

**MARINE SCOTLAND - LICENSING OPERATIONS TEAM (“MS-LOT”)
CONSIDERATION OF A PROPOSAL AFFECTING A DESIGNATED SPECIAL
AREA OF CONSERVATION (“SAC”), SPECIAL PROTECTION AREA (“SPA”) OR
PROPOSED SPA (“pSPA”).**

**APPLICATIONS FOR MARINE LICENCES UNDER THE MARINE (SCOTLAND) ACT 2010
FOR CONSTRUCTION, CAPITAL DREDGING AND SEA DISPOSAL, AND APPLICATION
FOR A HARBOUR REVISION ORDER UNDER THE HARBOURS ACT 1964 FOR THE
ABERDEEN HARBOUR EXPANSION PROJECT (“AHEP”)**

SITE DETAILS: NIGG BAY, ABERDEEN, ABERDEENSHIRE

Appropriate Assessment Conclusion:

The proposal will not adversely affect the integrity of the SACs, SPAs or pSPAs listed in section 2b of this form (either in isolation or combination) provided it is undertaken in strict accordance with the conditions set out in 2d.

Introduction

This is a record of the appropriate assessment (“AA”) undertaken in regards to Aberdeen Harbour Board’s (“AHB”) proposal to develop a new harbour facility at Nigg Bay, Aberdeen. The assessment has been undertaken by Marine Scotland - Licensing Operations Team (“MS-LOT”) on behalf of Scottish Ministers under Regulation 48 of the Conservation (Natural Habitats, &c.) Regulations 1994 (“the Regulations”), and in accordance with Council Directive 92/43/EEC on the conservation of natural habitats under wild fauna and flora (“the Habitats Directive”). The AA will be used to inform decisions on both the marine licence applications and the harbour revision order.

Scottish Ministers, as a 'competent authority' under the Regulations, must be satisfied that the proposal will not adversely affect the integrity of any European site (special areas of conservation (“SACs”) and special protection areas (“SPAs”)) either alone or in combination with other plans or projects before authorisations can be given for the proposal.

In Scotland Scottish Ministers are currently in the process of identifying a suite of new marine SPAs. In 2014 advice was received from the statutory nature conservation bodies (“SNCBs”) on the sites most suitable for designation and at this stage they became draft SPAs (“dSPAs”). Once Scottish Ministers have agreed the case for a dSPA to be the subject of a public consultation, the proposal is given the status of proposed SPA (“pSPA”) and receives policy protection, which effectively puts such sites in the same position as designated sites, from that point forward until a decision on classification of the site is made. This policy protection for pSPAs is provided by Scottish Planning Policy (paragraph 210), the UK Marine Policy Statement (paragraph 3.1.3) and the National Marine Plan for Scotland (paragraph 4.45). The Ythan Estuary, Sands of Forvie and Meikle Loch pSPA (extension to current

SPA) and the Outer Firth of Forth and St. Andrew's Bay Complex pSPA are currently at consultation and, therefore, are included in this assessment.

It is not a legal requirement under the Habitats Directive or relevant domestic regulations for this assessment to assess the implications of the proposal on the pSPAs. The assessment includes an assessment of implications upon those sites in accordance with domestic policy. Scottish Ministers are also required to consider article 4(4) of Council Directive 2009/147/EC on the conservation of wild birds ("the Birds Directive") in respect of the pSPAs. The considerations under article 4(4) of the Birds Directive are separate and distinct to the considerations which must be assessed under this Habitats Directive assessment but they are, nevertheless, set out within this assessment.

In accordance with regulation 50 of the Regulations the Scottish Ministers will, as soon as reasonably practicable following the formal designation of the pSPAs, review their decisions authorising the proposal. This will include a supplementary AA being undertaken concerning the implications of the proposal on the sites as designated (as they are currently pSPAs their conservation objectives are currently in draft form, their conservation objectives are finalised at the point the sites are designated).

Consultation

To inform the AA, MS-LOT sought advice from Scottish Natural Heritage ("SNH") via two formal 42-day consultation processes (initiated on 06 November 2015 and 26 April 2016). SNH were invited to comment on the environmental statement, marine licence applications and further environmental information during the consultations. MS-LOT received formal comments from SNH on 18 December 2015 and 01 June 2016. Further information on whether pSPAs and dSPAs had been considered as part of SNH's advice was received on 05 September 2016.

The advice received from SNH has been considered by MS-LOT and incorporated into the AA.

Responses were received from the Royal Society for the Protection of Birds ("RSPB") on 18 December 2015 and 03 June 2016, from Whale and Dolphin Conservation ("WDC") on 18 December 2015 and 07 June 2016 and from The Dee District Salmon Fishery Board ("Dee DSFB") on 17 December 2015. Marine Scotland Science ("MSS") provided comments on 22 December 2015, 08 June 2016, 22 June 2016 and 08 September 2016. In many cases there was further discussion with the consultees to provide further detail regarding their requests in relation to mitigation and licence conditions. Further details of how each of the requests has been dealt with is included in section 2d.

The main points raised were:

RSPB

- Initially objected to the proposal as there was insufficient information provided to enable a conclusion of no adverse impact. Following provision of further environmental information this objection was withdrawn, subject to certain mitigation plans being carried out.
- The recommended mitigation included
 - Timing peak construction and blasting periods to avoid the periods of peak numbers of eider in June, July and August.
 - Implementing a buffer/vessel exclusion zone (100m recommended) around Greyhope Bay during construction to provide undisturbed areas for eider to loaf and feed.

- Implementation of a vessel management plan post construction to avoid disturbance to moulting flocks which are likely to utilise the harbour and in particular the area of water in front of the Site of Special Scientific Interest in the south of the new harbour.
- Other recommendations included the inclusion of roosting structures targeted at terns and secure nesting locations for common and arctic terns that could be included in the design of the new harbour.
- Support for the Habitat Creation and Management Plan suggested by the Environmental Statement ("ES") and a note that these measures be integrated into any future design and build contracts to secure their delivery.
- A recommendation that the use of the area by cetaceans is fully monitored during and post construction.

WDC

- Initially opposed the proposal owing to concerns regarding mitigation and the timing of drilling and blasting. Following the provision of further environmental information WDC noted that the addition of bubble curtains (which create a micro-bubble barrier to reduce underwater noise) and further noise modelling meant they were content with the documents.

Dee DSFB

- Provided background information in order to target appropriate mitigation measures. It was noted that AHB were supportive of developing a monitoring programme to look at fish entry into the Dee in partnership with Marine Scotland Science and Dee DSFB. This was welcomed and Dee DSFB requested that it is included as a condition of the licence.
- Raised concerns regarding piling noise and requested that AHB track adult salmon as a condition of their licence and develop an effective mitigation strategy to minimise the impacts on salmon. Another recommendation was to listen for the presence of acoustically tagged smolts in the development zone so that appropriate adaptive mitigation steps can be implemented. Dee DSFB requested the opportunity to comment on the piling plan and associated mitigation once a main contractor has been appointed.
- A request that a condition of the marine licence includes a requirement that less than 1 lux of light will crest the breakwater as outlined in the lighting plan.
- That sufficient Acoustic Deterrent Devices ("ADD") are installed at the construction site at Nigg Bay and the mouth of the Dee to discourage predators when the sediment plume is detected.

MSS provided comments and their main concerns were regarding:

- Noise levels, particularly from blasting and the impact this would have on marine mammals both within and outwith the area of the proposed works.
- Dredging and dumping of dredge spoil.
- A need for clarification on provision of suitable refuge/foraging areas for eider.
- The lack of information on current use or likely use of the area by salmon and sea trout.
- The potential for disturbance and habitat change that may result in diadromous fish not using the area.
- The need to consider further monitoring and contribution to research.

Following provision of further information from the applicant MSS were content with the mitigation suggested but had some concerns regarding the cumulative impact on the

bottlenose dolphin population of this proposal in combination with other offshore wind farm projects in the Moray Firth and Forth and Tay. Following discussion with SNH and MS-LOT it was agreed that MSS would carry out analysis using a Population Viability Analysis (“PVA”) model to verify the conclusion reached by SNH. This model has previously been used for assessments of the cumulative impact from the Forth and Tay wind farms and is based upon a previously published model (Thompson et al., 2000). The modelling allowed MSS to reach the same conclusion as SNH that the AHEP would not adversely affect the SAC with respect to bottlenose dolphin.

There are no outstanding objections from consultees relating to European protected sites.

Table 1a provides links to the SNH Interactive (“SNHi”) website where the background information on the sites being considered in this assessment is available.

Table 1b. details the qualifying features of the SACs and SPAs in this assessment. The conservation objectives being considered are detailed in section 1c. For the qualifying interests where likely significant effect (“LSE”) has been identified (section 2b) the appropriate assessment assesses whether or not the relevant conservation objectives will be achieved.

Figure 1 shows the location of the proposed works and the SACs, SPAs and pSPAs discussed in this document.

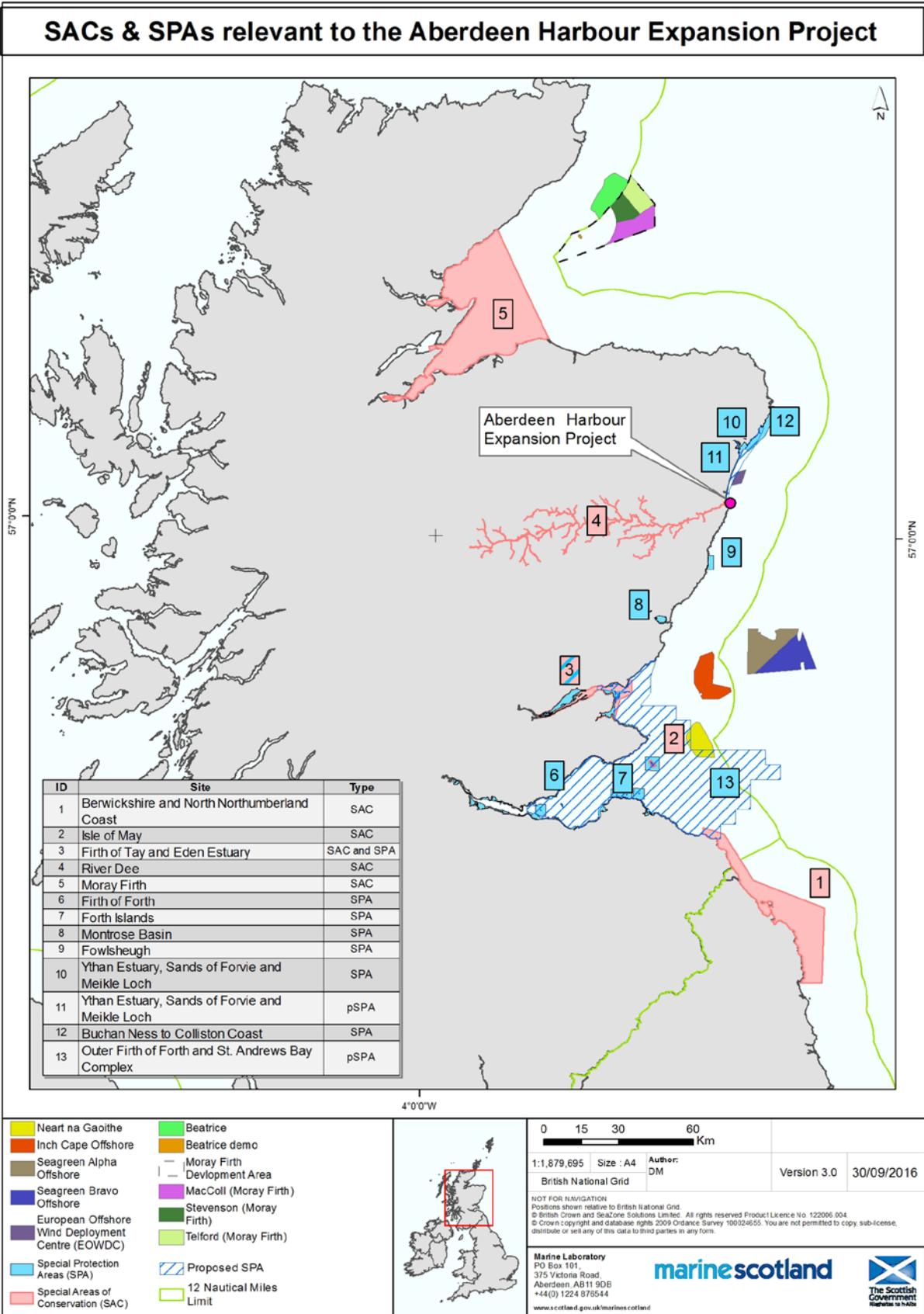


Figure 1. SACs, SPAs, pSPAs and offshore renewable projects relevant to the Aberdeen Harbour Expansion Project.

