

REPORT

Boston Alternative Energy Facility

Addendum to Chapter 17 and Appendix 17.1 - Benthic Ecology, Fish and Habitats

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HASKONINGDHV UK LTD.

Westpoint
Lynch Wood
Peterborough Business Park
Peterborough
PE2 6FZ
United Kingdom
Industry & Buildings
VAT registration number: 792428892

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Author(s): Chris Adnitt and Gemma Starmore

Drafted by: Gemma Starmore

Checked by: Chris Adnitt

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Approved by: Paul Salmon

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Acronyms

CI	Confidence Interval
DML	Deemed Marine Licence
DCO	Development Consent Order
EfW	Electricity from Waste
ES	Environmental Statement
HRA	Habitats Regulations Assessment
JNCC	Joint Nature and Conservation Committee
km	Kilometre
km ²	Squared kilometre
LNR	Local Nature Reserve
LWT	Lincolnshire Wildlife Trust
m	Metre
MU	Management Unit
PEC	Predicted Environmental Concentration
SAC	Special Area of Conservation

1 Executive Summary

- 1.1.1 This Habitats Regulations Assessment (HRA)/ and Environmental Statement (ES) Addendum Report is provided to further support the application for the Boston Alternative Energy Facility (the Facility) Development Consent Order (DCO). This report provides an addendum to the information provided within the submitted ES for benthic ecology, fish and intertidal habitats, in Chapter 17 Marine and Coastal Ecology (document reference 6.2.17, APP-055), and Appendix 17.1 Habitats Regulations Assessment (document reference 6.4.18, APP-111). This report should be read alongside Chapter 17 and Appendix 17.1 Habitats Regulations Assessment.
- 1.1.2 This report focuses on stakeholder comments, that have been made since the submission of the application, notably those from Natural England, the Royal Society for the Protection of Birds (RSPB), Environment Agency, Marine Management Organisation (MMO) and Lincolnshire Wildlife Trust.
- 1.1.3 The baseline information received since the original HRA and ES submitted the DCO application to the Planning Inspectorate (PINS) includes updated fish migratory periods and information from Natural England relating to the saltmarsh in the proposed wharf area within the Principal Application Site. Additional analysis has also been undertaken in relation to the air quality effects on the habitats. Based on the updated baseline information, as noted above, the assessments provided within both the ES and HRA, have been updated to utilise this information.
- 1.1.4 The information provided within this report updates the assessments for the following potential impacts, for both the ES and HRA:
- Habitat loss for the intertidal zone;
 - Disturbance from dredging and piling for fish; and
 - Potential for air quality issues related to emissions.
- 1.1.5 The updated impact assessment relating to habitat loss of saltmarsh demonstrates no change to the impact magnitude, and therefore no change to the impact significances as reported within the original application documents.
- 1.1.6 Measures are being developed with regard to providing offsets for habitat loss and these will be reported in detail in an updated Outline Landscape and Ecological Mitigation Strategy (OLEMS) document which will be submitted to the Examination at Deadline 2. This will include measures for the initial activities and any ongoing maintenance that is needed to maintain the habitats to provide the

benefits to impacted features.

- 1.1.7 For the impact of capital and maintenance dredging and piling on migratory fish, the updated information presented in this addendum has resulted in a change of magnitude levels from medium to negligible, and a change in the overall impact significance from moderate adverse to minor adverse. This downgrading in magnitude and subsequent impact significance is because of the updated fish migration timescales not overlapping with dredging periods and therefore presenting minimal risk to migrating fish, as well as the underwater noise impact range being a maximum of 10 meters, based on the presented underwater noise information, meaning that migrating fish are still able to pass by the proposed dredging as part of their migration.
- 1.1.8 As reported within the relevant reports as part of the DCO submission, mitigation and management measures will be in place to lower the potential for impact to fish including:
- Avoidance of key fish migration periods for dredging activities;
 - Piling restricted to daylight hours to avoid eel migration at night;
 - Piling mitigation such as soft start and ramp up procedures for piling at high tide; and
 - Piling at low tide as much as possible.
- 1.1.9 Additional information and clarification is presented on the potential impact of air emissions on marine and coastal habitats, including a summary of air emissions assessment on the Habitat Mitigation Area. No change to the magnitude of construction and operational phase impacts of the Facility are identified and therefore no change to the impact significances that were concluded in the original assessments in the ES and HRA as part of the DCO application.

