operated within the permitted limits set by the NIEA.

Furthermore, all non-salt compounds to be contained within the brine discharge are predicted to be well within current environmental quality standards (EQS) for each parameter. These are shown in Table 10 below.

Substance*	Max (ug/l)	Min (ug/l)	Mean (ug/l)	EQS in seawater (ug/l)
Cadmium (Total and dissolved its compounds)	0.36	0.07		2.5
Mercury (Total and dissolved an compounds)	0.02	0.02		0.3
Arsenic (Dissolved)	1.80	0.90	1.17	25
Boron (Total) (mg/l)	3.81	3.60	3.68	7000
Chromium (Total and dissolved)	1.0	1.0	1.0	15
Copper (Total and dissolved)	1.70	0.80	1.35	5
Lead	2.20	0.50	1.52	25
Nickel (Total and dissolved)	3.40	1.10	2.05	30
Zinc (Total and dissolved)	4.40	1.10	2.65	40

Table 10 \*The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015 against EQS

In consideration of all available information, controls by the regulator within the licence conditions allow for potentially adverse effects from brine discharge to be mitigated. These include:

- Setting standards with the consent to discharge;
- Compliance monitoring requirements;
- Time constraint from when discharge begins

Consideration was given to current best practice in relation to permitted salinity levels within coastal waters. The scientific literature indicates that salinities in excess of 40psu at the seabed are likely to be lethal to all sessile marine organisms, with the potential for areas of seabed subjected to long-term elevated salinities to become devoid of life. Even salinities between 36psu and 40psu are known to cause mortality for some sensitive species.

It has been determined that the background salinity levels in proximity to the proposed discharge location at Islandmagee are in the region of 30.5psu to 34.8psu. A strict standard of 36psu within 100m of the discharge location will ensure best environmental practice and limit impacts on the benthic environment to the vicinity of the diffusers (within 100m). This would result in a maximum impacted zone of 0.0354km<sup>2</sup> with salinities greater than 36psu, representing 0.002% of the North Channel SAC (total area 1,604km<sup>2</sup>) or 0.00325% of the Proposed East Coast (NI) Marine SPA (total area 966.68km<sup>2</sup>). The impact zone does not fall within either Larne Lough SPA or The Maidens SAC. No significant effects are envisaged on qualifying interests of these sites.

The regulatory authority can also request ongoing in-situ environmental monitoring to ensure compliance with the discharge consent standards. This can be undertaken in the form of telemetry-mounted buoys strategically placed within proximity to the discharge location. They would monitor in real time parameters of interest, such as dissolved oxygen and salinity. There would also be an automatic shut-off of brine discharge in the event that parameter alarms were triggered. Alarm levels would be set at salinity >36psu for 5 minutes, and dissolved oxygen <6mg/l for 5 minutes. An approved EMP will be required before any discharge can commence, the EMP will include the locations of all monitoring telemetry buoys and associated depths of sensors. This will be a condition in the Marine Licence and the Consent to Discharge.

The discharge consent will be issued to cover the leaching and maintenance only. This time period will ensure that any impacts on benthic habitats within vicinity of the discharge location will be relatively short-lived and will avoid any long-term permanent impacts to the seafloor environment.

Based on the modelled brine discharge output and the preceding literature review, it would appear that there are likely to be impacts on marine benthos within proximity to the proposed brine outfall location. However, these habitats and associated benthos are not listed as qualifying interests of the designated sites and do not have an adverse effect on the associated feature species for the purpose of Article 6(3) of the Habitats Directive.

Furthermore, guidance from the Commission stipulates that 'it is clear from the context and from the purpose of the Directive that the 'integrity of a site' relates to the site's conservation objectives'. In this regard, the qualifying interests are all highly mobile, particularly grey seal and

harbour porpoise, but also the bird species and associated assemblages. Whilst benthic habitats within 100m of the proposed outfall location will be significantly impacted by the brine effluent, they do not form part of the qualifying interests of the designated sites, then the site's integrity cannot be considered to be adversely affected.

#### Seawater abstraction

To reduce entrainment of prey items a mesh screen will be installed comprising a mesh size of 12mm. Flow rates will be conditioned to not exceed 0.15m/s at the screen.

As stated for the brine discharge above, the qualifying interests are all highly mobile, particularly grey seal and harbour porpoise, but also the bird species and associated assemblages. Whilst prey items may become entrained within the abstracted seawater, they do not form part of the qualifying interests of the designated sites and as there will not be an adverse effect on the associated feature species, then the site's integrity cannot be considered to be adversely affected.

#### Noise and disturbance

Marine Mammal Observers (MMOs) will be employed during the construction phase of the seawater intake and brine outfall when there is potential to generate underwater noise. MMOs will also be employed during the decommissioning phase. The MMOs will ensure, through pre-planned communication channels that noise generating construction activity does not commence whilst a marine mammal (cetacean or seal) is in close vicinity to the works. The extent of an appropriate exclusion zone will be agreed with the Licensing Authority in advance of the construction works and the contractor will only be allowed to commence works after the MMO has undertaken a 30 minute pre-watch, during daylight hours and suitable sea state, and has confirmed the absence of marine mammals from the exclusion zone.

#### Collision risks

Construction cranes and the drill rig will be lit at night for safety reasons. It is additionally proposed that the vent stack be lit to reduce risk of bird collisions. Lighting will preferably be green as this has been shown to disorientate migrating birds less than red light (Poot *et al.*, 2008). Alternatively, white strobes which flash once every 2-3 seconds have been shown to repel birds and produce far fewer collisions than do solid or blinking red lights to which birds may be attracted on foggy, misty nights (Manville, 2000, Poot *et al.*, 2008). Red-lights shall be avoided on tall structures where possible.

An overview of the conservation objectives of each of the designated sites and the associated qualifying interests is outlined below, along with a statement of likely effects on qualifying interests is presented below.

#### **Proposed East Coast (NI) Marine SPA**

The conservation objectives of the Proposed East Coast (NI) Marine SPA is to maintain or enhance the population of the qualifying species of all listed bird species listed in Table 2 (except for Light-



bellied Brent Goose and the Roseate Tern), to maintain or enhance the range of habitats utilised by the qualifying species, to ensure that site integrity is maintained, and to ensure that there is no significant disturbance of the species.

Likely significant effects were identified in respect of the brine discharge, seawater abstraction, habitat loss and collision impacts. Following an appropriate assessment, and assuming that all necessary mitigation measures are secured by means of conditions or restrictions, the outcome of the integrity test for each effect mechanism is set out below.

Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate.

Seawater abstraction – no adverse effect if licence conditions are prescribed for screening and abstraction flow rate.

Underwater noise and disturbance – no adverse effect.

Habitat loss – no adverse effect.

Collision impacts – no adverse effect.

***With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.***

#### **North Channel SAC**

The conservation objectives of the North Channel SAC is to ensure that for harbour porpoise (subject to natural change), the species remains a viable component of the site, there is no significant disturbance of the species, and the supporting habitats and processes relevant to the species and its prey are maintained.