1a. Name of Natura site(s) potentially affected & weblink(s) to current status:

SACs

Moray Firth SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8327

River Dee SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8357

Isle of May SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8278

Firth of Tay and Eden Estuary SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8257

Berwickshire and North Northumberland Coast SAC

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8207

SPAs

Ythan Estuary, Sands of Forvie and Meikle Loch SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8592

Ythan Estuary, Sands of Forvie and Meikle Loch pSPA (extension to current site)

<http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/proposed-marine-spas/ythan-estuary/>

Fowlsheugh SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8505

Buchan Ness to Collieston Coast SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8473

Montrose Basin SPA

https://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8548

Firth of Tay and Eden Estuary SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8501

Forth Islands SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8500

Firth of Forth SPA

http://gateway.snh.gov.uk/sitelink/siteinfo.jsp?pa_code=8499

Outer Firth of Forth and St Andrews Bay Complex pSPA

<http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/proposed-marine-spas/firth-of-forth-and-st-andrews-bay/>

1b. European qualifying interest(s):

SACs

Moray Firth SAC

Bottlenose dolphin (*Tursiops truncatus*)
Subtidal sandbanks

River Dee SAC

Atlantic salmon (*Salmo salar*)
Freshwater pearl mussel (*Margaritifera margaritifera*)
Otter (*Lutra lutra*)

Isle of May SAC

Grey seal (*Halichoerus grypus*)
Inshore sublittoral rock reefs

Firth of Tay and Eden Estuary SAC

Estuaries
Harbour seal (*Phoca vitulina*)
Intertidal mudflats and sandflats
Subtidal sandbanks

Berwickshire and North Northumberland Coast SAC

Grey seal (*Halichoerus grypus*)
Intertidal mudflats and sandflats
Reefs
Sea caves
Shallow inlets and bays

SPAs

Ythan Estuary, Sands of Forvie and Meikle Loch SPA

Common tern (*Sterna hirundo*)
Eider (*Somateria mollissima*)
Lapwing (*Vanellus vanellus*)
Little tern (*Sternula albifrons*)
Pink-footed goose (*Anser brachyrhynchus*)
Redshank (*Tringa tetanus*)
Sandwich tern (*Sterna sandvicenensis*)
Waterfowl assemblage

Ythan Estuary, Sands of Forvie and Meikle Loch pSPA (extension to current site)

Sandwich tern (*Sterna sandvicenensis*)
Little tern (*Sternula albifrons*)

Fowlsheugh SPA

Fulmar (*Fulmarus glacialis*)
Guillemot (*Uria aalge*)
Herring gull (*Larus argentatus*)
Kittiwake (*Rissa tridactyla*)
Razorbill (*Alca torda*)
Seabird assemblage

Buchan Ness to Collieston Coast SPA

Fulmar (*Fulmarus glacialis*)
Guillemot (*Uria aalge*)
Herring gull (*Larus argentatus*)
Kittiwake (*Rissa tridactyla*)
Seabird assemblage
Shag (*Phalacrocorax aristotelis*)

Montrose Basin SPA

Dunlin (*Calidris alpina alpina*)
Eider (*Somateria mollissima*)
Greylag goose (*Anser anser*)
Knot (*Calidris canutus*)
Oystercatcher (*Haematopus ostralegus*)
Pink-footed goose (*Anser brachyrhynchus*)
Redshank (*Tringa totanus*)
Shelduck (*Tadorna tadorna*)
Waterfowl assemblage
Wigeon (*Anas penelope*)

Firth of Tay and Eden Estuary SPA

Bar-tailed godwit (*Limosa lapponica*)
Common scoter (*Melanitta nigra*)
Cormorant (*Phalacrocorax carbo*)
Dunlin (*Calidris alpina alpina*)
Eider (*Somateria mollissima*)
Goldeneye (*Bucephala clangula*)
Goosander (*Mergus merganser*)
Grey plover (*Pluvialis squatarola*)
Greylag goose (*Anser anser*)
Icelandic Black-tailed godwit (*Limosa limosa islandica*)
Little tern (*Sternula albifrons*)
Long-tailed duck (*Clangula hyemalis*)
Marsh harrier (*Circus aeruginosus*)
Oystercatcher (*Haematopus ostralegus*)
Pink-footed goose (*Anser brachyrhynchus*)
Red-breasted merganser (*Mergus serrator*)
Redshank (*Tringa totanus*)
Sanderling (*Calidris alba*)
Shelduck (*Tadorna tadorna*)
Velvet scoter (*Melanitta fusca*)
Waterfowl assemblage

Forth Islands SPA

Arctic tern (*Sterna paradisaea*)
Common tern (*Sterna hirundo*)
Cormorant (*Phalacrocorax carbo*)
Fulmar (*Fulmarus glacialis*)
Gannet (*Morus bassanus*)
Guillemot (*Uria aalge*)
Herring gull (*Larus argentatus*)
Kittiwake (*Rissa tridactyla*)
Lesser black-backed gull (*Larus fuscus*)
Puffin (*Fratercula arctica*)
Razorbill (*Alca torda*)
Roseate tern (*Sterna dougalli*)
Sandwich tern (*Sterna sandvicenensis*)
Seabird assemblage
Shag (*Phalacrocorax aristotelis*)

Firth of Forth SPA

Bar-tailed godwit (*Limosa lapponica*)
Common scoter (*Melanitta nigra*)
Cormorant (*Phalacrocorax carbo*)
Curlew (*Numenius arquata*)
Dunlin (*Calidris alpina alpina*)
Eider (*Somateria mollissima*)
Golden plover (*Pluvialis apricaria*)
Goldeneye (*Bucephala clangula*)
Great crested grebe (*Podiceps cristatus*)
Grey plover (*Pluvialis squatarola*)
Knot (*Calidris canutus*)
Lapwing (*Vanellus vanellus*)
Long-tailed duck (*Clangula hyemalis*)
Mallard (*Anas platyrhynchos*)
Oystercatcher (*Haematopus ostralegus*)
Pink-footed goose (*Anser brachyrhynchos*)
Red-breasted merganser (*Mergus serrator*)
Red-throated diver (*Gavia stellate*)
Redshank (*Tringa totanus*)
Ringed plover (*Charadrius hiaticula*)
Sandwich tern (*Sterna sandvicenensis*)
Scaup (*Aythya marila*)
Shelduck (*Tadorna tadorna*)
Slavonian grebe (*Podiceps auritus*)
Turnstone (*Arenaria interpres*)

Outer Firth of Forth and St Andrew's Bay Complex pSPA

Arctic tern (*Sterna paradisaea*)
Black-headed gull (*Larus ridibundus*)
Common gull (*Larus canus*)
Common scoter (*Melanitta nigra*)
Common tern (*Sterna hirundo*)
Eider (*Somateria mollissima*)
Gannet (*Morus bassanus*)

Goldeneye (*Bucephala clangula*)
 Guillemot (*Uria aalge*)
 Herring gull (*Larus argentatus*)
 Kittiwake (*Rissa tridactyla*)
 Little gull (*Larus minutus*)
 Long-tailed duck (*Clangula hyemalis*)
 Manx shearwater (*Puffinus puffinus*)
 Puffin (*Fratercula arctica*)
 Red-breasted merganser (*Mergus serrator*)
 Red-throated diver (*Gavia stellate*)
 Shag (*Phalacrocorax aristotelis*)
 Slavonian grebe (*Podiceps auritus*)
 Velvet scoter (*Melanitta fusca*)
 Waterfowl assemblage
 Seabird assemblage

1c. Conservation objectives for qualifying interests:

Moray Firth SAC

To avoid deterioration of the habitats of the qualifying species 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 to ensure for the qualifying species that the following are established then maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying Species

- Bottlenose Dolphin

River Dee SAC

To avoid deterioration of the habitats of the qualifying species 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 to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species, including range of genetic types for salmon, as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Distribution and viability of freshwater pearl mussel host species
- Structure, function and supporting processes of habitats supporting the species
- Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species

- No significant disturbance of the species

Qualifying species:

- Atlantic salmon
- Fresh water pearl mussel
- Otter

Isle of May, Firth of Tay and Eden Estuary and Berwickshire and North Northumberland Coast SACs

To avoid deterioration of the habitats of the qualifying species (listed below) 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 to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

Qualifying species

- Grey Seal (Isle of May and Berwickshire and North Northumberland Coast)
- Harbour Seal (Firth of Tay and Eden Estuary)

SPAs

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and to ensure for the qualifying species that the following are maintained in the long term:

- Population of the species as a viable component of the site
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species

pSPAs (conservation objectives are still draft)

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species.

This contribution will be achieved through delivering the following objectives for each of the site's qualifying features:

- a) Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;

b) To maintain the habitats and food resources of the qualifying features in favourable condition.

Details of proposal (inc. location, timing, methods):

AHB proposes to develop a new harbour facility at Nigg Bay, Aberdeen, approximately 0.8km south of the existing harbour in Aberdeen City centre. Their proposal includes construction of two breakwaters, quaysides and associated infrastructure as well as a large-scale capital dredge and sea disposal operation. Works are currently scheduled to take place over a 3-year period commencing in winter 2016.

The harbour expansion will be developed under a design and build contract, so the precise details of the construction methods/programme have not yet been confirmed. For instance, for piling the proportion that will be impact/percussive versus vibro piling, the number and sizes of piles, and the number of hours per day spent piling, are not yet known. The figures in the table below, taken from Chapter 3 of the Environmental Statement (ES), represent the worst case scenario:

Construction Activity	Start Date	Duration	Completion Date
Mobilisation/preparatory works/diversions	Q4 2016	6 months	Q1 2017
Temporary access roads	Q4 2016	3 months	Q1 2017
Intake and outlet diversions (as required)	Q4 2016	6 months	Q1 2017
Dredging (including drilling and blasting)	Q1 2017	19 months	Q4 2018
Casting and placing of concrete units	Q1 2017	21 months	Q4 2018
Breakwater construction	Q1 2017	21 months	Q4 2018
Quay piling operations	Q2 2017	23 months	Q2 2019
Quay construction and infilling	Q2 2017	31 months	Q4 2019
Ancillary accommodation and site infrastructure	Q2 2018	Over an 18 month period	Q4 2019
Harbour project complete and harbour fully operational	Q4 2019	Over a 5 month period	Q2 2020
Minor infrastructure works installed during operational phase, such as installation of water tanks etc.	Q2 2020	Up to 12 months	Q2 2021

ASSESSMENT IN RELATION TO REGULATION 48 OF THE CONSERVATION (NATURAL HABITATS, &C.) REGULATIONS 1994

2a. Is the operation directly connected with or necessary to conservation management of the site? YES/NO *If YES give details:*

NO

2b. Is the operation likely to have a significant effect on the qualifying interest?

SNH have provided advice on whether they consider the proposal to have a likely significant effect on the qualifying interest for each of the sites. The text below is based on that advice.

Moray Firth SAC

- **Bottlenose dolphins – YES**

The ES demonstrates that bottlenose dolphins occur regularly throughout the year in Nigg Bay and immediately north at the mouth of the existing Aberdeen Harbour. Photo ID has confirmed that at least some of these individuals at Aberdeen Harbour are from the Moray Firth SAC. The Moray Firth dolphins are part of the East coast management unit for bottlenose dolphins with the population of the management unit being equivalent to the SAC population. The dolphins are known to travel south from the Moray Firth along the east coast of Scotland with regular sightings as far as the Firth of Forth (Thompson et al. 2011). The latest assessed condition of the bottlenose dolphin population within the Moray Firth SAC is Favourable Recovered (Cheney et al. 2012).

Potential impacts from the proposed new harbour on bottlenose dolphins are:

Construction

- Underwater noise arising from blasting, drilling, impact piling and dredging with the potential to result in disturbance, injury and death.
- Vessel movements causing disturbance and possible risk of injury from collision.
- Reduced water quality, including increased suspended sediments and contaminants which could be harmful to dolphins.
- There may also be impacts to the prey species of dolphin – either from the placement of infrastructure (habitat changes, pollution, sediment increase etc.), noise or reduced water quality.

Operation

- Vessel movements causing disturbance and possible risk of injury from collision.
- Maintenance operations including dredging.

- **Subtidal sandbanks – NO**

Not appraised further as the proposed works will have no impact at all on this feature.

River Dee SAC

- **Atlantic Salmon and Freshwater Pearl Mussel – YES**

Atlantic salmon occur along the coast of NE Scotland and spawn in several NE rivers. The closest designated natural heritage site to the proposed harbour is the River Dee SAC, just north of Nigg Bay. The latest assessed condition is Favourable Maintained.

Salmon and trout may act as host species during the larval stage of freshwater pearl mussel reproduction. Any impacts on these host species may therefore have an impact on freshwater pearl mussels. The latest assessed condition is Unfavourable No Change.

Potential mechanisms of impact from the proposed works on Atlantic salmon and freshwater pearl mussels include:

Construction

- Underwater noise arising from blasting, drilling, impact piling and dredging with the potential to result in disturbance, injury and death.
- Exclusion or displacement from or loss of habitat
- Reduced water quality, including increased suspended sediments and contaminants which could be harmful to salmon.
- Lighting, with the potential to influence migratory behaviour.

Operation

- Exclusion or displacement from or loss of habitat
 - Reduced water quality, including increased suspended sediments and contaminants which could be harmful to salmon.
 - Lighting, with the potential to influence migratory behaviour.
- **Otter – NO**

Not appraised further as SNH has advised that the proposal will have no significant impact on this feature. The latest assessed condition is Favourable Declining.

Isle of May SAC

- **Grey seal – YES**

See comments *. The latest assessed condition is Favourable Maintained.

- **Inshore sublittoral rock reefs - NO**

Not appraised further as the proposed works will have no impact at all on this feature. The latest assessed condition is Favourable Maintained.

Berwickshire and North Northumberland Coast SAC

- **Grey seal – NO**

*Grey seals occur throughout Scottish waters. Recent analysis of seal telemetry data by SMRU (SNH, 2011) has shown that grey seals tagged in both the Isle of May SAC and Berwickshire and North Northumberland Coast SAC appear to routinely travel past Aberdeen (through the proposed location) on their way to the Pentland Firth. Grey seals will haul out at various places along the route and may therefore use the grey seal haul out sites in Aberdeenshire.

A seal telemetry analysis by Sea Mammal Research Unit ("SMRU") (ES Appendix 15-B) found grey seals tagged at the Isle of May and Berwickshire and North

Northumberland Coast SACs had used Nigg Bay. There was also low connectivity with grey seal SACs further away such as the Humber Estuary, Monarch Islands, Faray and Holm of Faray. The degree of connectivity between the proposal area and protected sites is, however, only of sufficient level to warrant further assessment in connection with the population of the Isle of May. The latest assessed condition is Favourable Maintained.