2 Purpose of this Report

2.1.1 This 'Marine Ecology Addendum Report' for the Boston Alternative Energy Facility (the Facility)) supports the application for a Development Consent Order (DCO) (the DCO application) that has been made to the Planning Inspectorate under Section 37 of the Planning Act 2008 (the Act) by Alternative Use Boston Projects Ltd.

2.1.1 The purpose of this report is to provide additional information and assessment in response to relevant representations and comments received by the Applicant following DCO submission, notably from Natural England, the Royal Society for the Protection of Birds (RSPB), Environment Agency, Marine Management Organisation (MMO) and Lincolnshire Wildlife Trust. The additional information and assessment set out in this report relate to the updated baseline information on saltmarsh loss, fish and updated analysis for air quality.

2.1.2 The updates included within this report relate to Environmental Statement (ES) Chapter 17 Marine and Coastal Ecology¹ (document reference 6.2.17, APP-055) and Appendix 17.1 Habitats Regulations Assessment² (document reference 6.4.18, APP-111). This report should be read alongside Chapter 17 and Appendix 17.1 Habitats Regulations Assessment.

2.2 Consultation Comments Requiring Further Assessment Work

2.2.1 **Table 2-1** includes the relevant representations that this report responds to with regard to the fish, air quality and saltmarsh habitat. **Table 2-1** also provides an indication as to where the information has been provided within this report.

Table 2-1 Relevant Representations and further comments made that required additional assessment work

Organisation	Comment	Section of this Addendum providing the additional information
Natural England – relevant representation (RR-021)	Natural England notes that under operation, change in vessel traffic on intertidal habitats (increased ship wash) it appears to include text on dredging, but limited information included. (Executive Summary pg 11)	Section 4.2

¹ 6.2.17 Environmental Statement - Chapter 17 - Marine and Coastal Ecology [APP-055]. Available from: <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010095/EN010095-000440-6.2.17.%20Chapter%2017%20Marine%20and%20Coastal%20Ecology.pdf>

² 6.4.18 Environmental Statement – Appendix 17.1 Habitats Regulations Assessment [APP-111]. Available from: <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010095/EN010095-000490-6.4.18.%20Appendix%2017.1%20Habitats%20Regulations%20Assessment.pdf>

Organisation	Comment	Section of this Addendum providing the additional information
Natural England – relevant representation (RR-021)	<p>Natural England notes that the Applicant has determined a Saltmarsh loss = 1ha. However, we advise that separation between each NVC type is provided as currently unable to agree with the following until provided. Mudflat loss = 1.54ha Total loss of intertidal = 2.54ha or 24,500m² released Saltmarsh Extent and Zonation maps which include this section (available on gov.uk webpage).</p> <p>If above correct, loss in creating wharf/ berth = 5.5% of saltmarsh resource; 4.3% of mudflat resource.</p> <p>Note in A17.6.18 values of saltmarsh in Haven differ. (ES Chapter 17 Marine and Coastal Ecology (document reference 6.2.17, APP-055) Paragraph 17.8.17)</p>	Section 4.2
Natural England – relevant representation (RR-021)	Whilst dust impacts during construction considered at Havenside LNR; what about on the area of saltmarsh being used for the Habitat Mitigation Area?	Section 4.3
Natural England – relevant representation (RR-021)	As above, for Critical Loads/ Levels the ecological receptors considered statutory and non-statutory sites – but not Priority Habitats i.e., the saltmarsh adjacent to the site and part of the Habitat Mitigation Area.	Section 4.3
Natural England – relevant representation (RR-021)	Natural England is aware that only one other project has been included in the in-combination assessment. We would welcome a further check that this remains the case with other interested parties. We advise that the search consider any present or confirmed future projects which would not be included in the background data and other sources and sectors?	Section 4.3
Natural England – relevant representation (RR-021)	We note that the consultant has used the higher daily NO _x threshold of 200 ug/m ³ rather than 75 ug/m ³ . Whilst this higher threshold is considered in casework, a robust and evidenced argument must be made to show that the criteria are met i.e., SO ₂ and O ₃ below their respective CL _e . This assessment bases the justification on national and modelled data.	Section 4.3
Natural England – relevant representation (RR-021)	We note that the construction phase of the assessment does not consider emissions from ammonia. This suggests that ammonia from vehicle and vessel emissions were not considered. We query if the justification for this can be provided and the rationale as to why ammonia would not be a	Section 4.3