Likely significant effects were identified in respect of the brine discharge, seawater abstraction, underwater noise and disturbance, habitat loss and collision impact. Following an appropriate assessment, and assuming that all necessary mitigation measures are secured by means of conditions or restrictions, the outcome of the integrity test for each effect mechanism is set out below.

Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate

Seawater abstraction – no adverse effect if licence conditions are prescribed for screening and abstraction flow rate

Underwater noise and disturbance – no adverse effect if licence conditions are prescribed for use of Marine Mammal Observer during noisy operations

Habitat loss – no adverse effect

Collision impacts – no adverse effect

***With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.***

#### **Larne Lough SPA (and Ramsar site)**

The conservation objectives of the Larne Lough SPA and Ramsar site is to maintain or enhance the population of the qualifying species for four bird species listed in Table 2 (Light-bellied Brent Goose, Roseate Tern, Sandwich Tern and Common Tern), to maintain or enhance the range of habitats utilised by the qualifying species, to ensure that site integrity is maintained, and to ensure that there is no significant disturbance of the species.

Likely significant effects were identified in respect of the brine discharge, seawater abstraction and collision impact. Following an appropriate assessment, and assuming that all necessary mitigation measures are secured by means of conditions or restrictions, the outcome of the integrity test for each effect mechanism is set out below.

Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate.

Seawater abstraction – no adverse effect if licence conditions are prescribed for screening and abstraction flow rate.

Underwater noise and disturbance – no adverse effect.

Habitat loss – no adverse effect.

Collision impacts – no adverse effect if licence conditions are prescribed for lighting of tall structures and equipment.

***With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.***

#### ***The Maidens SAC***

The conservation objectives of the Maidens SAC is to maintain population numbers and distribution of grey seals, to maintain and enhance, as appropriate, physical features used by Grey seals within the site, and to maintain and enhance, as appropriate, the extent of the reefs.

Likely significant effects were identified in respect of the brine discharge, seawater abstraction and collision impact. Following an appropriate assessment, and assuming that all necessary mitigation measures are secured by means of conditions or restrictions, the outcome of the integrity test for each effect mechanism is set out below.

Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate

Seawater abstraction – no adverse effect if licence conditions are prescribed for screening and abstraction flow rate

Underwater noise and disturbance – no adverse effect (licence conditions prescribed for use of Marine Mammal Observer during noisy operations will address requirements under Wildlife (Northern Ireland) Order 1985 (as amended))

Habitat loss – no adverse effect

Collision impacts – no adverse effect

***With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.***

**The assessment conclusions provided above are conditional upon the following mitigation measures being secured by means of conditions or restrictions subject to which any consent might be granted:**

Brine discharge licence conditions:

- brine concentration max 260psu
- flow rate max 1000m<sup>3</sup> per hour
- temperature max 22<sup>o</sup>c
- salinity max 36psu at 100m from diffusers

Seawater abstraction:

- screening 12mm mesh
- abstraction flow rate max 0.15m/s at screen

Underwater noise and disturbance:

- Marine Mammal Observer present during key noisy activities

Habitat loss:

- none

Collision impacts:

- lighting of tall structures and equipment

All the mitigation requirements that have been identified within this HRA are included as conditions within the appropriate licences (Marine Licence ML28-12, Consent to Discharge TC041/20, Abstraction Licence AIL\_2012\_033) can be found in Annex 3.

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Annex 1

Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)					
Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
Proposed East Coast (NI) Marine SPA	<ul style="list-style-type: none"> <li>Great Crested Grebe</li> <li>Red-throated Diver</li> <li>Sandwich Tern</li> <li>Common Tern</li> <li>Arctic Tern</li> <li>Manx Shearwater</li> <li>Eider Duck</li> </ul>	<ul style="list-style-type: none"> <li>To maintain or enhance the population of the qualifying species</li> <li>To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>To ensure that the integrity of the site is maintained;</li> <li>To ensure there is no significant disturbance of the species and</li> </ul> <p>To ensure that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>Population of the species as a viable component of the site</li> <li>Distribution of the species within site</li> <li>Distribution and extent of habitats supporting the species</li> <li>Structure, function and supporting processes of habitats supporting the species.</li> </ul>	<p>Changes in salinity at outfall</p> <p>Sediment plumes due to excavation</p> <p>Abstraction impacts</p> <p>Habitat loss (construction)</p> <p>Collision with plant and tall machinery</p>	<p>Foraging reduction</p>    <p>Mortality or impact from collision.</p>	<p>Proposed SPA is to cover an area of some 96,668 ha and within the context of this large area, seabed losses associated with the proposals are deemed unlikely to be significant in light of the conservation objectives for the site as all qualifying species are highly mobile, in the case of wintering bird populations and foraging breeding birds. In terms of breeding birds, all nesting habitat comprise terrestrial habitat on islands within the pSPA. However in order to be precautionary a number of mechanisms have been retained for further evaluation.</p> <p>It is acknowledged that there remains potential for impacts on foraging of qualifying species so <b>the brine discharge cannot be concluded to have no LSE.</b></p> <p>Due to their short duration and negligible extent, relative to the size of the site, <b>sediment plumes will not represent a risk to site integrity.</b></p> <p>It is acknowledged that there remains potential for impacts on foraging of qualifying species so <b>the seawater abstraction cannot be concluded to have no LSE.</b></p> <p>The area of seabed which will be removed to accommodate the construction footprint of the proposed development within these UK National Site Network sites (approximately 0.013% of SPA) is negligible but as it is the <b>permanent loss of 153m<sup>2</sup> of benthic habitat, it cannot be concluded to have no LSE.</b></p>

**Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)**

Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
					<p>The potential for significant construction phase effects associated with bird collision to arise is considered to be minimal due, in part to the temporary nature of the construction phase which will involve the use of a drill rig and cranes for a period of 36 months only, in addition to the location of the proposed works, which will be undertaken within Larne Lough and as such will have little potential to result in significant effects upon truly marine species such as Manx shearwater <i>Puffinus puffinus</i>. The least agile species are also potentially the least likely to encounter the structures on their normal flight paths. The installation of a 40m vent stack has potential to increase the risk of bird collisions on a permanent basis again however it is considered that the nature of this structure, in addition to its location within the SPA, will not give rise to a significantly increased risk of collision by bird species utilizing the SPA.</p> <p>However it is acknowledged that, there remains potential for collision associated with qualifying species during the construction phase so <b>collision cannot be concluded to have no LSE.</b></p>

**Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)**

Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
North Channel SAC	Harbour porpoise	<p>To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:</p> <ol style="list-style-type: none"> <li>1. The species is a viable component of the site.</li> <li>2. There is no significant disturbance of the species.</li> <li>3. The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.</li> </ol>	Changes in salinity at outfall	Direct impact on mortality or secondary impact due to localised changes in benthic habitats and the food chain.	<p><b>Direct impacts will not result in mortality.</b></p> <p><b>Secondary localised impacts due to high levels of salinity and dispersed lower levels of salinity cannot be concluded to have no LSE.</b></p>
			Underwater noise during constructional drilling (over 6 month period)	<p>Temporary displacement and foraging reduction during drilling.</p> <p>Auditory injury due to exceedance of TTS and PTS limits.</p>	<p><b>LSE cannot be excluded since the noise/disturbance has the potential to impact on feeding behaviour.</b></p> <p>The temporary injury zone is calculated to be 16m. In the context of constructional works occurring in the marine environment, this is a low level impact. The most relevant site conservation objective is 2. <b>There is potential for LSE, although risk is low.</b></p>
			Sediment plumes due to excavation	<p>Short-lived impact (4-5 tidal cycles) over a small area. –leading to temporary disturbance.</p>	<p>Porpoises feed mainly on small shoaling fish, such as herring, but may also feed upon prey taken at or close to the seabed. As Harbour Porpoises use a series of high frequency clicks for echo-location during navigation and hunting, they are less susceptible to the impacts of suspended sediment plumes during foraging and are</p>

**Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)**

Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
					<p>routinely found in inshore areas of high natural turbidity (e.g. southern North Sea, Liverpool Bay in the Irish Sea).</p> <p><b>It is considered that temporary increase in suspended sediments will not cause any likely significant effects upon the feature species of The North Channel SAC (Harbour Porpoise).</b></p>
			Collision with plant and vessels during construction	Mortality or injury from collision.	<b>Potential LSE. Although risk considered to be low in terms of mortality from collision.</b>
			Seawater abstraction	Potential impacts from the water abstraction include sea life becoming entrained on the intake structures. This in turn may affect Harbour Porpoise in the SAC by limiting prey availability.	<b>LSEs due to prey reduction cannot be excluded for the seawater abstraction in the absence of mitigation.</b>

**Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)**

Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
Larne Lough SPA/ Ramsar  (including subsumed Swan Island SPA)	<ul style="list-style-type: none"> <li>Sandwich Tern</li> <li>Roseate Tern</li> <li>Common Tern</li> <li>Light-bellied Brent Goose</li> </ul>	<ul style="list-style-type: none"> <li>To maintain or enhance the population of the qualifying species</li> <li>Fledging success sufficient to maintain or enhance population</li> <li>To maintain or enhance the range of habitats utilised by the qualifying species</li> <li>To ensure that the integrity of the site is maintained;</li> <li>To ensure there is no significant disturbance of the species and</li> </ul> <p>To ensure that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>Population of the species as a viable component of the site</li> <li>Distribution of the species within site</li> <li>Distribution and extent of habitats supporting the species</li> <li>Structure, function and supporting processes of habitats supporting the species.</li> </ul>	<p>Changes in salinity at outfall</p> <p>Sediment plumes due to excavation</p> <p>Abstraction impacts</p> <p>Collision with plant and tall machinery</p>	<p>Foraging reduction</p> <p>Mortality or impact from collision.</p>	<p>The impact zone does not fall within Larne Lough SPA/Ramsar. No LSEs are envisaged on qualifying interests of these sites.</p> <p><b>Secondary localised impacts due to high levels of salinity and dispersed lower levels of salinity cannot be concluded to have no LSE.</b></p> <p><b>LSEs due to prey reduction cannot be excluded for the seawater abstraction in the absence of mitigation.</b></p>

**Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)**

Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
The Maiden's SAC	Grey Seal	<ul style="list-style-type: none"> <li>• Maintain (and if feasible enhance) population numbers and distribution of Grey Seal.</li> <li>• Maintain and enhance, as appropriate, physical features used by Grey Seals within the site</li> </ul>	Changes in salinity at outfall	Direct impact on mortality or secondary impact due to localised changes in the food chain.	<p><b>Localised impacts on food webs due to high levels of salinity and dispersed lower levels of salinity cannot be concluded to have no LSE.</b></p> <p><b>There will be no direct impact on Grey Seals.</b></p>
			Underwater noise during constructional drilling (over 6 month period)	<p>Temporary displacement during drilling.</p> <p>Auditory injury due to exceedance of TTS and PTS limits.</p> <p>Foraging reduction</p>	<p><b>Based on the impacts of noise disturbance on Grey Seals a LSE is discounted.</b></p> <p>Sound levels are not high enough to cause injury.</p> <p>Disturbance is temporary and has a very small footprint and a large foraging area is available.</p>
			Sediment plumes due to excavation	Short-lived impact (4-5 tidal cycles) over a small area. –leading to temporary disturbance.	<b>It is considered that temporary increase in suspended sediments will not cause any likely significant effects upon the feature species of The Maidens SAC (Grey Seal).</b>
			Collision with plant and vessels during construction	Mortality or injury from collision.	<b>The likelihood of a collision is very low. A LSE is discounted.</b>
	Annex 1 Habitats	<ul style="list-style-type: none"> <li>• Maintain and enhance, as appropriate the extent of the reefs</li> <li>• Allow the natural processes which determine the development, structure, function and distribution of the</li> </ul>	Changes in salinity at outfall	Habitat Deterioration effects.	<b>The impact zone does not fall within The Maidens SAC. No significant effects on qualifying interests of these sites.</b>



**Table 1A: Quality Assurance of the screening assessment and summary of conclusions (screened in sites)**

Site	Feature	Objectives	Mechanism	Potential Impact	Consideration of LSE
		<p>habitats associated with the reefs, to operate appropriately.</p> <ul style="list-style-type: none"> <li>• Maintain the extent and volume of sandbanks which are slightly covered by seawater all the time, subject to natural processes.</li> <li>• Allow the natural processes which determine the development, structure and extent of sandbanks which are slightly covered by sea water all the time, to operate appropriately</li> <li>• Maintain and enhance, as appropriate, the viability, distribution and diversity of typical species within this habitat.</li> </ul>			