Potential impacts from the proposed new harbour on grey seals are:

Construction

- Underwater noise arising from blasting, drilling, impact piling and dredging with the potential to result in disturbance, injury and death.
- Vessel movements causing disturbance and possible risk of injury from collision.
- Reduced water quality, including increased suspended sediments and contaminants which could be harmful to seals or impair foraging.
- There may also be impacts to the prey species of seals – either from the placement of infrastructure (habitat changes, pollution, sediment increase etc) or due to noise.

Operation

- Vessel movements causing disturbance and possible risk of injury from collision.
- Reduced water quality, including increased suspended sediments and contaminants which could be harmful to seals or impair foraging.
- **Intertidal mudflats and sandflats, Reefs, Sea caves and Shallow inlets and bays - NO**

Not appraised further as the proposed works will have no impact at all on these features. The latest assessed condition for the sea caves is Favourable Maintained. The other three features have not been assessed.

Firth of Tay and Eden Estuary SAC

- **Harbour (common) seal – NO**

Harbour seals tend to be more limited in their range foraging distances usually limited to about 50km from the core areas with an SAC. The two closest harbour seal SACs, Firth of Tay and Eden Estuary SAC and the Dornoch Firth and Morrich More SAC are beyond this normal foraging range. As a result, there will be no significant effect on the harbour seals from these sites. The latest assessed condition is Unfavourable Declining.

- **Subtidal sandbanks, Estuaries and Intertidal mudflats and sandflats – NO**

Not appraised further as the proposed works will have no impact at all on these features. The latest assessed condition for both features is Favourable Maintained.

Based on the above advice from SNH and the identification of LSE, the following SACs/ qualifying interests are considered in the Appropriate Assessment (section 2c)

- Moray Firth SAC – bottlenose dolphin
- Isle of May SAC – grey seal
- River Dee SAC – Atlantic salmon, freshwater pearl mussel

SPAs

SPAs are listed below with their qualifying species for which Nigg Bay is within their foraging range. These species were observed in surveys or recorded from literature to regularly use the bay.

The proposal has the potential to affect these species through:

- Disturbance from construction and operation
- Loss of habitat and feeding grounds, either temporary or permanent
- Reduced prey availability
- Reduced water quality

Consequently, there is a likely significant effect upon the following qualifying interests. Some interests qualify during the breeding season and others are non-breeding qualifiers, detail on this is also provided:

Ythan estuary, Sands of Forvie and Meikle Loch SPA

- **Breeding little tern**
- **Breeding sandwich tern**
- **Non-breeding eider**
- **Non-breeding redshank**
- **Overwintering waterfowl assemblage**

The latest condition for the non-breeding eider is Favourable Declining and for the other species is Favourable Maintained.

Ythan estuary, Sands of Forvie and Meikle Loch pSPA

- **Breeding sandwich tern**
- **Breeding little tern**

The marine extension to Ythan Estuary, Sands of Forvie and Meikle Loch SPA has been selected to provide protection to important foraging grounds used for feeding, by breeding Sandwich terns and little terns. The latest condition for these species at the current SPA is Favourable Maintained.

Buchan Ness to Collieston Coast SPA

- **Breeding fulmar**
- **Breeding guillemot**
- **Breeding herring gull**
- **Breeding kittiwake**

The latest assessed condition for fulmar is Unfavourable Declining, for guillemot is Favourable Declining and for the remaining species is Unfavourable No Change.

Fowlsheugh SPA

- **Breeding guillemot**
- **Breeding razorbill**
- **Breeding fulmar**
- **Breeding kittiwake**
- **Breeding herring gull**
- **Breeding seabird assemblage**

The latest assessed condition for herring gull is Unfavourable Declining and for the remainder of these species is Favourable Maintained.

Montrose Basin SPA

- **Non-breeding eider**
- **Non-breeding oystercatcher**
- **Non-breeding redshank**
- **Overwintering waterfowl assemblage**

The latest assessed condition for all these species is Favourable Maintained.

Firth of Tay and Eden Estuary SPA

- **Non-breeding common scoter**
- **Non-breeding velvet scoter**
- **Non-breeding eider**
- **Non-breeding goldeneye**
- **Non-breeding long-tailed duck**
- **Non-breeding oystercatcher**
- **Non-breeding redshank**
- **Overwintering waterfowl assemblage**

The latest assessed condition for scoter and eider is Unfavourable No Change, for long-tailed duck it is Unfavourable Declining, for oystercatcher Favourable Recovered and the remaining species are Favourable Maintained.

Forth Islands SPA

- **Breeding gannet**
- **Breeding lesser-black backed gull**

The latest assessed condition for both these species is Favourable Maintained.

Firth of Forth SPA

- **Non-breeding common scoter**
- **Non-breeding velvet scoter**
- **Non-breeding long-tailed duck**
- **Non-breeding eider**
- **Non-breeding goldeneye**
- **Non-breeding oystercatcher**
- **Non-breeding red-throated diver**

- **Non-breeding curlew**
- **Non-breeding ringed plover**
- **Non-breeding turnstone**
- **Non-breeding redshank**
- **Overwintering waterfowl assemblage**

The latest assessed condition for scoter, long-tailed duck and goldeneye is Unfavourable Declining, for eider and the overwintering waterfowl assemblage it is Favourable Declining and the remaining species are Favourable Maintained.

Outer Firth of Forth and St Andrew's Bay Complex pSPA

- **Non-breeding eider**

This site is in the process of being designated and has not latest assessed condition. SPA qualifying species (as previously listed in section 1b), which do not appear above, have not been observed in surveys or recorded from literature to regularly use Nigg Bay, therefore they are not appraised further as it is considered unlikely that they will be significantly impacted by the proposal.

2c. Appropriate assessment of the implications for the site in view of the site's conservation objectives.

Advice regarding whether the proposal is likely to adversely affect the integrity of the site was received from SNH and is summarised below in the main body of the text within this section of the assessment. Where applicable, comments or recommendations from other consultees have been included.

1. SACs

Relevant conservation objectives

Marine mammals are mobile species and impacts can also occur away from the relevant designated sites, so it is for the following conservation objectives to be considered against the potential impacts:

- Will the proposal cause significant disturbance to mobile species (bottlenose dolphins and grey seal) while they are outwith the SAC such that the viability of the SAC population is affected?
- Will the proposal in any way affect the population viability of the SACs from which the mobile species are connected? This could include indirect impacts – such as the degradation or loss of supporting habitats or feeding grounds which are outwith the SAC but which help to maintain the population of mobile species in the SACs in the long-term.

Atlantic salmon is also a mobile species and there may be impacts from underwater noise whilst approaching or leaving the mouth of the River Dee both within and outwith the designated site boundary and the conservation objectives above are also relevant.

For freshwater pearl mussels, the conservation objective that requires consideration is:

- Distribution and viability of freshwater pearl mussel host species i.e. impacts on

salmon may have an indirect effect on freshwater pearl mussels. If the salmon interest of the River Dee SAC is assessed not to adversely affect site integrity, then the freshwater pearl mussel interest will also be assessed as not being at risk in this SAC.

Potential impacts from AHEP

The main impacts from the proposed works are listed below with a short description of the risk each impact will have on the relevant species.

- Underwater noise – Bottlenose dolphin, grey seal and Atlantic salmon

Risks:

Death, injury (permanent and temporary), disturbance and displacement during construction.

- Vessel movements – Bottlenose dolphin, grey seal (MSS consider that this could also be a possible impact pathway in relation to Atlantic salmon).

Risks:

Injury from collision, disturbance (visual and acoustic) and displacement during construction and operation.

- Reduced water quality – Bottlenose dolphin, grey seal and Atlantic salmon

Risks:

Death and reduced health during construction and operation.

- Abundance of prey species – Bottlenose dolphin and grey seal

Risks:

Construction and operation result in localised reductions in the abundance of fish prey through, for example, underwater noise and a reduction in water quality.

- Lighting – Atlantic salmon

Risks:

Delay to migration patterns.

Assessment

The risks identified are underwater noise, vessel movements, reduced water quality and abundance of prey species. This assessment summarises advice received from SNH and includes further information from other consultees where applicable.

Underwater noise – Bottlenose dolphin, grey seal and Atlantic salmon

Modelling has been carried out to predict underwater noise from drilling, blasting and impact

piling. The study (ES technical appendix 13-B) uses a variety of metrics to estimate zones in which death, injury (permanent and temporary) and disturbance will occur for bottlenose dolphin, grey seal and Atlantic salmon.

There is considerable uncertainty in this assessment because:

- the details of the construction methods are not known yet;
- underwater noise modelling has made assumptions about the propagation of sound at the site, which can only be verified through measurements; and
- it is not known what levels of noise will transmit around Girdle Ness headland to the mouth of the current harbour (part of the River Dee SAC) without mitigation.

The ES provides information on how bottlenose dolphin, grey seal and Atlantic salmon use both the area of proposed works and the wider area around it. Based on a number of surveys, records of sightings and C-POD data (a passive acoustic monitoring tool used to monitor the presence or absence of cetaceans) the area of proposed works is considered to be important for bottlenose dolphins. The areas between Aberdeen and Stonehaven are recognised as feeding areas for grey seal and they are likely to transit past the entrance to Nigg Bay. It is likely that other areas to the north of the proposed works are also important for grey seal but there are more limited data regarding how the grey seals use the area. There are no grey seal haul out sites within the area likely to be affected by underwater noise, the nearest being at the mouth of the River Don, to the north. The ES and Dee DSFB provide background information on the salmon stocks in the River Dee and when the adult salmon are likely to be returning to the river.

The noisy activities associated with the proposed works are likely to cause disturbance or displacement of the species and without mitigation measures could cause injury. Even with mitigation measures in place there is still likely to be disturbance caused to the species. The ES and further clarification documents provided note that impact piling and blasting will, when possible, be carried out behind the breakwater to impede the propagation of sound behind the breakwater. Where this is not the case a bubble curtain will be deployed around the blast location. The contractor must also investigate alternative options to reduce the propagation of underwater noise and if these are found to be more effective than bubble curtains, the contractor must discuss the benefits and suitability of these options with SNH and Marine Scotland. Further mitigation includes use of vibro piling, a soft start for piling and a restriction of piling activity to 7am - 7pm Monday to Friday, 9am - 4pm on Saturdays and no percussive piling on Sundays. Time restrictions have been included as Marine Mammal Observers ("MMOs") are only effective during daylight hours, the break in noisy activity will also allow the dolphins to utilise the area for some of the time.

Vessel movements- Bottlenose dolphin, grey seal (MSS consider that this could also be a possible impact pathway in relation to Atlantic salmon)

Construction traffic will result in an increase in the number of vessels in the area, resulting in an increased collision risk for marine mammals. There will also be an increase in vessels travelling between Nigg Bay and the spoil disposal ground during dredging, with an estimated 11-25 daily trips on a continuous basis while dredging takes place. Traffic once the harbour is operational will also be at higher levels than currently occur although less than during construction.

Large vessels will be moving along a predictable route, mostly at slow speeds on approach to and leaving the new harbour, reducing the likelihood of collision. Smaller vessels can travel at faster speeds on less predictable routes and this led to the development of the Aberdeen Harbour Dolphin Code to guide the behaviour of all boat operators within the

current harbour. The regular presence of grey seals and dolphins in Aberdeen harbour indicates that these species are able to negotiate vessel traffic to maintain their foraging activities. Bottlenose dolphins in the harbour appear to have habituated to high vessel traffic in that area. They will leave the harbour and return based on the levels of vessel traffic with less dolphins observed when there are periods of higher numbers of vessels in transit (15.6.3.3, from Pirotta et al 2013). Bottlenose dolphins have been shown to recommence foraging as boats move away following the disturbance.

For grey seals the risks are as outlined for bottlenose dolphin although SNH note that while collisions with seals can occur, they are recognised as being agile swimmers that are able to avoid relatively slow moving vessels.

Reduced water quality - Bottlenose dolphin, grey seal and Atlantic salmon

There are risks of pollution incidents during construction of the harbour. In addition, the ES states that numerical modelling forecasts a reduction in water quality within the harbour during the operational phase of the scheme (15.6.4.4). There will also be increased concentrations of suspended sediments during dredging for construction and maintenance of the scheme within Nigg Bay and at the spoil disposal site, approximately 1km from the harbour. The total volume of material to be dredged is 2,850,000 m³ (for the construction phase). It is also stated that there may be overlap with disposal of dredged material from the existing Aberdeen Harbour during their maintenance dredging activities.

Marine mammals are susceptible to marine pollution and to bioaccumulation, consequently adequate pollution control measures are required during the new harbour's construction and operation. The ES states that prey for marine mammals are unlikely to be present in the harbour once it is operational. On this basis bottlenose dolphins nor grey seals would not be likely to enter the new harbour so any exposure to contaminants is likely to be limited.

However, for grey seals there is an additional risk if the new harbour is used for landing fish in the future as that could represent a foraging opportunity that grey seals may exploit. This would increase the amount of time they spent in the new harbour.

Suspended sediments could temporarily impair the foraging ability of marine mammals, although cetaceans largely rely upon echolocation for foraging, so would be less affected by reductions in visibility. As highly mobile species, they are able to move away from areas of higher concentrations and return once the disturbance has ceased. It should be noted that disposal of dredge material from maintenance of the new harbour, once operational, will require a separate marine licence. A further appropriate assessment would be required to be undertaken before any such further authorisation may be given.

There is a lack of published literature relating to critical levels for diadromous fish of exposure to suspended sediments in the marine environment. However, it is apparent that many species of diadromous fish (including Atlantic salmon) appear to be capable of migrating through and surviving high suspended solid concentrations in estuarine environments (although they are likely to try to avoid areas of high suspended solids). Diadromous fish species are present, or have been recorded, in many estuaries regarded as being at the higher end of the turbidity scale and some of these sites have been designated as a Special Area of Conservation for migratory fish species. It is considered unlikely that the increased turbidity arising from dredging within Nigg Bay (or dumping at the disposal site) would deter fish from entering or leaving the river.