Organisation	Comment	Section of this Addendum providing the additional information
	significant contributor? Especially given that nitrogen deposition exceeds the 1% threshold.	
Natural England – relevant representation (RR-021)	We support the consideration of an assessment on priority saltmarsh habitat. However, are there other sensitive habitats.	Section 4.3
Natural England – relevant representation (RR-021)	The assessment states that the minor adverse impact identified will be dealt with by monitoring. However, Natural England advises that this is not mitigating the adverse impact and does not negate the impact to sensitive features. What will monitoring be looking to identify? If a significant change occurs, what actions will be taken?	Section 4.3
Natural England – relevant representation (RR-021)	Natural England queries how precautionary are the emissions which have been calculated? Was this based on a worst-case scenario e.g., worst-case MET data for Daily NOx and maximum run-times? This would be useful if made clearer.	Section 4.3
Natural England – relevant representation (RR-021)	Natural England notes that Table 14-30 presents values during operational phase for The Wash with in-combination contributions of all pollutants above 1% of the relevant annual mean Critical Loads/ Levels. Therefore, we query how impacts will be mitigated for?	Section 4.3
Natural England – relevant representation (RR-021)	Natural England notes that all levels of pollutants exceeded for LNR and LWS. Therefore, we query what the effects of N deposition on the Habitat Mitigation Area will be? If based on similar values to Havenside LNR then PEC predicted to be marginally over the most stringent critical load range (20- 30 kg N ha ⁻¹ year ⁻¹).	Section 4.3
Natural England – relevant representation (RR-021)	Paragraph states - The Facility was not predicted to lead to any significant effects during its operation which would require mitigation measures. As the Facility would be required to operate under the conditions of its Environmental Permit, this is considered to be an adequate mechanism to ensure that significant impacts are not experienced. Natural England queries what mitigation is suggested for designated sites? Only mention monitoring of stacks.	Section 4.3
Natural England – relevant	Operational impact – longer-term all pollutants exceed >1% relevant annual critical loads (based on APIS). Critical levels will be exceeded in The Wash	Section 4.3

Organisation	Comment	Section of this Addendum providing the additional information
representation (RR-021)	<p>and the Havenside LNR (as well as other LWS) as they are downwind of the site. Presumably also the saltmarsh in Area B – the Habitat Mitigation Area (not considered by assessment)?</p> <p>Need to look at recent evidence of impacts of N deposition on saltmarsh. Evidence shows it leads to increased vegetative growth with poor root development leading to die- back and potential erosion (Deegan et al. 2007, 2012) (Penk 2020).</p> <p>There are also impacts associated with nutrient enrichment through the spread and dominance of grass species. APIS notes the indication of exceedance as an increase late successional species, increase productivity, and increase in dominance of graminoids. This is particularly worrying in ungrazed saltmarshes on the east coast where <i>Elytrigia atherica</i> (Sea Couch) outcompetes other saltmarsh species in the upper marsh.</p> <p>Eutrophication can increase algal cover (mats) in the pioneer/ low-marsh smothering mudflat and pioneer marsh.</p> <p>As well as this impact on the physical loss of saltmarsh, excessive nutrients can also have an impact on the ability of saltmarsh to store carbon (Geoghegan et al (2018).</p> <p>Natural England therefore queries how the above potential changes to saltmarsh will be addressed. What mitigation measures could be adopted? A change in vegetation to The Wash would affect SAC habitats; in addition, a change in vegetation with increased cover of <i>Elytrigia atherica</i> locally in the Habitat Mitigation Area would make it less suitable for wildfowl and waders. And therefore would not be considered effective compensation. Further management measures may be required such as grazing.</p>	
Natural England – further comment made in	<p>Natural England undertook a saltmarsh survey on the 7th September 2021 to assess the vegetation present in both the Wharf Area and Habitat Mitigation Area. 5 quadrats were taken in the Wharf Area and 10 in the Habitat Mitigation Area. We agree that the vegetation is broadly as described in the Marine and</p>	Section 4.2