**Table 1B: Quality Assurance of the screening assessment and summary of conclusions (screened out sites)**

Sites	Features overview	Objectives summary	Mechanisms summary	Potential Impacts summary	Consideration of LSE
Belfast Lough SPA [UK9020101]	Waders & Terns	Refer to Table 2 for individual site objectives	Collisions with structures and vessels.	Aerial and underwater collisions causing injury or death.	<p>All of the sites listed in this table are more than 12km from the abstraction and brine outfall discharge points. All of the risks are considered to be too far away to have a significant effect on the designated site features.</p> <p>The remaining sites that were screened in (see Table 1A), are considerably closer to the development site and have many features in common with those sites that have been screened out. These include a range of habitats and supporting habitats, wildfowl, waders, terns and other seabirds, Grey Seal and Harbour Porpoise. Appropriate Assessment of those screened in sites has confirmed the decision to screen out the sites included in this table (Table 1B).</p>
Belfast Lough Ramsar Site [UK12002]	Wildfowl and waders	<p><b>Species</b></p> <ul style="list-style-type: none"> <li>To maintain or enhance the population of the qualifying species;</li> <li>To maintain or enhance the range of habitats utilised by the qualifying species</li> </ul>	Habitat loss	Loss of habitat providing feeding.	
Belfast Lough Open Water SPA [UK9020290]	Great Crested Grebe	<ul style="list-style-type: none"> <li>To ensure that the integrity of the site is maintained;</li> <li>To ensure there is no significant disturbance of the species and</li> </ul>	Sediment plumes	Loss of visibility reducing feeding opportunities and smothering habitat.	
Outer Ards SPA [UK9020271]	Waders, Terns & Brent Goose	<ul style="list-style-type: none"> <li>To ensure that the following are maintained in the long term:                             <ul style="list-style-type: none"> <li>Population of the species as a viable component of the site</li> <li>Distribution of the species within site</li> <li>Distribution and extent of habitats supporting the species</li> <li>Structure, function and supporting processes of habitats supporting the species</li> </ul> </li> </ul>	Noise/disturbance	Loss of feeding opportunities and impacts on energy budgets.	
Strangford Lough SAC [UK0016618]	Shoreline, inter-tidal and sub-tidal habitats. Common Seal		Liquid effluent and spillages	Oil/fuel pollution incident	
Strangford Lough SPA [UK9020111]	Wildfowl, waders & terns		Abstraction impacts.	Removal of prey.	
Copeland Island SPA [UK9020291]	Breeding seabirds		Brine discharge impacts	Loss of habitat and deterrence of fauna.	
Ailsa Craig SPA [UK9003091]	Breeding seabirds	<ul style="list-style-type: none"> <li>Avoid significant risk from injury or killing</li> <li>Ensure availability of prey</li> </ul>			

Table 1B: Quality Assurance of the screening assessment and summary of conclusions (screened out sites)					
Sites	Features overview	Objectives summary	Mechanisms summary	Potential Impacts summary	Consideration of LSE
Skerries and Causeway SAC [UK0030383]  Treshnish Isles SAC [UK0030289]  Inner Hebrides and the Minches SAC [UK0030393]  North Anglesey Marine SAC [UK0030398]	Sub-tidal habitats, Harbour Porpoise  Reefs, Grey Seal  Harbour Porpoise  Harbour Porpoise	<p><b>Habitats</b> To ensure for the qualifying habitat that the following are maintained in the long term:</p> <ul style="list-style-type: none"> <li>• Extent of the habitat on site</li> <li>• Distribution of the habitat withinsite</li> <li>• Structure and function of the habitat</li> <li>• Processes supporting the habitat</li> <li>• Distribution of typical species of the habitat</li> <li>• Viability of typical species as components of the habitat</li> <li>• No significant disturbance of typical species of the habitat</li> </ul>			

**Annex 2:**

**Table 2: Quality Assurance of the appropriate assessment and integrity test and summary of conclusions**

Feature	Mechanism of LSE impact	Assessment of potential adverse effect	Evidence Base/ Supporting Reference	Conclusion
North Channel SAC				
Harbour Porpoise	Brine discharge, Seawater abstraction, Underwater noise, Habitat loss and Collision.	<p>Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate.</p> <p>Seawater abstraction – no adverse effect if licence conditions are prescribed for screening and abstraction flow rate.</p> <p>Underwater noise and disturbance – no adverse effect if licence conditions are prescribed for use of Marine Mammal Observer during noisy operations.</p> <p>Habitat loss – no adverse effect</p> <p>Collision impacts – no adverse effect</p>	<p>Brine discharge</p> <p>It has been determined that the background salinity levels in proximity to the proposed discharge location at Islandmagee are in the region of 30.5psu to 34.8psu. A strict standard of 36psu within 100m of the discharge location will ensure best environmental practice and limit impacts on the benthic environment to the vicinity of the diffusers (within 100m). This would result in a maximum impacted zone of 0.0354km<sup>2</sup> with salinities greater than 36psu, representing 0.002% of the North Channel SAC (total area 1,604km<sup>2</sup>). No significant effects are envisaged on qualifying interests of this site.</p> <p>Brine discharge licence conditions:</p> <ul style="list-style-type: none"> <li>• brine concentration max 260psu</li> <li>• flow rate max 1000m<sup>3</sup> per hour</li> <li>• temperature max 220c</li> <li>• salinity max 36psu at 100m from diffusers</li> </ul> <p>Seawater abstraction</p> <p>To reduce entrainment of prey items a mesh screen will be installed comprising a mesh size of 12mm. Flow rates will be conditioned to not exceed 0.15m/s at the screens.</p> <p>Harbour Porpoises are highly mobile. Whilst prey items may become entrained within the</p>	With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.

			<p>abstracted seawater, they do not form part of the qualifying interests of the designated sites and as there will not be an adverse effect on the associated feature species, then the site's integrity cannot be considered to be adversely affected.</p> <p><b>Underwater noise</b>          For Harbour Porpoise the disturbance zone extends to 60m and the temporary injury zone is limited to 16m from the noise source. The disturbance temporary injury zone is small and will have limited environmental impact. This impact will have a maximum duration of 18 days.</p> <p>Marine Mammal Observers (MMOs) will be employed during the construction phase of the seawater intake and brine outfall when there is potential to generate underwater noise. MMOs will also be employed during the decommissioning phase. The MMOs will ensure, through pre-planned communication channels that noise generating construction activity does not commence whilst a marine mammal (cetacean or seal) is in close vicinity to the works. The extent of an appropriate exclusion zone will be agreed with the Licensing Authority in advance of the construction works and the contractor will only be allowed to commence works after the MMO has undertaken a 30 minute pre-watch, during daylight hours and suitable sea state, and has confirmed the absence of marine mammals from the exclusion zone.</p> <p>Habitat loss</p>	
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			<p>Harbour Porpoise are highly mobile with a wide foraging range and an ability to feed on a range of prey sources and it is considered unlikely that the area of benthic habitat to be lost (approximately 153m<sup>2</sup> 0.000095% of the SAC) as a result of the proposed development is of significant in the context of the available habitat in the wider area.</p> <p>Collision impacts Vessel traffic will mainly be associated with the 6 months period within which the intake and discharge</p>	
<b>The Maidens SAC</b>				
Grey Seal	<p>Brine discharge</p> <p>Seawater abstraction</p>	<p>Direct impact on mortality or secondary impact due to localised changes in the food chain.</p> <p>Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate.</p>	<p>Brine discharge</p> <p>Background salinity levels in proximity to the proposed discharge location at Islandmagee are in the region of 30.5psu to 34.8psu. A strict standard of 36psu within 100m of the discharge location will ensure best environmental practice and limit impacts on the benthic environment to the vicinity of the diffusers (within 100m). This would result in a maximum impacted zone of 0.0354km<sup>2</sup> with salinities greater than 36psu. The impact zone does not fall within The Maidens SAC. No significant effects are envisaged on qualifying interests of this site.</p> <p>Brine discharge licence conditions:</p> <ul style="list-style-type: none"> <li>• brine concentration max 260psu</li> <li>• flow rate max 1000m<sup>3</sup> per hour</li> <li>• temperature max 220c</li> <li>• salinity max 36psu at 100m from diffusers</li> </ul>	<p>With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.</p>