Abundance of prey species - Bottlenose dolphin and grey seal

The ES states (15.6.4.5) that potential fish prey may temporarily avoid areas of adverse

noise and sediment influences arising from construction. Significant adverse effects on potential fish prey within the wider region are not expected. Bottlenose dolphin feed regularly at the mouth of the River Dee and may also forage in Nigg Bay. Mitigation for salmon is likely to be effective for other fish species and consequently not adversely affect prey species for bottlenose dolphin and grey seal.

Lighting – Atlantic salmon

The ES states that dimmed and directional lighting will be used to minimise light spillage to non-operational areas.

Freshwater pearl mussel

Potential impacts on freshwater pearl mussel are indirect through impacts to their host species during larval stages. It is considered that juvenile salmon and trout in the River Dee will provide sufficient resources as a host species for freshwater pearl mussel for the duration of the piling works.

Mitigation

Underwater noise – Bottlenose dolphin, grey seal and Atlantic Salmon

Vibro piling to be used instead of impact piling where practical. Passive acoustic monitoring (“PAM”) to be used for mitigation zone monitoring for vibro piling at night.

Impact/percussive piling - Use of MMOs for 1km buffer, soft start procedure. Restricted to 7am - 7pm Monday to Friday, 9am - 4pm on Saturday, and no percussive piling on Sundays. In addition, impact piling can only be carried out in areas which are screened from the open water by the presence of a fully or partially constructed breakwater(s) so that there is no direct line of sight (reducing the noise reaching the open water) between the location of the piling and open water. PAM should be used if impact/percussive piling is carried out in hours of darkness.

Drilling – MMOs, PAM during hours of darkness, with 500m mitigation zone.

Blasting – MMOs and a mitigation zone of at least 1km. No blasting should take place at night unless there are exceptional circumstances, if this is the case PAM must be used. In addition, blasting will either be carried out behind bubble curtains or from areas which are screened from the open water by the presence of a fully or partially constructed breakwater(s) so that there is no direct line of sight between the location of the charges and open water.

Dredging – MMOs, PAM and 500m mitigation zone to avoid disturbance and to ensure no bottlenose dolphins injured during sediment disposal.

Vessel movements

Develop a vessel routing plan, vessel management plan and application of Aberdeen harbour dolphin code.

Reduced water quality

Development of an Environmental Management Plan including a pollution prevention plan.

Abundance of prey species

No additional mitigation, measures such as soft –start piling included to reduce the risk of injury to marine mammals will allow mobile prey species to leave the area.

Lighting

Dimmed and directional lighting.

Conclusion

Underwater noise - Bottlenose dolphin, grey seal and Atlantic salmon

SNH concluded that the combined mitigation proposed should prevent death and injury from piling and blasting, and also limit the level of disturbance and displacement of bottlenose dolphin from their preferred foraging area at the mouth of the River Dee, and of Nigg Bay whilst in transit along the east coast of Scotland such that it would not lead to an adverse effect on their population.

It is recommended that marine mammal and noise monitoring is put in place in order to validate the claims made in the ES, and supporting documents. Recordings should be made of piling and blasting, behind the breakwater barrier and the bubble curtain barrier but along the line of sight. Noise monitoring and reporting may also allow adaptive mitigation such that if noise levels are consistently below predictions it might allow some flexibility in the mitigation requirement. A monitoring strategy must be agreed before works commence and be linked to the Construction Environmental Management Document (“CEMD”).

In conclusion for grey seal, SNH advised that the proportion of the grey seal population from the Isle of May SAC that occurs in Nigg Bay is small and there would not be an adverse effect on the integrity of the SAC population.

In conclusion for Atlantic salmon, SNH advised that the use of soft start for impact piling, diurnal restriction on piling and blasting throughout the year and cessation of piling on Sundays, together with restriction on impact piling to where there is no line of sight to open sea and use of bubble curtains for blasting, should prevent any temporary auditory injury and allow Atlantic salmon to continue their migration and movement into and out of the River Dee SAC. There would not be an adverse effect on the integrity of the River Dee SAC from underwater noise.

Vessel movements – Bottlenose dolphin and grey seal

SNH concluded that vessel movements are unlikely to affect the population of seals from the Isle of May SAC. With suitable mitigation there should be no adverse effect on the integrity of the Moray Firth SAC bottlenose dolphin population. SNH advised that conditions should be attached to the marine licence to require a vessel routing plan and management plan. The Aberdeen harbour dolphin code was developed specifically for within the current harbour and not the areas outwith it. Bottlenose dolphins are not likely to occur within the new harbour as it will be a semi enclosed area with limited foraging potential. A code will be developed to guide the behaviour of boat operators in Nigg Bay and the waters around the new and existing harbours.

Reduced water quality – Bottlenose dolphin, grey seal and Atlantic salmon

SNH concluded that it can be shown that there would not be an adverse effect on integrity of relevant SACs with suitable mitigation and best practice in place. They advised that conditions should be attached to the marine licence to require an Construction

Environmental Management Document, including a pollution prevention plan, to be agreed with MS-LOT (and relevant consultees) prior to the commencement of any works.

Abundance of prey species – Bottlenose dolphin and grey seal

SNH concluded no adverse effect on site integrity.

Lighting – Atlantic salmon

SNH concluded no adverse effect on site integrity.

SACs In-combination assessment

The further information provided by the applicant included a table (Table 6.1) that SNH considered to include all relevant developments SNH were aware of for consideration in an in-combination assessment:

- European Offshore Wind Deployment Centre (“EOWDC”)
- Seagreen Alpha Offshore Wind Farm
- Seagreen Bravo Offshore Wind Farm
- Inch Cape Offshore Wind Farm
- Neart na Gaoithe Offshore Wind Farm
- Moray Firth Eastern Development Area (Telford, Stevenson and MacColl Offshore Wind Farms)
- Beatrice Offshore Wind Farms

MS-LOT are also aware of other operations which may be taking place in the area during the period when the AHEP construction is planned and where LSE on the bottlenose dolphin qualifying interest was identified and therefore should also be included in an in-combination assessment:

- Cromarty Firth Port Authority – Navigation channel dredge, West harbour dredge, phase 3 dredge
- Aberdeen Harbour Board - maintenance dredge
- Global Energy Nigg – capital dredge
- Macduff harbour - maintenance dredge
- Peterhead harbour masterplan – construction and dredging (work was originally due to be completed by the end of 2016, however MS-LOT are aware that works have not yet commenced and are likely to do so later this year. Noise is considered to be largely limited to inside the harbour limits).
- Ardersier port development – construction and dredging (work was due to commence in 2014 however MS-LOT are aware that works have not yet started).

Mitigation has been included on the marine licences issued for these operations to reduce potential impacts on bottlenose dolphins.

SNH noted that it is not straightforward to assess cumulative effects at the project proposal level, especially when timescales for various projects often change from what is predicted, for example the Firth of Forth and Tay wind farms are subject to legal proceedings.

SNH were of the opinion that the underwater noise produced by the European Offshore Wind Development Centre in Aberdeen Bay is likely to be short in duration and adequately mitigated. (Since SNH provided their advice updated information about this development has been provided which notes there will not be any piling as suction buckets will be used

instead). Also considered was the previous Moray Firth wind farm cumulative assessment which concluded that the impact on bottlenose dolphins would not be detrimental to the population. SNH's qualitative cumulative assessment concluded that the Aberdeen harbour expansion project would not add significant impact to the development works already planned. However, MSS previously provided advice regarding the need for a quantitative cumulative assessment of the potential effects to the east coast of Scotland bottlenose dolphin population from the Aberdeen Harbour Expansion Project proposal and other developments within the dolphin population's range, including the Moray Firth and Forth and Tay offshore wind farms. Discussions between SNH, MSS and MS-LOT agreed that MSS would use a PVA to verify the advice given by SNH.

The assessment that MSS has undertaken includes some very precautionary assumptions, and should be considered to be indicative, rather than absolute. These assumptions are listed in table 6 in the appendix (Appendix 1). A PVA model was run to provide a baseline assessment of the population with no impact, and further scenarios were run with different developments added. The effect of the Aberdeen harbour development was small alone, and also when combined with other developments. All population size outcomes were statistically indistinguishable from each other and from the baseline population. When the worst case scenario (Aberdeen harbour plus Moray Firth and Forth and Tay wind farms) was run to 10 years following the end of construction activities, the population trend was stable, and potentially increasing slightly. This indicates that under this worst case scenario, the bottlenose dolphin population is not predicted to be pushed into decline.

SNH have advised that they do not consider that the proposal in combination with other developments would have an adverse effect on the integrity of bottlenose dolphin feature of the Moray Firth SAC, given the mitigations proposed. Having now considered cumulative effects in a more quantitative manner, including both the Moray Firth and Forth and Tay wind farms, MSS have reached the same conclusion, again, on the basis that the mitigations and working practices discussed are implemented. These include:

- All pile driving works being carried out behind partially constructed breakwaters.
- Blasting works being carried out behind breakwaters where possible.
- All blasting works being carried out with bubble curtains operating to reduce noise levels propagated to open water.
- The minimum amount of blasting being undertaken, using the smallest practical charges.
- Blasting works undertaken for a period of 3 to 7 months, with 1 to 2 blasts per day and breaks between blasting days for dredging work.

MSS agrees with and support the recommendation from SNH that monitoring of both marine mammals and noise levels is undertaken during the construction works. MSS and SNH will be involved in discussions regarding the plans to develop this monitoring to ensure that it meets scientific standards to allow meaningful interpretation.

In relation to the grey seal and Atlantic salmon qualifying interests SNH advised that the AHEP would not have an adverse effect on the integrity of the SACs when considered in combination with other development works.

Having considered the information provided by the applicant, the potential risks from the different impact pathways, the mitigation and the advice provided by SNH, MSS and other consultees, and the details of other development work taking place in the

region, MS-LOT concludes that the AHEP proposed works, alone or in-combination with other plans or projects, will not adversely affect the integrity of the Moray Firth SAC with respect to bottlenose dolphin, the Isle of May SAC with respect to grey seal or the River Dee SAC with respect to Atlantic salmon and freshwater pearl mussel, provided it is undertaken in strict accordance with the conditions to be attached to the marine licence, as set out in 2d.

2. SPAs

SNH provided the following advice:

Relevant conservation objectives

Impacts will occur away from the designated site areas, so the following conservation objectives are considered:

- Whether the proposal causes significant disturbance to birds while they are outwith the SPAs, such that the viability of the SPAs' populations are affected.
- Whether the proposal will in any way affect the population viability of the SPAs with which the birds are connected. This could include indirect impacts – such as the degradation or loss of supporting habitats or feeding grounds which are outwith the SPAs but which help to maintain the population of the birds in the SPAs in the long-term.

Potential impacts from this proposal

- Disturbance

Construction activities are likely to cause disturbance to birds using Nigg Bay. This may displace them for all or part of the duration of the 3 year construction period. It will be difficult for vessels to avoid aggregations of sea duck in the bay during the construction phase (updated clarification note provided by AHB to MSS, SNH and RSPB on 11 April 2016). Gulls, fulmar, terns and gannet are less sensitive to vessel presence and movements than sea ducks so may continue to forage in the area during construction. Operation of the harbour may also cause disturbance (e.g. from vessel movements) resulting in displacement of some species. Dredging may potentially attract gulls if benthic organisms are released into the water column.

- Loss of habitat

Once construction is completed it will result in a permanent loss of habitat in the harbour and under the breakwaters. There will also be changes to the benthic habitats from maintenance dredging. This will result in a reduction in availability of benthic invertebrates, fish and shellfish and regular dredging of the seabed is likely to prevent re-colonisation of the site. It is not possible to mitigate for this loss.

Sandeels, an important component of the diet of many seabirds such as terns, are present in Nigg Bay but in lower numbers than elsewhere in the wider region (chapter 12 of the ES). The ES indicates that habitat within the proposal site is unsuitable for sandeel although some evidence of sandeel is found in the benthic samples. Key spawning and nursery grounds for sandeels were identified just outside Nigg Bay and the ES predicts that these will be unaffected by the construction and operation of the harbour.

Species such as razorbill, guillemot, gannet and fulmar feed regularly in the outer areas of Nigg Bay and are common offshore. These species have large foraging ranges and therefore displacement or habitat loss of these seabird species is very unlikely to lead to adverse impacts on their populations. Kittiwake are common in the proposal area and there are large roosts of several thousand individuals along the breakwaters in Aberdeen harbour. While kittiwakes are more constrained in their choice of prey items there is sufficient alternative habitat available.

Sandwich and common tern are common in the area and roost on the rocky shore in nearby Greystone Bay. Terns have more restricted foraging ranges than other seabird species (Thaxter et al 2012). They are likely to feed largely in the outer areas of the bay where there is sandeel habitat. Auks tend to forage in the outer areas of the bay where there are likely to be higher concentrations of sandeels.

Waders such as oystercatcher, ringed plover, curlew and redshank were recorded as present only in low numbers so the proposal would not have a significant adverse impact on populations of these species.

The breakwaters would provide a substitute rocky shore habitat for roosting gulls and terns.

Nigg Bay is a natural bay that acts as a refuge for aggregations of sea ducks, depending on the prevailing wind and weather conditions. It offers a higher level of shelter than many other bays along the north-east coastline (ES 14.6.1.2).

For most species of sea duck, there is sufficient alternative habitat meaning that the integrity of the SPAs for which they are qualifying interests will not be adversely affected.