Organisation	Comment	Section of this Addendum providing the additional information
September 2021	<p>Coastal Ecology Chapter with the following NVC types being present - SM11 <i>Aster tripolium</i> var. <i>discoideus</i> salt-marsh community; SM13a <i>Puccinellia maritima</i> salt-marsh community, sub-community with <i>Puccinellia maritima</i> dominant; SM13d <i>Puccinellia maritima</i> salt-marsh community, <i>Plantago maritima</i>-<i>Armeria maritima</i> sub-community; SM16c <i>Festuca rubra</i> salt-marsh community, <i>Festuca rubra</i>-<i>Glaux maritima</i> sub-community and SM24 <i>Elymus pycnanthus</i> salt-marsh community. These vegetation types are typical of The Wash and are therefore no less important. Although the strip of SM16c (which is a more species-rich community type) in the wharf area is less common and only found at a limited number of locations in The Wash. Natural England also noted the presence of SM10, however access to the shoreline where the saltmarsh abuts the mudflats was limited.</p> <p>We would welcome the re-assessment of the condition of the saltmarsh to moderate value.</p>	
Environment Agency relevant representation (RR-013)	<p>The Outline Landscape and Ecological Mitigation Strategy (Document reference 7.4) is predominantly a terrestrial document and does not adequately assess the impact on intertidal saltmarsh. We are concerned that the impact of permanent intertidal habitat loss (saltmarsh and mudflat) on the marine ecology and the risks of further loss or degradation of saltmarsh at the operational stage have not been fully considered or mitigated for.4.5. The proposed mitigation is located outside the WFD waterbody and does not mitigate for the loss off saltmarsh habitat. Plans for net gain should also consider designs that will benefit fish and invertebrates and saltmarsh plants. We do not consider that the DCO as it currently stands would adequately protect the WFD waterbody.</p>	Section 4.2
Lincolnshire Wildlife Trust relevant representation (RR-011)	<p>We do not agree with the final conclusion of minor adverse effect on intertidal mudflat and saltmarsh in Marine and Coastal Ecology Chapter (doc ref 6.2.17). both are priority habitats of principal importance for the conservation of biodiversity under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. Additionally, we consider that the priority habitat within this part of the Haven is functionally linked to The Wash SPA habitat. Relying on natural reestablishment of this habitat post</p>	Section 4.2

Organisation	Comment	Section of this Addendum providing the additional information
	<p>construction is not adequate. Impacts such as boats being grounded on the mudflats at low tide and increased boat wash associated with the Facility may affect natural regeneration. Impacts on bird species associated with the SPA should be assessed and considered in the EIA. We conclude a significance effect of 'major adverse' due to the permanent loss of 1 ha of saltmarsh and 1.4 ha mudflat. We do not agree that the permanent loss of saltmarsh and mudflat would only require net gain measures. Any permanent losses should be compensated for. The compensation should be included in the EIA.</p>	
RSPB relevant representation (RR-024)	<p>The RSPB recognises that there is a section within the ES on air pollution associated with the proposed facility. Due to the predominant South-westerly wind, any particulates could land on nearby protected and priority habitats, as well as impact the aquatic environment of The Haven. This has been covered briefly in the HRA and we expect this to be followed up with the Environment Agency to ensure this potential impact pathway is addressed fully. It is essential that this issue is robustly assessed in the HRA given the Supplementary Conservation Advice has a specific target to "Maintain concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk)" for all relevant features of The Wash SPA.</p>	Section 4.3
MMO / Cefas (letter issued 23 September 2021)	<p>The MMO have noted some discrepancies between Table 17-6 in the 'Marine and Coastal Ecology' section of the ES, and Table 4.5 within 'A17/2b - Volume 2b: Technical Report: Ecology and Nature Conservation' which has been referenced as the source for Table 17-6. For instance:</p> <ul style="list-style-type: none"> • Table 17-6 shows that for river lamprey (juvenile) migration times are from July-September whereas in Table 4.5 river lamprey (juvenile) migration times are from September to October. • Similarly, for river lamprey (adults), Table 4.5 shows migrations times from September to October whereas Table 4.5 shows April to May. • Also, for sea trout, Table 17-6 shows migratory times from April to September for adults and March to April for juvenile, however, Table 4.5 states that sea trout adults migrate all year 	Section 3 Table 3-1