			<p>Seawater abstraction</p> <p>To reduce entrainment of prey items a mesh screen will be installed comprising a mesh size of 12mm. Flow rates will be conditioned to not exceed 0.15m/s at the screens.</p> <p>Grey Seals are highly mobile. Whilst prey items may become entrained within the abstracted seawater, they do not form part of the qualifying interests of the designated sites and as there will not be an adverse effect on the associated feature species, then the site's integrity cannot be considered to be adversely affected.</p>	
Proposed East Coast (NI) Marine SPA				
<ul style="list-style-type: none"> <li>• Great Crested Grebe</li> <li>• Red-throated Diver</li> <li>• Sandwich Tern</li> <li>• Common Tern</li> <li>• Arctic Tern</li> <li>• Manx Shearwater</li> <li>• Eider Duck</li> </ul>	<p>Brine discharge</p> <p>Seawater abstraction</p> <p>Collision with plant and tall machinery</p>	<p>Brine discharge – no adverse effect if licence conditions are prescribed for brine concentration, temperature and flow rate.</p> <p>The potential for significant construction phase effects associated with bird collision to arise is considered to be minimal due, in part to the temporary nature of the construction phase which will involve the use of a drill rig and cranes for a period of 36 months only, in addition to the location of the proposed works, which will be undertaken within Larne Lough and as such will have little potential to result in significant effects upon truly marine species such as Manx shearwater Puffinus puffinus. Mitigation measures will also be put in place to decrease the likelihood of collisions occurring.</p>	<p>Brine discharge</p> <p>Background salinity levels in proximity to the proposed discharge location at Islandmagee are in the region of 30.5psu to 34.8psu. A strict standard of 36psu within 100m of the discharge location will ensure best environmental practice and limit impacts on the benthic environment to the vicinity of the diffusers (within 100m). This would result in a maximum impacted zone of 0.0354km<sup>2</sup> with salinities greater than 36psu, representing 0.00325% of the Proposed East Coast (NI) Marine SPA (total area 966.68km<sup>2</sup>). No significant effects are envisaged on qualifying interests of this site.</p> <p>Brine discharge licence conditions:</p> <ul style="list-style-type: none"> <li>• brine concentration max 260psu</li> <li>• flow rate max 1000m<sup>3</sup> per hour</li> <li>• temperature max 220c</li> </ul>	<p>With the adoption of all required control measures, it is possible to conclude that there will be no adverse effect on the integrity of the site.</p>



			<ul style="list-style-type: none"> <li>• salinity max 36psu at 100m from diffusers</li> </ul> <p>Seawater abstraction To reduce entrainment of prey items a mesh screen will be installed comprising a mesh size of 12mm. Flow rates will be conditioned to not exceed 0.15m/s at the screens.</p> <p>Birds are highly mobile. Whilst prey items may become entrained within the abstracted seawater, they do not form part of the qualifying interests of the designated sites and as there will not be an adverse effect on the associated feature species, then the site's integrity cannot be considered to be adversely affected.</p> <p>Collision Construction cranes and the drill rig will be lit at night for safety reasons. It is additionally proposed that the vent stack be lit to reduce risk of bird collisions. Lighting will preferably be green as this has been shown to disorientate migrating birds less than red light (Poot et al., 2008). Alternatively, white strobes which flash once every 2-3 seconds have been shown to repel birds and produce far fewer collisions than do solid or blinking red lights to which birds may be attracted on foggy, misty nights (Manville, 2000, Poot et al., 2008). Red-lights shall be avoided on tall structures where possible.</p>	
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Larne Lough RAMSAR/SPA				
<p>Sandwich Tern Roseate Tern Common Tern Light-bellied Brent Goose</p>	<p>Brine Seawater abstraction Collision with plant and tall machinery</p>		<p><b>Brine discharge</b> Background salinity levels in proximity to the proposed discharge location at Islandmagee are in the region of 30.5psu to 34.8psu. A strict standard of 36psu within 100m of the discharge location will ensure best environmental practice and limit impacts on the benthic environment to the vicinity of the diffusers (within 100m). This would result in a maximum impacted zone of 0.0354km<sup>2</sup> with salinities greater than 36psu. The impact zone does not fall within Larne Lough SPA. No significant effects are envisaged on qualifying interests of this sites.</p> <p><b>Brine discharge licence conditions:</b> brine concentration max 260psu flow rate max 1000m<sup>3</sup> per hour temperature max 22°C salinity max 36psu at 100m from diffusers</p> <p><b>Seawater abstraction</b> To reduce entrainment of prey items a mesh screen will be installed comprising a mesh size of 12mm. Flow rates will be conditioned to not exceed 0.15m/s at the screens.</p> <p>Birds are highly mobile. Whilst prey items may become entrained within the abstracted seawater, they do not form part of the qualifying interests of the designated sites and as there will not be an adverse effect on the associated feature species, then the site's integrity cannot be considered to be adversely affected.</p>	

Habitats Regulation Assessment

			<p>Collision            Construction cranes and the drill rig will be lit at night for safety reasons. It is additionally proposed that the vent stack be lit to reduce risk of bird collisions. Lighting will preferably be green as this has been shown to disorientate migrating birds less than red light (Poot et al., 2008). Alternatively, white strobes which flash once every 2-3 seconds have been shown to repel birds and produce far fewer collisions than do solid or blinking red lights to which birds may be attracted on foggy, misty nights (Manville, 2000, Poot et al., 2008). Red-lights shall be avoided on tall structures where possible.</p>	
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## Annex 3

### Draft Licence Conditions

All the mitigation requirements that have been identified within this HRA are included as conditions within the appropriate licences (Marine Licence ML28-12, Consent to Discharge TC041/20, Abstraction Licence AIL\_2012\_033)

#### All Conditions in the Draft Marine Licence ML28-12

##### General Conditions

1. Under the Marine and Coastal Access Act 2009, a marine construction licence covers the duration of a project. This licence cannot be transferred without the authorisation of the Licensing Authority. Should the Licensee wish to transfer the licence, contact must be made with the Licensing Authority at least one month before a proposed transfer date.
2. The Licensee(s) shall not deposit any other material than that detailed in the updated Marine Licence application form received by the Licensing Authority, dated 10 December 2019.
3. The Licensee(s) shall contact the Licensing Authority if it is proposed to vary the materials or planned methods to be used from those described in the documentation supplied in the updated application.
4. The facility authorised to be constructed under this Licence shall only be used for the storage of natural gas. The Licensee(s) shall contact the Licensing Authority immediately if it is proposed to vary or change the intended use of the facility from the storage of Natural Gas. It should be noted that a change of use may invalidate a licence and that a further application may be necessary.
5. In the event of the Licensee(s) becoming aware that any of the information on which the licence is based has changed, the Licensing Authority shall be immediately notified in writing of the alterations. It should be noted that alterations may invalidate a licence and that an application for a new licence may be necessary.
6. The Licensee(s) shall ensure that a copy of this licence, and any subsequent variations made in accordance with section 72 of the Act are given to each agent, contractor and sub-contractor appointed to carry out part or all of the works. The Licensee(s) must ensure that such agent, contractor or sub-contractor is aware of the conditions within the aforementioned licence and any subsequent variations.
7. The Licensee(s) shall ensure that copies of the licence are available for inspection by Marine Licence Enforcement Officers at:
  - The premises of the Licensee(s)
  - The premises of the operating facility
  - The premises of and on board any vessel or chartered agent acting on behalf of the Licensee(s); and