Male eider from the Ythan move south to moult. Large numbers of eider occur between Nigg Bay and the Ythan estuary with high counts occurring regularly in the summer months in the area of Blackdog, Girdle Ness (including Nigg Bay) and the Ythan estuary. Eider duck are present in the proposal area all year round, using the sheltered site for feeding, roosting and moulting. Flocks in the summer reaching peak numbers of 749 and 903 (ES 14.5.4). Colour ringing has demonstrated that these flocks include birds that breed at Forvie on the Ythan estuary. Numbers at Blackdog/Bridge of Don generally exceed those at Nigg Bay but the survey area at Nigg Bay was much smaller than at the Bridge of Don (Lewis et al., 2008).

The wintering flocks of eider at the Ythan Estuary are a component of the SPA feature and include some locally breeding birds as well as birds from elsewhere that gather over winter (Baille in Wernham et al., 2002). Many eider that breed at Forvie spend the winter on the Tay and Forth estuaries.

SNH has carried out an apportioning exercise following their guidance for marine renewable developments (SNH, 2014) which indicates that approximately 93% of the eider in Nigg Bay breed at the Ythan Estuary and Sands of Forvie as part of the SSSI population, and 3% breed at the Montrose Basin SPA. Based on these figures, 10-13% of Ythan Estuary, Sands of Forvie and Meikle Loch SPA feature of non-breeding eider is estimated to moult at Nigg Bay. The Forth and Tay estuaries hold large populations of eider and the proportions of birds from the Ythan Estuary overwintering respectively at the Outer Firth of Forth and St. Andrews Bay Complex proposed SPA ("pSPA") is estimated as 3%.

There has been a decline in the eider population at Forvie, and this reflects national declines in numbers of breeding eider. Given the high numbers of birds aggregating

in Nigg Bay, at a period when they may be vulnerable as they are flightless, it would appear to be an important area for this species.

Experience from development works at Faslane and Sullom Voe indicates that eider habituate to and tolerate a reasonable level of human activity, even whilst breeding. Habitat loss has the potential to have a greater impact (Chris Waltho and Martin Heubeck advice to Alex Robbins, SNH marine ornithologist). During site surveys eider flocks were observed loafing on the water at Nigg Bay (information provided at meeting of 16/5/16 between AHB, MS-LOT, MSS, SNH and RSPB) and it is likely they are using the bay for shelter and foraging.

Eider foraging habitat

Mussel (*Mytilus edulis*) is a main prey item of eider duck which will also feed on other bivalves and crustacean such as crabs. The benthic survey found a small area of a biotope supporting mussels by the short sea outfall at Girdle Ness. This is outwith the footprint of the proposal area and would not be affected by it either directly or indirectly (updated clarification note provided on 11 April 2016).

Mussels were not found in other areas in the benthic survey with the exception of a small intertidal area, close to where the northern breakwater would meet the shore, where they were only recorded as occasional. It is likely that eider duck are feeding on sandy subtidal habitat. While some of this habitat would be lost due to construction and maintenance of the new harbour, it is widespread inside and outwith the new harbour. Similar habitat was recorded in the vicinity of the proposed Aberdeen bay wind farm. One sample for the new harbour identified a biotope that may be of higher value to eider due to the presence of the bivalve *Fabulina fabula*. The extent of this habitat is not known, but it is outwith the footprint of the proposal area and would not be directly affected by it (information provided at meeting of 16/5/16) but may be subject to temporary disturbance during construction.

The northern breakwater will be built in the first year of construction and it is likely that the southern will follow in the second (meeting of 16/5/16). The new breakwaters will provide substrate of around 21,000m² for marine wildlife such as mussels and crabs to potentially colonise. Notwithstanding the high energy environment which may limit the suitability of parts of the breakwaters, the concrete armour units will provide niches and crevices of varying depths. The casting mould will be modified to create a rougher surface to enhance marine growth. The breakwaters will not be treated nor kept free of marine growth (updated clarification note provided on 11 April 2016).

In addition, the area between the southern breakwater and the southern end of the West Quay will be re-profiled during construction of the harbour and may be reinforced with rock armour. However, it will be outside the operational harbour and subsequently undisturbed. It may be re-colonised by mussels and other marine life and provide further foraging habitat for eider duck.

Consequently, construction of the new harbour should not result in loss of important foraging habitat for eider and may provide additional habitat within a few years of construction commencing.

Eider shelter

Nigg Bay is one of the largest bays on the NE coast that is relatively close to the Ythan estuary. It is likely to provide shelter, as shown by the areas where eider duck

form rafts in the bay (ES, fig 14.3).

The most common wind direction in Nigg Bay is from the south west, in line with the dominant long term wind directions across the UK. The highest wind speeds were associated with winds from the south and south west (information from the ES).

The wave rose plots in Technical Appendix 6A of the ES, Oceanographic Works, provide evidence of the direction and strength of waves. Waves will approach the bay from the north-east round to the south. The largest waves approached from the south-east which was generally the most common wave approach direction. Waves from the north-east were also frequent.

The outer face of the northern breakwater and inner (northern) face of the southern breakwater will be relatively sheltered when winds and waves approach from the south and south-east. The outer face of the northern breakwater will be exposed when winds and waves are approaching from the east but the inner face of the southern breakwater would potentially provide some shelter (although potentially there may be disturbance from boat movements). The natural topography of the bay will provide shelter from winds from the north-west, west and south-west. The southern face of the south breakwater might provide shelter from winds and waves approaching from the north-east.

The breakwaters would provide sheltered areas from wind and waves in many conditions and could increase shelter in the area of mussel habitat at Girdle Ness and the area with *Fabulina fabula* to the east of the northern breakwater. These areas will not be disturbed by boat movements (updated clarification note provided on 11 April 2016 and meeting of 16 May 2016). There will also be an exclusion zone to prevent vessels associated with construction of the harbour from passing close to the shore in the vicinity of Greyhope bay. This area to the north of Nigg, which is used by smaller numbers of eider, can provide some shelter (updated clarification note provided on 11 April 2016).

There will also be shelter within the harbour once operational. The route taken by boats entering and exiting the harbour will avoid the very southern part of the bay where birds currently form rafts when the wind direction is from the north (meeting of 16 May 2016).

Construction of the breakwaters would commence prior to June each year before eider numbers have begun to increase in Nigg Bay. Breakwater construction would recommence at the end of the winter period as soon as weather conditions allow.

Public access to the breakwaters will be prohibited other than for emergency or maintenance purposes, so eider roosting on these structures should not be disturbed. Security fencing will prevent terrestrial predators such as foxes.

Consequently, long term displacement of eider is considered unlikely if the mitigation proposed is implemented.

- Reduced water quality

There are risks of pollution incidents during construction of the harbour, for instance from fuel, oil and lubricants. In addition, the ES states that numerical modelling forecasts a reduction in water quality within the harbour during the operational phase of the scheme (15.6.4.4).

There will also be increased concentrations of suspended sediments during dredging for construction and maintenance of the scheme within Nigg Bay and at the spoil disposal site, approximately 1km from the harbour. The total volume of material to be dredged is 2,850,000 m³ (for the construction phase). It is also stated that the disposal of dredged material from the existing Aberdeen Harbour could be occurring at the same time.

Marine birds are susceptible to pollution which can affect their health or cause death. Consequently, adequate pollution control measures are required during the new harbour's construction and operation. Suspended sediments could temporarily impair the foraging ability of birds that feed in the bay, although as described above, prey availability is likely to be reduced. The application states that measures to overcome these issues will be included within an agreed Environmental Management Plan.

- Collision with vessels

Birds in moult such as eider will have reduced ability to fly and move out of the way of vessels. The ES states that they are likely to be able to dive to get out of the way. Eider are flightless during moult and therefore have restricted mobility. They are able to forage and dive but this has a greater energetic cost due to the change in wing-loading (e.g. Frimer, 1995). Moult is an energetically costly period for eider and therefore additional exertion should be avoided (Guillemette et al., 2007 and Savard et al., 2011).

The ES states that the Marine Co-ordinator who will co-ordinate traffic with AHB's Vessel Traffic Services, will advise vessel skippers of any aggregations of birds and temporary avoidance areas may be put in place *where possible* (14.7). A vessel routing plan is proposed as mitigation.

- Lighting

Artificial lighting is widely acknowledged to have a negative effect on birds (e.g. Poot et al., 2008), which can cause attraction and disorientation. However, we note that the HRA includes a dimmed and directional lighting strategy. Lighting will be directed inwards to the harbour on the northern breakwater and minimised on the southern breakwater. A lighting strategy appropriately applied would reduce any artificial lighting impacts.

SNH concluded that, with suitable mitigation the proposal should not lead to an adverse effect on the integrity of populations of birds from the SPAs listed in section 2b of this form. Conditions should require a buffer area to prevent disturbance to eider around Girdle Ness during construction and operation of the harbour; construction of the breakwaters to commence prior to June each year; casting mould of the concrete armour units for the breakwaters to be modified to create a rougher surface to enhance marine growth; no treatment of marine growth on the surfaces of the breakwaters; an CEMD including a pollution prevention plan to be agreed with MS-LOT (and relevant consultees); a vessel routing plan and lighting strategy.

SPAs In-Combination Assessment

SNH previously advised an adverse effect on site integrity for Kittiwakes at Fowlsheugh from various offshore wind projects (Forth and Tay windfarm projects) for collision and

displacement from foraging areas. However the appropriate assessment completed by MS-LOT concluded that the proposed works would not adversely affect the integrity of the Fowlsheugh SPA with respect to kittiwake (see [the Forth and Tay Offshore Wind Farm AA](#)).

The impact pathway from the harbour is disturbance from an inshore area. Most kittiwake foraging at the Nigg Bay area, forage outwith the bay itself, around the headland. Partial construction of the breakwaters is being provided, prior to blasting or piling taking place, to mitigate the impacts of underwater noise on cetaceans, and this will also provide mitigation for potential disturbance to kittiwake during construction. Post construction the breakwaters would provide roosting habitat.

Consideration of the in-combination effects with the European Offshore Wind Development Centre in Aberdeen Bay, particularly in relation to displacement of eider, has been given. The HRA for this proposal identified that the turbine envelope does not appear to coincide with any regularly-used or significant hotspots of activity for any species and that for eider there was strong evidence that shallower water closer to the shore was preferred. It is noted that any on or near-shore work relating to this proposal will be of short duration. Therefore, SNH advised that there will be no adverse effect on site integrity in combination with this proposal.

Having considered the information provided by the applicant, the potential risks from the different impact pathways, the mitigation and the advice provided by SNH and other consultees, and the details of other development works taking place in the region, MS-LOT concludes that the AHEP, alone or in-combination with other plans or projects, will not adversely affect the integrity of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA, Fowlsheugh SPA, Buchan Ness to Collieston Coast SPA, Montrose Basin SPA, Firth of Tay and Eden Estuary SPA, Forth Islands SPA or Firth of Forth SPA, provided it is undertaken in strict accordance with the conditions which are to be attached to the marine licence, and set out in 2d.

Ythan Estuary, Sands of Forvie and Meikle Loch pSPA and Outer Firth of Forth and St. Andrews Bay Complex pSPA

As detailed on page 1 of this document proposed SPAs receive Habitats Directive Article 6(3) policy protection, therefore consideration has also been given to Ythan Estuary, Sands of Forvie and Meikle Loch pSPA which is a marine extension of Ythan Estuary, Sands of Forvie and Meikle Loch SPA. The qualifying interests (sandwich tern and little tern) of this pSPA are also qualifying interests of the Ythan Estuary, Sands of Forvie and Meikle Loch SPA. In an email dated 05 September 2016 SNH confirmed that the conclusion of no adverse effect on site integrity for the SPA were also applicable to this pSPA. MS-LOT agree with this conclusion. The Outer Firth of Forth and St. Andrews Bay Complex pSPA also receives policy protection. SNH advised in relation to eider duck that impacts would be small (with the proportion of birds from the Ythan overwintering at the Outer Firth of Forth and St. Andrews bay Complex pSPA estimated to be 3%). In an email dated 05 September 2016 SNH advised no LSE for other qualifying interests of this pSPA and MS-LOT note this advice. MS-LOT conclude that the proposed works will not adversely affect the integrity of this pSPA.

As the Ythan Estuary, Sands of Forvie and Meikle Loch pSPA and the Outer Firth of Forth and St. Andrews Bay Complex pSPA are not yet designated they also fall within the regime governed by the first sentence of Article 4(4) of the Birds Directive as follows:

“In respect of the protection areas referred to in paragraphs 1 and 2, Member States shall take appropriate steps to avoid pollution or deterioration of habitats or any disturbances affecting the birds, in so far as these would be significant having regard to the objectives of

this Article. Outside these protection areas, Member States shall also strive to avoid pollution or deterioration of habitats.”

MS-LOT have considered the information presented in the ES, in particular Volume 4 Habitats Regulations Appraisal, Volume 2 Chp. 7: Marine Water and Sediment Quality, Volume 3 ES Appendix 6-B: Hydrodynamic Modelling and Coastal Processes Assessment, Volume 3 ES Appendix 7-D: Sediment Plume Modelling, along with an Intertek clarification memorandum – “Redeposited Sediment Depths From Dredging Spill” dated 21 July 2016.

This information predicts that there will be increased suspended sediment concentration levels from the dredge overspill, although this is not expected to overlap with the boundaries of the pSPA. Increased mud deposition from the trailer suction hopper dredging spill is thought to come close to the pSPA boundary, although deposition depths close to the boundary is predicted to be minimal (Figure 1 Intertek clarification memorandum – “Redeposited Sediment Depths From Dredging Spill” dated 21 July 2016). Modelling shows that increased suspended sediment concentration and sediment deposition at the disposal site will not come close to the pSPA boundary.

In conclusion, proposed dredging and dredge spoil disposal activities (during construction and operation) will result in some increase in suspended sediment concentration and sediment deposition, however these increases will be localised and temporary in nature and therefore will not significantly affect the ability of the terns to forage for prey within the pSPA or in the immediate vicinity of the boundaries of the pSPA. MS-LOT do not consider that the dredging and disposal activities will lead to any significant pollution or habitat deterioration within the pSPA.