Organisation	Comment	Section of this Addendum providing the additional information
	<p>around whereas juvenile migration occurs from April to May.</p> <p>The MMO request that you review the migratory times and update the information provided in the ES accordingly. If known, it would be beneficial for the peak months of each species' migratory periods to be denoted on the table with '**'</p>	
MMO / Cefas (letter issued 23 September 2021)	<p>Although not stated in the table legend, the MMO note that Table 17-6 (from row 9 to 12) shows herring, sprat, cod (<i>Gadus morhua</i>) and whiting (<i>Merlangius merlangus</i>) with specific seasons highlighted in green. It is our understanding that, as the Wash has been reported as a nursery area for herring, sole, plaice, whiting and cod (Ellis et al., 2012), their presence in table 17-6 suggests these species' nursery times in the Wash. The MMO would appreciate clarifications on this with a revision of the table legend to include the updated information.</p>	<p>Section 3</p> <p>Table 3-1</p>
MMO / Cefas (letter issued 23 September 2021)	<p>The MMO note that the facility would operate 24 hours a day requiring lighting during hours of darkness. However, from the documents reviewed, it is not clear whether artificial lighting over the water column would be required for dredging or piling works. If this is the case, there is potential for artificial lighting to result in further disturbance to fish. Therefore, the MMO would expect potential effects from light disturbance on fish receptors to be scoped in for further assessment.</p>	<p>Dredging and piling activities are limited to construction hours and therefore will not be occurring at night times.</p>
MMO / Cefas (letter issued 23 September 2021)	<p>The MMO also note that mussel and cockle beds have been identified as economic resources for the local inshore fishermen in the Wash by Eastern IFCA. However, an assessment of potential impacts arising from the construction and operation of the proposed development on commercial fisheries in the area has not been presented for review. Nonetheless, we note that the Applicant has already engaged with a representative of Boston fishermen to address their concerns.</p>	<p>The shellfish beds in The Wash are not in the direct or indirect impact area for construction activities through either suspended sediment or deposition of sediment and therefore no pathway for impact exists.</p>
MMO / Cefas (letter issued 23 September 2021)	<p>The MMO consider that there is a high likelihood for potential impacts on fish receptors to occur as a result of increased suspended sediment concentrations, poor water quality from dredging works, and underwater noise from piling causing an acoustic 'barrier' to fish movement, impeding travel/migration. Whilst we appreciate the ES' acknowledgement of these impacts and the proposal</p>	<p>Further information on the timing of the noisy activities has been provided, as well as further information on the piling methodologies, in Section 4.1 below.</p>