- The site of the works

8. The Licensee(s) must ensure that if for any reason of *Force Majeure* any substance or object is deposited other than at the site described in this licence, then the Licensing Authority must be notified of the full details of the circumstances of the deposit as soon as the Licensee(s) are aware of the incident occurring. *Force Majeure* may be deemed to apply when, due to stress of weather or another cause, the master of a vessel, vehicle or marine structure determines that it is necessary to deposit a substance or object other than according to a licence. Such actions must be directly related to the safety of a human life, a vessel, vehicle or marine structure which is threatened by the failure to take the action. Under Annex II, Article 7 of the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, the Licensing Authority is obliged to immediately report *force majeure* incidents to the Convention Commission.

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### **Pipeline Infrastructure Construction Conditions**

1. The Licensee(s) shall inform the Licensing Authority of the starting date of the construction work at least two months prior to commencement of the works, and finishing date of the work 1 week before its termination.
2. The Licensee shall submit a Construction Environmental Management Plan (CEMP) two months before construction is due to start for agreement with the Licensing Authority. The CEMP will cover the following – the prevention of water pollution on construction sites, the prevention of disturbance through noise, vibration, dust and visual impacts. The implementation of the CEMP shall be overseen by the Ecological Clerk of Works.
3. The Licensee(s) shall appoint an approved, experienced Marine Mammal Observer (MMO) during the construction phase of the seawater intake and the brine outfall. Prior to works commencing, a Marine Mammal Protocol shall be submitted and approved by the Department. The Protocol shall be written and implemented in accordance with JNCC Guidance ‘The protection of marine European Protected Species from injury and disturbance October 2010’ Appendix C.
4. The use of impact piling or blasting is not anticipated for this licence. However, if a requirement emerges due to geological anomalies, the Licensee shall notify the Licensing Authority. A noise risk impact assessment must be produced and submitted to the Licensing Authority for approval before these construction methods can be considered to prevent disturbance to sensitive receptors.
5. Should impact piling or blasting be necessary, the Licensee(s) must submit information on the expected location, start and end dates of noise generating activities to the Department to fulfil the requirements of the Marine Noise Registry, in order to satisfy the ‘Forward Look requirements of the Registry, prior to the commencement of the licensed activities. The licence holder must notify the Department of the successful submission of ‘forward look’ data within 7 days of commencement of the licensed works. A noise risk impact assessment must be produced and submitted to the Licensing Authority for approval before activities can begin to prevent disturbance to sensitive receptors. <https://mmr.jncc.gov.uk/>

6. Prior to works commencing, a marine biosecurity protocol shall be submitted to and approved by the Department. Please see the following link for Best Practice Guidance: Marine Biosecurity Planning Guidance. <https://www.daera-ni.gov.uk/articles/monitoring-marine-invasive-non-native-species>
7. The Licensee(s) shall, within eight weeks after the completion of the licensed works, make a written report to the Licensing Authority stating the quantity and description of all articles and substances deposited under the authority of this licence.
8. The Licensee must ensure that HM Coastguard, in this case [nmocontroller@hmcg.gov.uk](mailto:nmocontroller@hmcg.gov.uk), The National Maritime Operations Centre is made aware of the works prior to commencement.
9. The Licensee(s) must notify the Commissioners of Irish Lights of the intention to deploy navigational aids in relation to *in situ* monitoring or navigational buoys. If aids to Navigation such as buoys or fixed beacons are deemed necessary, to be installed, modified or removed a “Statutory Sanction” must be applied for through the Irish Lights office.

Captain Rory Mullins  
Navigation Services Manager  
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Commissioners of Irish Lights  
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<http://www.irishlights.ie>

10. The Licensee must issue local notification to marine users - including the Licensing Authority, fishermen's organisations, neighbouring port authorities and other local stakeholders - to ensure that they are made fully aware of the activity.
11. Any consented cable/pipeline protection works must ensure existing and future safe navigation is not compromised. The MCA would accept a maximum of 5% reduction in surrounding depth referenced to Chart Datum but under no circumstances should depth reductions compromise safe navigation.
12. The Licensee(s) must notify The Source Data Receipt team, UK Hydrographic Office, Taunton, Somerset, TA1 2DN (Email: [hdcfiles@ukho.gov.uk](mailto:hdcfiles@ukho.gov.uk); Tel: 01823 337900) of both commencement and completion of the works in order that all necessary amendments to nautical charts can be made, to ensure navigational safety. This office must be copied into all notifications.
13. The Licensee(s) attention is drawn to Article 42 of the Historic Monuments and Archaeological Objects (NI) Order 1995 that requires finders of archaeological objects to report within 14 days to a relevant authority. In the event of a discovery of an archaeological object and/or remains during construction works the Licensee(s) must: (1) record the position and details of the site; (2) not disturb the site further and (3) report your discovery to and seek further advice from the Department immediately.

14. The Licensee(s) must report any recovered wreck material to the Receiver of Wreck (Maritime and Coastguard Agency) in accordance with the Merchant Shipping Act 1995.

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**Environmental Monitoring Programme**

15. The Licensee(s) shall ensure that the agreed monitoring and mitigation are employed pre, during and after the excavation of the caverns by implementing the Environmental Monitoring Programme as outlined in the Marine Environmental Conditions Update, 2019. The Licensee shall work with the Licensing Authority to establish a Science and Technical Advisory Group to finalise arrangements for the *in-situ* buoys to monitor the conditions of the Water (NI) Order consent. The Science and Technical Advisory Group will meet prior to the construction phase and on a quarterly basis initially. The frequency of meetings will be reviewed by the Licensing Authority in consultation with Science and Technical Advisory Group.
16. As outlined, the Environmental Monitoring Programme shall cover the following elements:
- Real time water quality by *in situ* buoys measuring salinity, dissolved oxygen and temperature,
  - A minimum of six brine tracking surveys during the first year of the operation of the brine outfall,
  - Marine mammal surveys including static acoustic monitoring and the use of marine mammal observers
  - Seal survey
  - Benthic grab and video surveys
  - Beam trawl fish survey and commercial pot fishery and by-catch survey
  - Bird survey
17. The Licensee(s) shall ensure that the EMP data is submitted to the Licensing Authority in a MEDIN-compatible format. Monitoring data from the *in situ* buoys will be available in real time on a web-based system. The Licensee must submit all reports, studies and survey data to the Licensing Authority on a 6 monthly basis.
18. The Licensee(s) must ensure that a suitably qualified and experienced Ecological Clerk(s) of Works / Environmental manager(s) is, or are, appointed prior to the commencement of the licensable programme of works. The appointed person(s) will provide environmental liaison establishing and maintaining effective communications between the Licensee, Licensing Authority, contractors, stakeholders, conservation groups and other users of the sea during the period in which licensed activities authorised under this licence are undertaken. Prior to the commencement of the works, the Licensee(s) must notify the Licensing Authority in writing of the identity, contact details and qualifications of the appointed Ecological Clerk(s) of Works / Environmental manager(s).
19. The term of appointment for the Ecological Clerk(s) of Works must cover the period from the commencement of a programme of marine works until completion of the process, unless otherwise agreed by the Licensing Authority.