Furthermore, to ensure that any impacts to the pSPA associated with the dredging and dredge spoil disposal activities are effectively minimised and monitored, AHB will be required to submit a Dredging and Dredge Spoil Disposal Management and Monitoring Plan for MS-LOT’s approval prior to commencement of the works (see condition 1a in section 2d).

MS-LOT consider that the Outer Firth of Forth and St. Andrews Bay Complex pSPA is sufficiently far from the area of proposed works that there will be no risk of pollution, deterioration of habitats or disturbance of the qualifying interests from the AHEP.

2d. Conditions required.

MS-LOT considers that the issues raised by RSPB, WDC and Dee DSFB are taken into account and, in some cases, have been included in the conditions outlined below. In some cases there was further discussion to clarify requirements e.g.

- It was agreed that there was a lack of certainty on the effectiveness of acoustic deterrent devices (ADDs) to safeguard smolt passage through the harbour so ADDs will not be used. Furthermore, SNH advised of the need to consider the potential impact of ADDs on the bottlenose dolphin population of the Moray Firth SAC.
- It was confirmed with RSPB (30 June 2016) that they were content with a condition that restricts commencement of breakwater construction between 1st June and 31st August i.e. during the period when eider are likely to be moulting and unable to move away from the area easily.

Condition	Reason
<p>1. The licensee must submit a detailed Construction Environmental Management Document (“CEMD”) to the licensing authority for their written approval, no later than two months or at such a time as agreed with the licensing authority, prior to the commencement of the works. It is not permissible for the works to commence prior to the granting of such approval. In granting such approval, the licensing authority may consult any such other advisors, organisations or stakeholders as may be required at their discretion. The CEMD must be consistent with the marine licence application, environmental statement (“ES”) and supporting information.</p> <p>The CEMD must include, but shall not be limited to the following:</p> <ul style="list-style-type: none"> a) detailed Construction Method Statements (“CMSs”) and Construction Environmental Management Plans (“CEMPs”) including the following specific management plans: <ul style="list-style-type: none"> I. marine mammal protection plan (“MMPP”); II. vessel management plan (“VMP”); III. noise and vibration mitigation plan (including hours of operation) IV. lighting plan (including strategy for dimmed and directional lighting) V. traffic management plan; VI. pollution prevention plan; VII. otter protection plan; VIII. piling management plan; IX. fish species protection plan; X. habitat management plan; XI. waste management plan; and XII. Nigg Bay Site of Special Scientific Interest management plan. XIII. dredging and dredge spoil disposal management and monitoring plan b) commencement dates, duration and phasing information of key elements of construction; 	<p>To minimise disturbance and avoid injury to bottlenose dolphins, salmon (SACs) and birds (SPAs).</p> <p>To reduce disturbance and avoid injury to birds and to provide mitigation (SPAs).</p> <p>To mitigate loss of habitat for birds (SPAs).</p> <p>To ensure all environmental issues are taken into account in designing the construction of the harbour.</p> <p>To monitor the effectiveness of mitigation methods proposed.</p>

<ul style="list-style-type: none"> c) a schedule of mitigation and monitoring measures to protect the environment, including cross-referencing between relevant management plans or other documents; d) processes to control changes from the agreed schedule of mitigation; e) processes to detail how each and all contractors and sub-contractors will be made aware of environmental sensitivities, what requirements they are expected to adhere to, how chains of command will work including shore to vessel communications etc.; and f) a process and schedule for providing the licensing authority with regular updates on construction activity, issues encountered and how these have been addressed. <p>In the event that the licensee wishes to request staged approval of the CEMD, the licensee must submit, in writing, a detailed schedule of the proposed CEMD submission stages and associated documents relative thereto, to the licensing authority for their written approval, no later than two months or at such a time as agreed with the licensing authority, prior to the commencement of the works.</p> <p>In the event that the licensee wishes to update or amend the CEMD, the licensee must submit, in writing, details of the proposed updates or amendments to the licensing authority for their written approval, no later than one month or at such a time as agreed with the licensing authority, prior to the planned implementation of the proposed updates or amendments. It is not permissible for any works associated with the proposed updates or amendments to proceed prior to the granting of such approval.</p> <p>Unless otherwise agreed, in writing by the licensing authority, all works must proceed in accordance with the approved CEMD.</p>	
<p>2. The licensee must submit a detailed MMPP to the licensing authority for their written approval, no later than two months or at such a time as agreed with the licensing authority, prior to the commencement of the works. It is not permissible for the works to</p>	<p>To minimise disturbance and avoid injury to marine mammals (SACs). This will also mitigate impact on salmon (SACs).</p>

commence prior to the granting of such approval. In granting such approval, the licensing authority may consult any such other advisors, organisations or stakeholders as may be required at their discretion. The MMPP must be consistent with the marine licence application, ES, the CEMD (including CMSs and CEMPs) and supporting information.

The MMPP must set out measures to prevent injury and disturbance to marine mammals and must include, but shall not be limited to the following:

- a) restriction of piling activity to 7am - 7pm Monday to Friday, 9am - 4pm on Saturdays and no percussive piling on Sundays;
- b) restriction of blasting to day light hours unless during exceptional circumstances.
- c) a process to record and report, in writing to the licensing authority, within 48 hours, instances where blasting has occurred, due to exceptional circumstances, outwith daylight hours;
- d) measures to ensure piling commences with soft start over forty minutes;
- e) use of MMOs and PAMs during piling/blasting/noisy activities to ensure that start up does not occur while dolphins and seals are within the mitigation zone;
- f) details to show how this would be managed over the 1km area and any amendments that may be required;
- g) measures to ensure that the minimum amount of blasting is undertaken using the smallest practicable charges;
- h) measures to ensure blasting works are undertaken for a maximum period of seven consecutive months, with no more than two blasts per day;
- i) measures to ensure impact piling will only be carried out in areas in which it is screened from the open water by the presence of a partially or fully constructed breakwater(s), so that there is no 'direct line of sight' between the impact piling and open water;

<p>j) measures to ensure blasting will only be carried out in areas in which it is screened from the open water by the presence of a partially or fully constructed breakwater(s), so that there is no 'direct line of sight' between the blasting and open water, or will be carried out behind bubble curtains; and</p> <p>k) adherence to relevant JNCC guidelines (except where amendments have been agreed) and other best practice.</p> <p>In the event that the licensee wishes to update or amend the MMPP, the licensee must submit, in writing, details of the proposed updates or amendments to the licensing authority for their written approval, no later than one month or at such a time as agreed with the licensing authority, prior to the planned implementation of the proposed updates or amendments. It is not permissible for any works associated with the proposed updates or amendments to proceed prior to the granting of such approval.</p> <p>Unless otherwise agreed, in writing by the licensing authority, all works must proceed in accordance with the approved MMPP.</p>	
<p>3. The licensee must submit a detailed VMP to the licensing authority for their written approval, no later than two months or at such a time as agreed with the licensing authority, prior to the commencement of the works. It is not permissible for the works to commence prior to the granting of such approval. In granting such approval, the licensing authority may consult any such other advisors, organisations or stakeholders as may be required at their discretion.</p> <p>Relative to the duration of the works, the VMP must include details on vessels, their speeds, routes and frequency of trips during the works, creation of high and low disturbance areas, a vessel free buffer zone around Girdle Ness and Greyhope Bay, and details of how vessel management will be coordinated.</p> <p>Relative to the operation of the harbour, the VMP must include a code of practice to guide the behaviour of vessels in and in the vicinity of the harbour around marine mammals and</p>	<p>To minimise disturbance to marine mammals (SAC) and birds (SPAs).</p> <p>To avoid disturbance to foraging birds (SPAs).</p>

<p>rafts of birds and avoidance of the area around Girdle Ness and Greyhope Bay.</p> <p>In the event that the licensee wishes to update or amend the VMP, the licensee must submit, in writing, details of the proposed updates or amendments to the licensing authority for their written approval, no later than one month or at such a time as agreed with the licensing authority, prior to the planned implementation of the proposed updates or amendments. It is not permissible for any works associated with the proposed updates or amendments to proceed prior to the granting of such approval.</p> <p>Unless otherwise agreed in writing by the licensing authority, works must proceed in accordance with the approved VMP.</p>	
<p>4. The licensee must submit a detailed monitoring strategy to the licensing authority for their written approval, no later than two months or at such a time as agreed with the licensing authority, prior to the commencement of the works. It is not permissible for the works to commence prior to the granting of such approval. In granting such approval, the licensing authority may consult any such other advisors, organisations or stakeholders as may be required at their discretion. The monitoring strategy must be consistent with the marine licence application, ES, the CEMD (including CMSs and CEMPs) and supporting information.</p> <p>The monitoring strategy must include, but shall not be limited to the following:</p> <ul style="list-style-type: none"> a) monitoring of underwater noise produced from piling and blasting and effectiveness of mitigation; b) monitoring of use of Nigg Bay by marine mammals during construction; c) monitoring of use of the new harbour and its surroundings by eider duck during construction and once it is operational; d) development of monitoring programme to track adult salmon in the vicinity of the development site and entering the River Dee; and e) a timetable for reporting the findings of the monitoring 	<p>To ensure the proposed mitigation is effective for marine mammals (SACs) and birds (SPAs).</p>

<p>In the event that the licensee wishes to update or amend the monitoring strategy, the licensee must submit, in writing, details of the proposed updates or amendments to the licensing authority for their written approval, no later than one month or at such a time as agreed with the licensing authority, prior to the planned implementation of the proposed updates or amendments. It is not permissible for any works associated with the proposed updates or amendments to proceed prior to the granting of such approval.</p> <p>Unless otherwise agreed in writing by the licensing authority, works must proceed in accordance with the approved monitoring strategy.</p>	
<p>5. The licensee must ensure that construction of the breakwaters does not commence between 01 June and 31 August.</p>	<p>To minimise disturbance to birds when they are moulting (SPAs).</p>

Name of assessor	Victoria Bell and Tracy McCollin
Date	10 August and 12 September 2016
Name of Approver	Gayle Holland
Date	11 October 2016

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APPENDIX 1

MSS advice – Aberdeen harbour cumulative impacts on the east coast of Scotland bottlenose dolphin population 7th September 2016

MSS has previously provided advice regarding the need for a cumulative assessment of the potential effects to the east coast of Scotland bottlenose dolphin population from the Aberdeen Harbour Expansion Project proposal and other developments within the dolphin population's range. This advice provides an update on that position.

The assessment that MSS has undertaken (see appendix) includes some very precautionary assumptions, and should be considered to be indicative, rather than absolute. These assumptions are listed in table 6 in the appendix. A Population Viability Analysis (PVA) model was run to provide a baseline assessment of the population with no impact, and further scenarios were run with different developments added. The effect of the Aberdeen harbour development was small alone, and also when combined with other developments. All population size outcomes were statistically indistinguishable from each other and from the baseline population. When the worst case scenario (Aberdeen harbour plus Moray Firth and Forth and Tay wind farms) was run to 10 years following the end of construction activities, the population trend was stable, and potentially increasing slightly. This indicates that under this worst case scenario, the population is not predicted to be pushed into decline.

SNH have advised that they do not consider that the proposal in combination with other developments would have an adverse effect on the integrity of bottlenose dolphin feature of the Moray Firth SAC, given the mitigations proposed. Having now considered cumulative effects in a more quantitative manner, including both the Moray Firth and Forth and Tay wind farms, MSS have reached the same conclusion, again, on the basis that the mitigations and working practises discussed are implemented. These include:

- All pile driving works being carried out behind partially constructed breakwaters.
- Blasting works being carried out behind breakwaters where possible
- All blasting works being carried out with bubble curtains operating to reduce noise levels propagated to open water.
- The minimum amount of blasting being undertaken, using the smallest practical charges
- Blasting works undertaken for a period of 3 to 7 months, with 1 to 2 blasts per day and breaks between blasting days for dredging work.

We agree and support the recommendation from SNH that monitoring of both marine mammals and noise levels is undertaken during the construction works. We would appreciate being involved in discussions regarding the plans to develop this monitoring to ensure that it meets scientific standards to allow meaningful interpretation.

Appendix: MSS PVA modelling of bottlenose dolphin population in relation to cumulative effects from Aberdeen harbour development

Introduction

This analysis was undertaken to inform advice on the cumulative effects of the Aberdeen Harbour expansion project to the east coast of Scotland bottlenose dolphin population. It was felt that there was need to quantify to some extent the relative effects of all licensed activities for comparison and combination with the Aberdeen harbour proposals.

Methods

This PVA uses the same demographic parameters as were used in Thompson *et al.* (2000). Two main variables have changed subsequent to this; the starting population size and the inclusion of a “take” of animals to account for developments that may impact upon individuals in the population.

Starting population size

The original PVA presented in Thompson *et al.* (2000) had a starting population size of 130 animals, which was the best estimate at the time. The east coast bottlenose dolphin population size was estimated from data collected in 2006 and 2007, at 195 animals (highest posterior density interval (HPDI) 162-253) (Cheney *et al.*, 2013), and this is used as the starting population in the PVA runs. Although there have been subsequent years of data collection that could inform an updated population estimate, this has not been published and so there is no verified source. However, anecdotal evidence suggests that the current population estimate could be a little larger than 195 animals.

Calculating “takes” from the population

In order to account for cumulative impacts upon the population, model scenarios have been run which take animals from the population. The methodology for this follows that used by MORL, BOWL and Inch Cape wind farm developers in their applications, and which was expanded to account for the cumulative effects of all the Moray Firth and Forth and Tay wind farms. The assumptions made are described below, and are based on expert opinion of a highly precautionary set of parameters.