Organisation	Comment	Section of this Addendum providing the additional information
	<p>for mitigation measures to protect fish species at this stage, the following points should be addressed and presented for review:</p> <ul style="list-style-type: none"> • Timing and duration of the proposed works: specific months, number of piles to be installed per day below the water line. • Piling methods: vibro vs percussive, piles diameter, hammer energy and timing to drive each pile to the design depth. <p>Clarification is needed on whether the project intends to undertake simultaneous piling i.e., impact or vibratory piling of more than one pile at any one time.</p>	
MMO / Cefas (letter issued 23 September 2021)	<p>No dredging works are anticipated to be undertaken at night-time which will minimise the exposure of some migratory species such as eels and trout smolts which migrate at night. The MMO are in agreement with the ES that avoiding dredging at night will allow eels and lamprey to migrate upstream and downstream during hours of darkness when they are typically active. The MMO note however that although we agree that this mitigation in terms of spawning and migratory activity is also appropriate to reduce (not avoid) the impacts of noise and vibration on those species of concern, the information provided on migratory times within Chapter 17 of the ES is contradictory and should be reviewed. Furthermore, in order to define a temporal restriction during key migration periods, the MMO recommend that the exact timing of the construction works (i.e., months when dredging and piling works are likely to be undertaken) is presented by to help us identify potential overlaps with peak migratory seasons for sensitive fish species and to evaluate the effectiveness of the mitigation measures already proposed.</p>	<p>Section 3</p> <p>Table 3-1</p>
MMO / Cefas (letter issued 23 September 2021)	<p>The MMO appreciate the mitigation measures proposed for piling works and recognise that piling works will be undertaken above the water (i.e. in the dry) whenever possible. However, due to the likelihood of piling works being undertaken below the water line and given the narrow nature of The Haven at this location, and the results of the UWN assessment, the MMO have concerns regarding the potential for an acoustic 'barrier' to occur during migratory seasons for the key sensitive fish species. Effects will still be localised, as this will be within the river, but an acoustic barrier across the river is</p>	<p>Further information has been provided in order to inform an assessment of the potential for a barrier to fish migration as a result of underwater noise from both piling and dredging activities.</p> <p>See Section 4.1 for an assessment on both piling and dredging impacts.</p>

Organisation	Comment	Section of this Addendum providing the additional information
	<p>expected from piling works below the water line (which could potentially disrupt migration). Therefore, the MMO request that you provide further information on when dredging and piling works are likely to be undertaken to help identify the specific potential overlap with peak migratory seasons of fish.</p>	
<p>MMO / Cefas (letter issued 23 September 2021)</p>	<p>The MMO would expect to see a list of any commercial species or species of conservation importance present. If no shellfish species meeting this description are present, this should be noted. The MMO request that you present information on the shellfish species recorded in the site-specific fishing survey so these species can be considered when assessing impacts, where appropriate. You should also include the caveat of using fishing surveys to identify shellfish species present. The MMO consider that the evidence, when fully presented, is expected to be sufficient.</p>	<p>No species of commercial or conservation importance were identified from the area to be affected by dredging.</p>
<p>MMO / Cefas (letter issued 23 September 2021)</p>	<p>The MMO note that one of the potential impacts identified on p.89 of Chapter 17 is 'Impact 4 – Underwater noise (piling and dredging). Fish behaviour and migration'. The assessment that follows is primarily focused on the effects of recoverable injury, mortality, and potential mortal injury. Consideration has not been given to the fact that noise may displace species and may create an acoustic barrier preventing fish passage or migration, especially in a relatively narrow river. The ES states that the section of The Haven near the Principal Application Site is approximately 40 m wide at low tide and approximately 100 m wide at high tide. The MMO require consideration of noise displacement and acoustic barriers on fish species.</p>	<p>Further information has been provided in order to inform an assessment of the potential for a barrier to fish migration as a result of underwater noise from both piling and dredging activities.</p> <p>See Section 4.1 for an assessment on both piling and dredging impacts.</p>
<p>MMO / Cefas (letter issued 23 September 2021)</p>	<p>Paragraph 17.8.103, states "With regard to underwater noise impacts from dredging activities, only backhoe dredging has the potential to impact on fish species (Table 17-15), with mortality and potential mortal injury, and recoverable injury, predicted to occur less than 10 m from the dredging activities". The MMO consider this conclusion to be too specific and may not be applicable to this development. It is important to note that noise modelling is case/site specific and depends on many variables.</p>	<p>Section 4.1</p>
<p>MMO / Cefas</p>	<p>The MMO note that a desk-based assessment of other similar projects was undertaken, to estimate the potential impact ranges for fish species and harbour</p>	<p>Section 4.1</p>