1. The responsibilities of the Ecological Clerk(s) of Works must include, but are not limited to the following:



- Quality assurance of the final draft of all plans and programmes required under this Licence.
- Ensuring that all works are carried out in accordance with Construction Environmental Management Plan (CEMP) and Environmental Monitoring Programmes.
- Project Monitoring Plan compliance with all environmental conditions and agreements.
- Ensuring any wildlife designated site or protected species permissions are in place as required by the project.
- Provide advice on monitoring and compliance of the licence by the Licensee(s) in coordination with the Licensing Authority.
- Liaise with the marine Licensing Authority on works progress.
- Produce a communications plan aimed at the public, residents and stakeholders.

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### **Post Discharge & Operational Conditions**

20. The Licensee(s) shall carry out surveys of the discharge site after the cessation of the brine discharge in line with the Environmental Monitoring Programme for a period of up to 24 months, or longer if required by the Licensing Authority.
21. The Licensee(s) shall submit to the Licensing Authority an annual report of the EMP, post-discharge termination covering a 24 month period or longer if required by the Licensing Authority.

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### **Outline Decommissioning Conditions**

22. The Licensee(s) shall notify the Licensing Authority in writing 6 months in advance of decommissioning of the installations and shall submit a new licensing application to cover the entirety of the decommissioning process
23. The Licensee(s) shall ensure that all materials (excluding rock armouring) shall be removed from the seabed, unless the Licensing Authority decides otherwise based on best practice at the time of decommissioning.
24. The Licensee(s) shall ensure that the remaining abstraction and discharge pipelines are capped at the seabed, unless the Licensing Authority decides otherwise based on best practice at the time of decommissioning.
25. The Licensee(s) shall ensure the structural integrity of the salt caverns post decommissioning and ensure as best practice provisions detail at the time ensure the structural integrity is sustainable.
26. The Licensee(s) shall ensure that no materials or waste are deposited on the seabed.
27. The Licensee(s) shall supply a report of all materials that were in or on the seabed which were removed after decommissioning the marine structures and a list of any materials left behind in situ.

**Conditions as set in the Draft Consent to Discharge TC041/20**

1. The discharge shall consist solely of salt and associated dissolved elements (as detailed in condition 2 of this consent) arising from the solution mining of salt stratum using seawater (Brine).
2. Monitoring of consent parameters shall take place at:
  - a. A sampling chamber based on land Grid Ref 342899 401730 and;
  - b. Monitoring Buoys placed in the water column close to the diffusers.
3. The effluent discharged to the marine environment, to be sampled from the sample chamber at Grid ref 342899 401730, shall not:
  - a. contain suspended solids in excess of 500 milligrams per litre (measured after drying at 105°C);
  - b. have a pH value less than 6 nor greater than 9;
  - c. have a temperature in excess of 22°C;
  - d. exceed 24,000 cubic metres per day from both diffusers combined;
  - e. exceed a maximum rate of discharge of 0.278 cubic metres per second from both diffusers combined;
  - f. contain more than 260 Practical Salinity Units (PSU);
  - g. exceed the Environmental Quality Standards (EQS) as outlined in the table below (condition 4);
  - h. contain any visible oil or grease;
  - i. contain any substance (other than as defined above) which will cause the marine environment to be toxic or injurious to fish or other aquatic organisms and/or contain any substance (other than as defined above) to such an extent as to cause the receiving marine environment, to be poisonous or injurious to the spawning grounds, spawn or food of fish in those waters, or otherwise cause damage to the ecology of those waters outside the 100m radius impact zone, as described within the applications and supporting documentation.

4. In addition the sample shall also be analysed for the parameters listed below;

	Substance*	EQS in seawater (ug/l) & consent standard.
i)	Cadmium (Total and dissolved and compounds)	2.5
ii)	Mercury (Total and dissolved and compounds)	0.3
iii)	Arsenic (Dissolved)	15
iv)	Boron (Total) (mg/l)	7000
v)	Chromium (Total and dissolved)	15
vi)	Copper (Total and dissolved)	5
vii)	Lead	25
viii)	Nickel (Total and dissolved)	30
ix)	Zinc (Total and dissolved)	40

\*The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015

5. The consent holder shall monitor the discharge continuously for the above parameters and shall initiate an immediate shut down as detailed in Environment Monitoring Programme (condition 10) on detection of breach of any parameter. The Northern Ireland Environment Agency (NIEA) shall be notified by the consent holder immediately upon such an occurrence using the 24 hour Water Pollution Hotline on 0800 807060.
6. Where levels of any of the substances listed in i-ix above are detected in a concentration likely to cause a breach of the Environmental Quality Standard (EQS) in the receiving water, an immediate shut down should be initiated. The Northern Ireland Environment Agency (NIEA) shall be notified by the consent holder immediately upon such an occurrence using the 24 hour Water Pollution Hotline on 0800 807060.
7. The discharge shall be made via a diffuser arrangement consisting of two vertical ports at 20 metre centres, with a total length of 40 metres, Grid references **345076 403469 & 345091 403482**.
8. Facilities shall be available to ensure that representative samples of the discharge can be obtained. The sampling point for the discharge shall be located at a purpose built chamber at Grid Reference 342899 401730
9. The sample point for the discharge shall be labelled and maintained so that it is freely available and accessible to authorised officers of the Department.
10. Authorised officers of the Department shall be allowed to readily and safely obtain a sample of the effluent discharge, measurement of flow, images of discharge or other data relative to the discharge at all times.
11. Before any discharge authorised under this consent commences the Environmental Monitoring Programme (EMP) shall be agreed in writing with the Department. The programme shall include, but not exclusively:
  - a) A suitable number of monitoring buoys with remote telemetry real time reporting facility;
  - b) Location (Eastings and Northings) of monitoring buoys;
  - c) Agreed monitoring frequency and parameters (PSU, pH, temperature);
  - d) Appropriate contingency and emergency actions including shut down procedures should there be a failure in real time monitoring or consent parameters are exceeded;
  - e) Continuous self-monitoring and reporting arrangements of both discharge and receiving waters;
  - f) An agreed number of surveys and biological monitoring activities to assess impacts on habitats and species in the impact zone and surrounding area, as outlined in the Marine Construction Licence;

- g) Additional targeted monitoring at commencement, during a trial discharge regime (gradual ramp-up) at each state of the tide, to confirm the brine plume conforms to model predictions;
- h) Actions that the consent holder will undertake once the brine discharge is complete;
- i) The establishment of a Science and Technical Advisory Group to provide oversight for the EMP.