The assumption is made that any animal that is exposed to noise levels sufficient to induce PTS experiences an increase in mortality, with 25% of those animals exposed removed from the population. These are all taken as adult animals and females are taken first as this has a larger effect on the population than the loss of males.

Any animal that is exposed to noise levels sufficient to cause disturbance is assumed to experience a reduction in reproductive rate. This is mediated through a take of calves, at a rate proportional to the proportion of the population that is disturbed. The demographic parameters used from Thompson *et al.* (2000) logically lead to 8 calves being produced per year under an un-disturbed scenario. So for example, if 25% of the population is disturbed, then 2 calves are assumed not to be produced.

Takes related to wind farm developments

Since the time when these models were run for the wind farm developments, events have delayed many of the projects and so the timelines used in the analysis to support consenting are now incorrect. In this analysis, we have therefore estimated the times at which these projects may go ahead (table 1). The only project which has certainty around these timelines is the BOWL development in the Moray Firth. Timing is the only difference between the parameters for the wind farms used here and those used in the previous assessment.

Table 1. Timelines for pile driving at wind farm developments across the east coast range of bottlenose dolphins. Years with pile driving are marked with X.

	BOWL	MORL	Inch Cape	Neart na Gaoithe	Seagreen
2016					
2017	X				
2018	X	X			
2019		X			
2020				X	
2021			X	X	
2022			X		
2023					X
2024					X
2025					X

In the modelling undertaken here, we assume that the level of impact remains the same from these projects, but would point out that this assessment was based upon the original worst case design envelopes presented by the wind farm developers. This envelope has been significantly refined in terms of the number of turbines to be installed and the parameters presented here are likely to represent a significant over-estimate of the extent of the impact. However, further noise and impact assessments were not undertaken on the refined envelope for marine mammals and so we do not have refined estimates to incorporate into this framework and hence use the original data. The only changes that have been made relate to the years in which the impact is estimated to take effect. This results in a smaller being modelled for the wind farms than was used for cumulative assessments in the consenting process for these developments.

None of the scenarios modelled for the wind farms include any takes of adults through exposure PTS (permanent threshold shift) inducing noise levels, but all include some takes of calves as a result of disturbance (table 2). Further details about how the numbers of calves taken from the population were calculated are available in the BOWL, MORL and Inch Cape ESs. While Neart na Gaoithe and Seagreen may be piling in the years indicated, no disturbance to bottlenose dolphins was predicted, so calves are only taken in the years in which the Inch Cape development is estimated to be piling (although there is little certainty about this currently).

Table 2. Numbers and age classes of animals modelled to be removed from the population each year due to wind farm construction. Scenarios are as described in the original ESs for the wind farms.

Year	Moray Firth				Forth and Tay				ES Scenarios
	Calves		Adults		Calves		Adults		
	Female	Male	Female	Male	Female	Male	Female	Male	
2016	0	0	0	0	0	0	0	0	N/A
2017	1	1	0	0	0	0	0	0	BOWL A
2018	1	1	0	0	0	0	0	0	BOWL A + MORL 1
2019	1	1	0	0	0	0	0	0	MORL 1
2020	0	0	0	0	0	0	0	0	N/A
2021	0	0	0	0	1	0	0	0	Inch Cape 6
2022	0	0	0	0	1	0	0	0	Inch Cape 6
2023	0	0	0	0	0	0	0	0	N/A
2024	0	0	0	0	0	0	0	0	N/A
2025	0	0	0	0	0	0	0	0	N/A

Takes related to Aberdeen harbour development

Source noise levels and propagation have been estimated in the Aberdeen harbour ES. Following discussion with the harbour authority, mitigations to reduce the noise levels at sea have been put into place. For both pile driving and blasting activities, the mitigations proposed are expected to reduce noise levels beyond the construction works such that there will not be a risk of PTS. Therefore, no adults have been removed from the modelled population. It is still likely that levels of noise sufficient to disturb bottlenose dolphins may be produced beyond the construction works and so a scenario in which calves are removed from the population has been produced.

To calculate the number of calves to be removed it is necessary to understand the proportion of the total population that may be disturbed. Here, we assume that all animals that use the area around the current and proposed harbours are disturbed. Recent photo-ID work undertaken by St Andrews University (Quick *et al.*, 2014) provides an abundance estimate for the area between Aberdeen and Stonehaven of 53 bottlenose dolphins. If we consider that all of these animals may be subject to disturbance from the Aberdeen harbour construction works, then this accounts for 27.18% of the total population of 195. From 8 calves produced, this means that the effect of disturbance from the Aberdeen harbour development would be modelled such that it removed 2.17 calves. This is likely to overestimate the effects on these animals, because many of them will also use other key areas, such as the Moray Firth SAC and the Tay estuary. Quick *et al.* (2014) reported that in 2012 and 2013 respectively, 88% and 79% of dolphins identified in the area between Aberdeen and Stonehaven were also sighted in one these other key areas.

Typically in this framework, to ensure that the results are precautionary, decimal places greater than 0.1 are rounded up to the next whole animal. However, in the year that the Aberdeen harbour development is scheduled to take place, wind farm construction will only be taking place at the BOWL site, and this activity was predicted to take 1.31 calves from the population. This was rounded up to 2 calves, and so we consider that this rounding up has already allowed for additional

precaution. Therefore, the total calves predicted to be taken from the population from both developments in total would be 3.48, which has been rounded up to 4 in this modelling framework (table 3).

Table 3. Total takes to be modelled from each development in each year of the model run

Year	Moray Firth wind farms		Forth and Tay wind farms		Aberdeen harbour		Total	
	Female calves	Male calves	Female calves	Male calves	Female calves	Male calves	Female calves	Male calves
2007							0	0
2008							0	0
2009							0	0
2010							0	0
2011							0	0
2012							0	0
2013							0	0
2014							0	0
2015							0	0
2016							0	0
2017	1	1			1	1	2	2
2018	1	1					1	1
2019	1	1					1	1
2020							0	0
2021			1				1	0
2022			1				1	0
2023							0	0

PVA scenarios run

Vortex software was used to run the PVA models (Lacy & Pollak, 2014). The first year of the simulation was considered to be 2007 since this is the year in which the data used to generate the population abundance estimate were collected (Cheney *et al.*, 2013). The final year of the simulation was considered to be 2023, one year after the last modelled impact in the Forth and Tay wind farms. Scenario F below was also run for a further 10 years to demonstrate the long term trajectory of the population trend.

Six different scenarios were considered. These were:

- A. Baseline (no impact modelled)
- B. Aberdeen harbour only
- C. Moray Firth wind farms only
- D. Moray Firth and Forth and Tay wind farms
- E. Aberdeen harbour and Moray Firth wind farms
- F. Aberdeen harbour, Moray Firth and Forth and Tay wind farms.

However, the Vortex software that was used only allows for scenarios in which the same number of animals is removed in each year. Clearly, this does not match the scenarios detailed above well. We therefore generated scenarios that could be modelled in this software, that matched the desired scenarios as closely as possible (table 4). Where this was not possible, the closest scenario that retains precaution (i.e. overestimates the effect) has been modelled.

Table 4. Scenarios as modelled to account for inflexibility of Vortex software. The difference between the scenarios noted in table 3 and those modelled is shown in the final column.

Scenario ID	Scenario name	Female calves taken	Male calves taken	Years calves taken	Difference to planned scenario
A	Baseline	0	0	N/A	Exact match
B	Aberdeen harbour only	1	1	2017	Exact match
C	Moray Firth wind farms only	1	1	2017 2018 2019	Exact match
D	Moray Firth and Forth and Tay wind farms	1	1	2017 2018 2019 2020 2021 2022	Overestimates the effect by two calves in 2020 (100%), and by 1 calf in 2021 and 2022 (50%) Total overestimation of 4 calves taken
E	Aberdeen harbour and Moray Firth wind farms	2	2	2017 2018 2019	Overestimates the effect by 2 calves in 2018 and 2019 (50%) Total overestimation of 4 calves taken
F	Aberdeen harbour, Moray Firth and Forth and Tay wind farms	1	1	2017 2018 2019 2020 2021 2022	Underestimates the effect in 2017 by 2 calves (50%). Matches the scenario in 2018 and 2019. Overestimates in 2020 by 2 calves (100%) and in 2021 and 2022 by 1 calf (50%) Total overestimation of 2 calves taken

Each scenario was run through 10,000 iterations for 17 years, where year 1 is the year of the most recent population estimate (2007), year 11 is the year of Aberdeen Harbour construction and first year of construction in the Moray Firth wind farms. To note, scenarios D and F are the same. They have both been run and are presented in the results separately to make it clear which developments have been included. This has come about because of the lack of flexibility in the Vortex software.

Results

All models ran successfully through 10,000 iterations. The outputs are presented below to illustrate various points.

The means and 95% confidence intervals around the population sizes in 2023, after construction works are considered likely to have finished at the Forth and Tay wind farms are presented (figure 1). This is a reproduction of a plot that was generated in previous advice regarding the cumulative effects of the Moray Firth and Forth and Tay wind farms to the bottlenose dolphin population. The results presented here show less effect than those, because the envelopes for construction work at the wind

farms have been reduced, in terms of the number of years in which work is likely to take place.

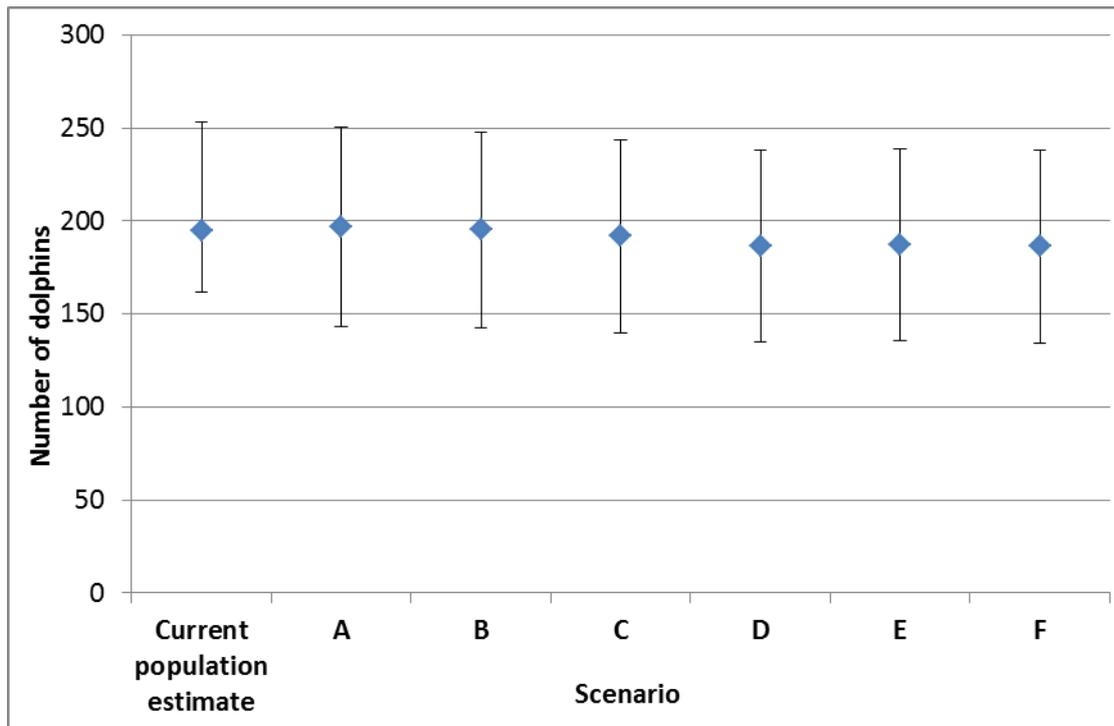


Figure 1. Plot showing mean population size at the end of scenario runs for each scenario detailed in Table 4. The current population size (Cheney et al., 2013) is also shown. Errors shown are 95% confidence limits, except for the current population estimate which uses highest posterior density intervals (Bayesian equivalent of confidence limits).

For each scenario, the frequency distribution of different population sizes from the 10,000 models runs was also presented (figure 2) to demonstrate the range of different outcomes from the modelling exercises.