Organisation	Comment	Section of this Addendum providing the additional information
(letter issued 23 September 2021)	seals. The impact ranges from these similar projects have been used to inform the assessment for Boston Alternative Energy Facility. The MMO consider that using other project specific assessments (assuming that the assessments and modelling have been undertaken appropriately and in accordance with best practice), can only provide a rough estimation of the magnitude (i.e. tens of meters or hundreds of meters) of potential effects. It is important to note that noise modelling depends on many variables and is case/site specific. Therefore, it is not appropriate to draw precise conclusions in this instance (i.e. “with regard to the underwater noise impacts from piling, the most sensitive fish species group (swim bladder is involved in hearing) would be at risk of serious injury or fatality if they were closer than 50 m to the source of the piling noise” (para 17.8.101)), particularly when it is not clear how applicable these other assessments are to the Facility site. Even if we take the worst-case effect ranges for fish species (for a stationary receptor) that are presented in Table 17-15, which is 100 m for recoverable injury, this is the entire width of The River Haven at high tide.	
MMO / Cefas (letter issued 23 September 2021)	The MMO note that it would be beneficial to provide further details of the proposed piling and dredging works, such as the anticipated duration of the activity per day, the anticipated months of the year when these activities will be taking place. Further information detailing whether any vibro-piling will be undertaken, or whether the piling works will just consist of impact/percussive piling should also be submitted.	Section 4.1

3 Updates to Fish Migration Information

- 3.1.1 As outlined above, since the submission of the DCO Application, queries were raised regarding some of the fish migratory periods as documented in the ES. To ensure that appropriate mitigation is in place, updated information and assessment has been provided.
- 3.1.2 **Table 3-1** provides an updated table showing the fish migratory periods (for species within the ES and HRA), that the updated assessments have been based on.

Table 3-1 Migration Periods for Diadromous Fish Species Found Near the Location of the Application Site*.

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Eel (juvenile) <i>Anguilla anguilla</i>				↑	↑	↑	↑	↑	↑			
Eel (adult) <i>Anguilla anguilla</i>										↓	↓	
Smelt (juvenile) <i>Osmerus eperlanus</i>				↓	↓	↓						
Smelt (adult) (spawning in estuary) <i>Osmerus eperlanus</i>			↑	↑								
River lamprey (adult) <i>Lampreta fluviatilis</i>									↑	↑		
Sea trout (juvenile) <i>Salmo trutta</i>				↓	↓							
Sea trout (adult) <i>Salmo trutta</i>	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓	↑ and ↓
Herring <i>Clupea harengus</i>												
Sprat <i>Sprattus sprattus</i>					peak	peak						
Cod <i>Gadus morhua</i>												
Whiting <i>Merlangius merlangus</i>												

*Notes: Arrows Indicate Whether the Migration is Upstream (↑) or Downstream (↓). (Source: Environment Agency (2014) Boston Barrier Project ES Volume 2b: Ecology and Nature Conservation Technical Report, Natural England). Herring source: ICES (2014),

[Redacted text]

[Redacted text] Cod source: NW IFCA (2021),

[Redacted text] Whiting source: NW IFCA (2021), [Redacted text]

[Redacted text] Lamprey source: (Canal and River Trust

[Redacted text]

4 Updates to Environmental Impact Assessment

4.1 Assessment for Underwater Noise and Suspended Sediment Impacts due to Piling and Dredging Activities during Construction on Fish

Piling Methodologies

- 4.1.1 The piling of both sheet piles and tubular piles will be by impact piling. Tubular piles are estimated to have a diameter of 762mm. Sheet piles would take up to five minutes each to install, while tubular piles would take up to 15 minutes.
- 4.1.2 Sheet piles would be installed first, from June to early August, and then tubular piles would commence from July to September. Piling would only take place during the daytime, with a restriction of between 8am and 8pm (with an option of 7am to 7pm) (as described in Section 5.5 of Chapter 5 Project Description (document reference 6.2.5, APP-043). These hours of operation are secured by requirement 11 in Schedule 2 to the Draft DCO (document reference 2.1, APP-005).
- 4.1.3 A number of piling rigs would be on site at any one time, allowing for the next pile to be placed in readiness for piling, while the previous pile is installed. It is likely that there would be continuous piling, as there would be sufficient rigs on site to allow for changeover times to occur while other piles are installed. However, it is unlikely that there would be any simultaneous piling as each pile location would have its own specific requirements, that would require previous piles to be installed in order for the next to be installed. A maximum of 96 sheet piles could therefore be installed in any one day, and a maximum of 48 tubular piles.