The EMP will remain in place for the life time of the project and changes to the monitoring programme shall be agreed in writing with NIEA prior to implementation.

12. A continuous flow monitoring and recording system with onsite visual display, from which readings can be readily obtained, shall be provided and operated to record the daily volume and instantaneous flow of the discharge. The consent holder shall keep the flow monitoring for a minimum period of at least five years and shall be made available to the Department upon request. Flows of the discharge shall be measured at Grid Reference. 342899/401730. The flow monitoring system shall be calibrated and maintained as required and records of the calibration and maintenance made available to the Department on request.
13. An immediate shut down must be initiated should a salinity in excess of 36 PSU be detected at any of the monitoring buoys at the 100m impact zone. The Department shall be notified immediately upon such an occurrence using the 24 hour Water Pollution Hotline, 0800 807060. The Discharge shall not re-commence without the prior written agreement of the Department.
14. An immediate shut down must be initiated should a temperature exceeding 2°C above ambient sea temperature be detected at any of the monitoring buoys at the 100m impact zone. The Department shall be notified immediately upon such an occurrence using the 24 hour Water Pollution Hotline, 0800 807060. The Discharge shall not re-commence without the prior written agreement of the Department.
15. The consent holder shall maintain the outfall pipe and diffusers in an efficient operational condition, so as to minimise the possibility of blockages or other failures. Maintenance records shall be available for inspection by the Department on request.
16. An alarm system shall be provided to notify the consent holder in the event of failure of the diffusers
17. Under the requirements of the Control of Pollution (Oil Storage) Regulations (Northern Ireland) 2010 **all** oil storage must comply with the appropriate requirements as laid out in the regulations. Oil in the regulations is defined as: “any kind of oil, including diesel, heating, waste, vegetable and plant oil”. The only exemptions to the regulations are: (a) any property used mainly as a private dwelling if the storage capacity is 3500 litres or less, (b) any storage below 200 litres, (c) any storage on a farm if the storage is used in connection with agriculture, (d) any premises regulated by COMAH or (e) any container wholly underground.
18. Bunds shall be provided around all chemical storage tanks to reduce the risk of pollution of waterways and groundwater from spillage or leakage.

19. The storage of any chemicals or dangerous substances not listed on the original consent application shall be notified immediately to the Department.
20. The person making the discharge shall be responsible for payment of all annual charges.
21. Should the consent holder wish to transfer responsibility for this consent they must submit an application for transfer of ownership within 21 days of the transfer taking place.
22. If the consent holder intends to change anything at the site which will impact on the content of this consent and/or the composition or quality of the effluent then they must make application to the Department for review of this consent. A review submission should be made no later than 4 months before the proposed changes will be carried out.

### **INFORMATIVES**

1. This discharge consent may be reviewed at any time, if the area of discharge or any area downstream, has been, or becomes designated under the European Communities Nature Conservation (Natural Habitats etc) Regulations (Northern Ireland) 1995 or the consent conditions do not meet the requirements of any other European Community Directive.
2. It is an offence under section 47 of the Fisheries Act (Northern Ireland) 1966 to cause pollution which is subsequently shown to have a deleterious effect on fish stocks.
3. This consent is valid only for the period of solution mining and de-brining for 7 storage caverns. Once this activity is completed the consent will be revoked. Should additional discharges be necessary, a new/review consent will be required.
4. The sea water abstraction is subject to licencing under The Water Abstraction and Impoundment (Licensing) Regulations (Northern Ireland) 2006, it is an offence under Regulation 4 to abstract water without the appropriate authorisation.
5. The discharge authorised by this consent shall not commence until the Marine Construction licence, required under Part 4 of the Marine and Coastal Access Act 2009 has been approved.
6. This consent is issued on the understanding that the resulting caverns will be used for the storage of Natural Gas. The consent holder shall contact the Department immediately if it is proposed to change the intended use of the facility from the storage of Natural Gas. It should be noted that a change of use may require a review of the existing authorisation or an application for a new authorisation.
7. This authorisation replaces any previous authorisations for the same activity at this location.

**Conditions as set in the Draft Abstraction Licence AIL 2012 0033**

**1. Location of abstraction point**

1.1. This licence authorises the abstraction of sea water at Grid reference 344640 403270 marked as 'Abstraction' on the attached map.

**2. Purpose of abstraction**

2.1. The primary purpose of this activity is the 'solution mining of seven underground gas caverns.

**3. Means of abstraction**

3.1. The means of abstraction is by pumping.

**4. Period of abstraction**

4.1 Abstraction is authorised to take place during the following period:

- All year,
- Once the solution mining phase for this project ends, and the seven caverns are formed, then this abstraction will cease, and the licence be revoked. Should additional abstraction activity be required, a new / review licence will be required.

**5. Daily Abstraction volumes / rates**

5.1. The quantity of water abstracted shall not exceed 24,000 cubic metres per day. This daily volume equates to an abstraction rate of 0.278 cubic metres per second.

5.2. The velocity of the abstraction through the 12 mm intake mesh will not exceed 0.15 m/second, in order to prevent fish entrapment.

5.3. Definitions of time periods:

5.3.1. A day = 24 consecutive hours

**6. Measurement and Records**

6.1. Records

6.1.1. A record of the daily volume of abstracted water under condition 1

6.1.2. Monitoring Plan shall be kept and made available for inspection on site.  
(using either approved Excel spreadsheet or “*Data Return Form for Abstraction Licenses*”)

6.1.3. An annual summary of the records kept at 6.1.1 and 6.1.2 and Section 7 Monitoring Plan shall be submitted to the Department by 1<sup>st</sup> February of the following year/s.

## **7. Monitoring Plan**

7.1. Four months prior to this abstraction starting the licensee shall submit a plan for monitoring the operation to the Abstraction Licensing Team for approval. The plan shall contain management, operational and monitoring details relevant to the following issues:

- The daily management of the abstraction and details on emergency shut down procedures
- The design of the intake, specifically concerning intake velocity restriction and screening size
- Details of monitoring and measurement devices and methods
- Management of impingement (or evidence that none is required)
- Maintenance activities (if required)
- Record keeping

7.2. The approved plan will constitute a detailed programme of activities and a reporting regime (for information/data) which must be provided to the Department within the agreed timetable.

7.3. The said plan will also become a condition of the licence (as an annex) and may be reviewed periodically by the Department, the licence holder or in response to the reported monitoring results.

## **8. Inspection**

8.1. Authorised Officers from the Department shall be allowed to safely inspect the operation of the scheme at all times.

8.2. Any change in the operation of the scheme which results in abstraction of water not specified in the original application shall be notified immediately to the Department.

## **9. Decommissioning Stage**



9.1 At least 12 months prior to the gas storage caverns being decommissioned, by each cavern being filled with sea water, an abstraction licence must be submitted to the Department for consideration and determination of this consumptive activity.

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