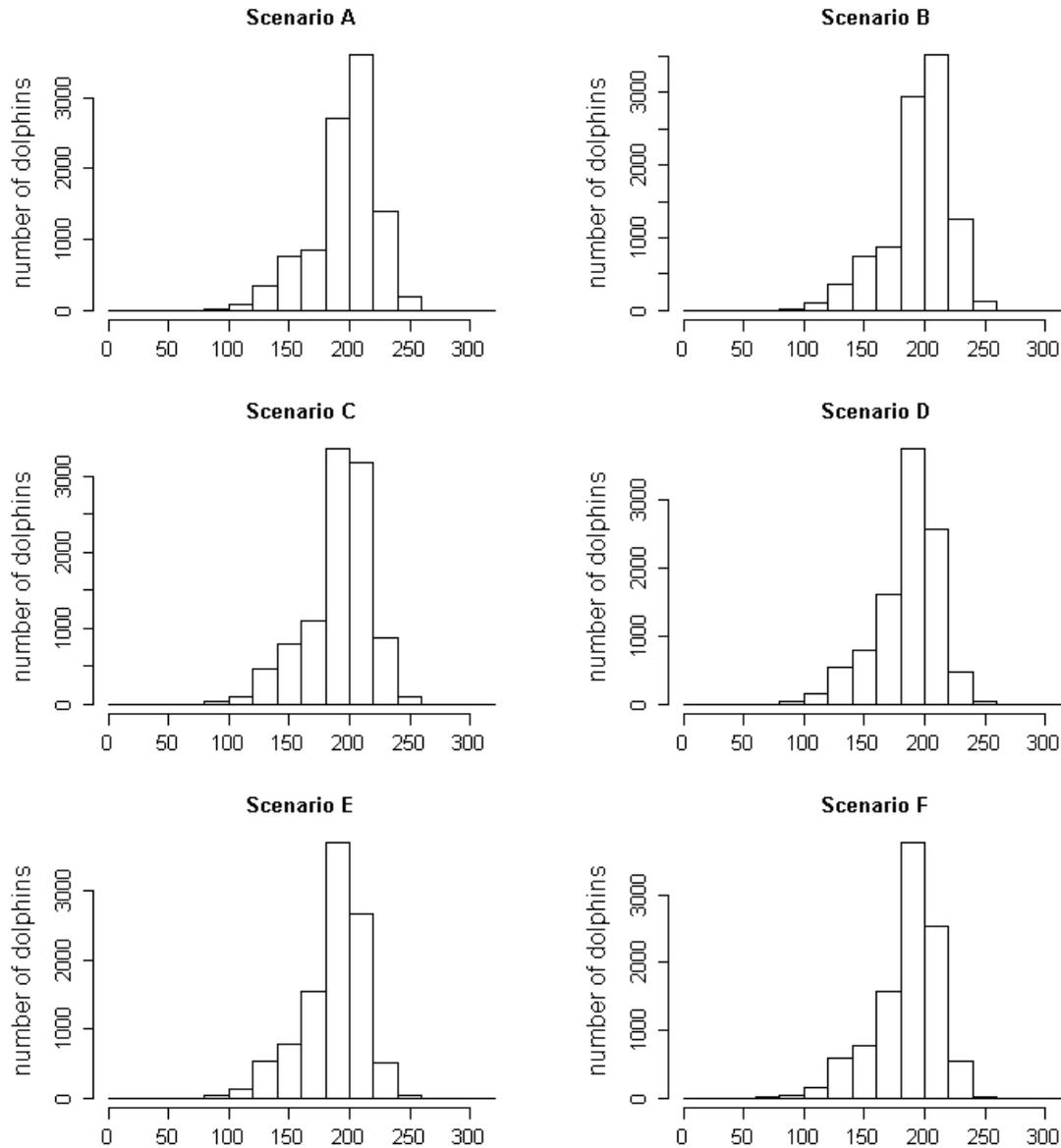


Figure 2. Histograms showing the frequency distribution of final population sizes for each scenario listed in Table 4.

In order to understand the likely population trajectories over time, population size was plotted against year for each scenario (figure 3). It demonstrates that reductions in population size compared with scenario A (no impact modelled) occur in 2017 and last largely for the duration of the impact, i.e. while calves are modelled to be removed. Following this, the population stabilises and begins to increase.

Scenario F was modelled for an additional 10 years in order to investigate whether the population would continue to be stable or increasing (the trend that Cheney *et al.*, 2013 considered to be true) in the longer term (figure 4). The output figure confirms this to be the case.

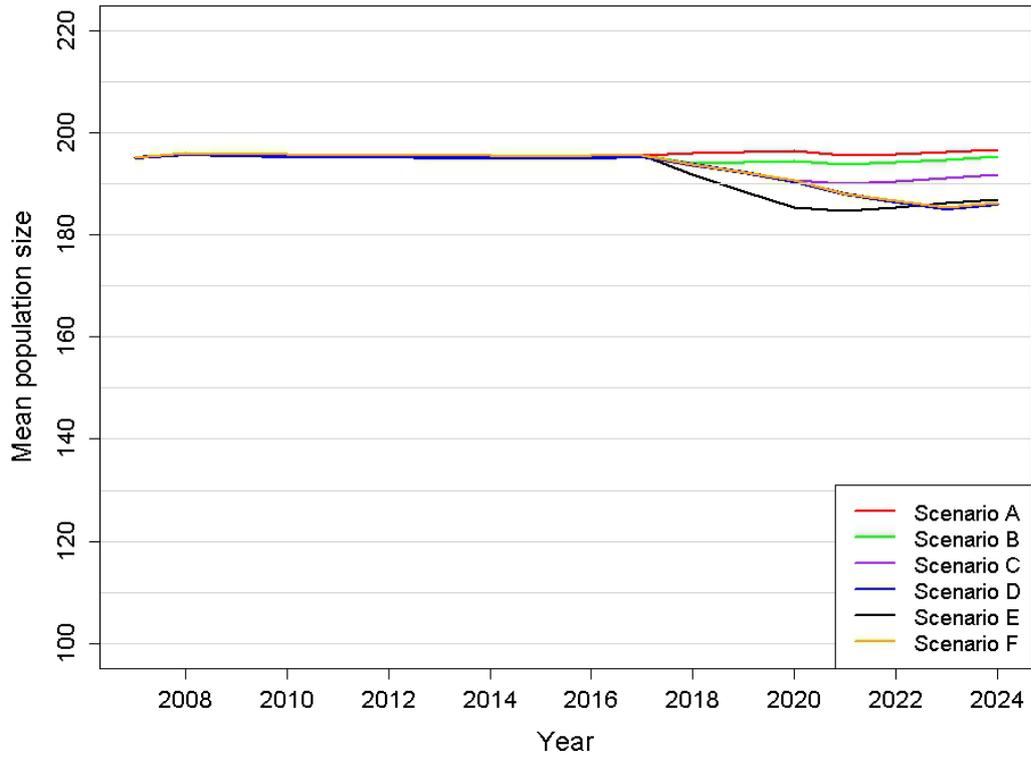


Figure 3. Plot showing trajectory of population through time for each modelled scenario

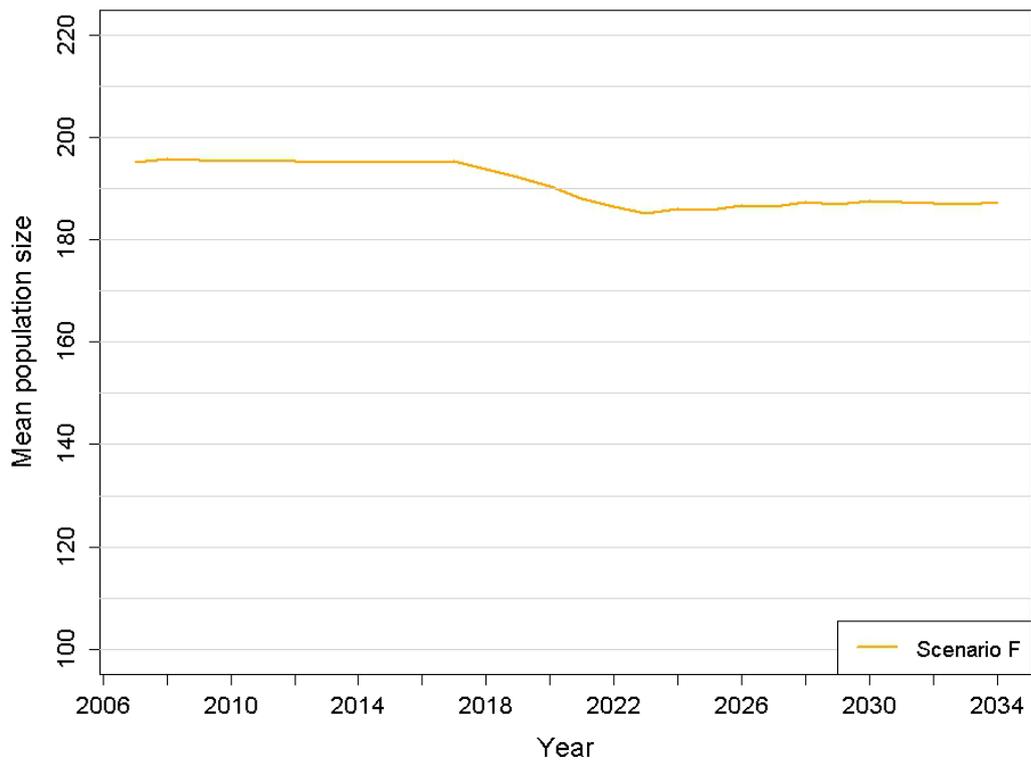


Figure 4. Plot showing trajectory of population for scenario F, extended for ten years after construction finishes.

For assessments undertaken for seabirds in relation to wind farms, there has been a move towards the use of the counterfactual of population size as a metric. These

metrics have been calculated here (table 5) and show the ratio of the final population sizes from each of the scenarios to the final population size for the baseline (scenario A). The maximum reduction in relation to the baseline population size is 5.58%, for scenarios D and F (Moray Firth and Forth and Tay wind farms, and also including Aberdeen harbour). Scenario B (Aberdeen harbour alone) shows a 1.02% reduction in population size, but when this is combined with the wind farms, due to the way the modelling had to be undertaken in Vortex, this effect disappears.

Table 5. Counterfactuals for each scenario.

Scenario	Starting population size	Final population size (after 17 years)	Counterfactual	Inverse of counterfactual as % of modelled 2024 baseline population
A	195	197	1	-
B	195	195	0.9898	1.02 %
C	195	192	0.9746	2.54 %
D	195	186	0.9442	5.58 %
E	195	187	0.9492	5.08 %
F	195	186	0.9442	5.58 %

Discussion

The analysis presented here should be considered to be indicative rather than absolute, because many of the parameters used are precautionary “best guesses” (table 6). Nevertheless, using the same analytical framework as was used in the consenting process for the Moray Firth and Forth and Tay wind farms, we have shown that the cumulative impacts from all of these projects are smaller than the potential range demonstrated for the assessments used for those wind farms. This is largely because the design envelopes for the wind farms have been refined to reflect the latest understanding of those projects and so the impacts from them have been applied to fewer years than was previously the case.

Table 6. List of assumptions made in the modelling process

Assumption	Impact on the assessment
Demographic parameters from Thompson <i>et al.</i> (2000) and starting population size from Cheney <i>et al.</i> (2013) are correct	Given the trend for the baseline population in the PVA, which anecdotal evidence suggests may be an underestimate, it is likely that the demographic parameters underestimate survival or reproductive rates, or both, leading to more conservative estimates population viability. Increases precaution.
All bottlenose dolphins that use the area between Aberdeen and	Dolphin groups will be spread along this coastline and while some may encounter the works at Aberdeen harbour, this is not the only area that they are able to use. Indeed, the majority of individuals in this area are known to also use the Inner Moray Firth or the Firth of

Stonehaven will be susceptible to displacement from foraging areas as a result of the works at Aberdeen harbour	Tay. This assessment is therefore likely to overestimate the number of animals that may be exposed to noise levels sufficient to disturb them. Increases precaution.
Any disturbance within a year is equivalent to 1 year of disturbance.	This assumption means that even a small period of disturbance is modelled in the same way as a year's worth of disturbance. Aberdeen harbour estimate that blasting work will take between 3 and 7 months. Clearly this is a large range of potential durations of disturbance and at the lower end, the assumption that 3 months of disturbance is equivalent to that from 1 year is an overestimation. This is less so for a duration closer to 7 months, although such a duration is still well within the modelled effect. Increases precaution.
Disturbance will lead to 25% reduction in reproductive rate in affected animals, through reduced foraging ability	The effect of disturbance on foraging ability and the implications of this for reproduction are unknown, and further research is required on this. However, given that the animals that use this area are known to make use of other important foraging areas, it is likely that animals will find alternative food sources. Unknown.
Rounding up of the number of calves to be taken	While the number of calves removed from the modelling exercise was based upon the proportion of the population exposed to disturbance, any predicted number of calves to be taken greater than 0.1 was rounded up to the next whole number. Increases precaution.
Increased numbers of calves taken to accommodate Vortex framework (see table 4)	Table 4 details the scenarios used and the numbers of calves modelled to be taken from the population. In most of the single development scenarios, the modelling takes the required number of calves. However, in the cumulative scenarios, more calves than necessary are taken in order to account for the inflexibility of the modelling framework. Increases precaution.
Blasting works all take place in one calendar year	Blasting works are modelled to all occur in one calendar year. Aberdeen harbour expect them to take between 3 and 7 months, and so in all likelihood this will be correct. However, depending upon timelines, it is possible that the blasting works could be spread over two calendar years. It would be possible re-run the assessment to apply the same level of effect in two years, but we consider that scenario F already models more effect than is likely to take place and therefore is sufficient to cover this eventuality. Maintains the level of precaution

The effect of the Aberdeen harbour development on its own is small, as is its contribution to the cumulative effect. The harbour development has been modelled such that all effect attributed to it occurs in 2017. This means that although the level of effect is similar to the wind farms, it is only applied in one year and therefore has less effect. The modelling framework used is relatively inflexible in how effects can be applied, and so any disturbance modelled would be equivalent regardless of its duration within a year.

The assessment assumes that all dolphins using the area between Aberdeen and Stonehaven may be disturbed by these construction works, such that there is an effect on breeding success. However, noise levels sufficient to disturb bottlenose dolphins are not expected at the mouth of the river Dee (the existing harbour mouth), which is a known foraging location. It is also highly likely that animals using this area will find suitable alternative areas should they be disturbed, given that Quick *et al.* (2014) found that around 80% of animals using this area were also sighted in the Inner Moray Firth or the Firth of Tay.

Demographic parameters were taken from the Thompson *et al.* (2000) PVA, although the starting population size was updated to reflect more recent evidence (Cheney *et al.*, 2013). These demographic parameters in themselves were taken from studies of bottlenose dolphins around the world and so can only provide an indication of the true parameters for the east coast of Scotland bottlenose dolphin population. It is, however, likely that the parameters used are underestimating the trend in the bottlenose dolphin population. While scenario A (baseline with no impact) predicts a slight increase in abundance over the analysis period, it predicts an abundance of approximately 195 individuals in 2015. There is anecdotal evidence that the population size in that year was at least 200 animals. Such a difference could be caused by the PVA model underestimating reproductive or survival rates, either of which would lead the population to be more resilient to changes as a result of impacts through human activities.

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