Underwater Noise Modelling – Desk Based Assessment

- 4.1.4 At the Facility, water depths range from -3.4m ordnance datum (OD) to -3.8m OD, with tidal ranges of 5.3m to 2.7m. The estuary bed at this location is formed of silt and very fine sand (see ES Chapter 16 Estuarine Processes (document reference 6.2.16, APP-054) for more information). The width of the Haven at the Facility ranges from approximately 40m at low tide, to approximately 100m at high tide.
- 4.1.5 Within the noise assessment for fish (and marine mammals), a desk-based assessment was undertaken to inform the potential for impact ranges due to underwater noise. Within that assessment, impact ranges as derived for the Port of Cromarty Firth (Port of Cromarty Firth, 2018) and for the Victoria Harbour, Hartlepool expansion project (PD Teesport, 2018) were used.
- 4.1.6 The Port of Cromarty Firth project involved the expansion of the existing port and included piling of both tubular piles and sheet piles. The expansion of Victoria

Harbour included the dredging for channel realignment. A comparison of the modelling undertaken for both the Port of Cromarty Firth and Victoria Harbour projects, and the project and environmental specific parameters for these and Facility, are included in **Table 4-1**.

- 4.1.7 The primary underwater noise modelling factors for piling activities are the water depth of the site, and the hammer energy to be used (Port of Cromarty Firth, 2018). In both cases, the Port of Cromarty Firth is the worst-case in terms of impact ranges for both hammer energy (with either 120kJ or 500kJ used at the Port of Cromarty Firth, compared to a maximum of 25kJ at the Facility), and water depths (with up to 15m CD for the Port of Cromarty Firth and up to 3.8m for the Facility). This gives confidence to the actual piling impact ranges for the Facility being lower than for those used within the desk-based assessment.
- 4.1.8 Modelling was undertaken for both backhoe and trailer suction hopper dredging at Victoria Harbour, with the assumption that dredging would take place for 24 hours a day.

Table 4-1 Description of the modelling for the Port of Cromarty Firth, and project parameters for the Facility

Project design or environmental parameter	Port of Cromarty Firth	Victoria Harbour, Hartlepool	Facility
Water depth at modelling location	-4 to -15m Chart Datum (CD)	Approx. 6m at worst-case modelling location	-3.4 to -3.8m OD
Distance to shore	Approx. 100m	Approx. 1.1km at worst-case modelling location	0m
Width of water channel	Approx. 900m	N/A	40m (low tide) to 100m (high tide)
Seabed characteristics	Mixture of sand and mud	Mixture of sand and clay	Mixture of silt and sand
Methodology of modelling	A parabolic equation method for lower frequencies (12.5Hz to 250Hz), and a ray tracing method for higher frequencies (250Hz to 100kHz)	A parabolic equation method for lower frequencies (12.5Hz to 250Hz for dredging), and a ray tracing method for higher frequencies (315Hz to 100kHz for dredging) Modelling was undertaken at both high and low tides	-
Thresholds modelled	Popper <i>et al.</i> (2014) thresholds for Mortality and potential mortal injury,	Popper <i>et al.</i> (2014) thresholds for Mortality and potential mortal injury,	-

Project design or environmental parameter	Port of Cromarty Firth	Victoria Harbour, Hartlepool	Facility
	recoverable injury, and TTS for all fish groups – <ul style="list-style-type: none"> Fish with no swim bladder Fish with a swim bladder not involved in hearing Fish with a swim bladder involved in hearing Assumed same strike rate and hammer energy through piling period, with no soft-start, and a stationary receptor	recoverable injury, and TTS for all fish groups – <ul style="list-style-type: none"> Fish with no swim bladder Fish with a swim bladder not involved in hearing Fish with a swim bladder involved in hearing Assuming a stationary receptor	
Description of tubular piles	Diameter of 2m Hammer energy of 500kJ Source level of 217.7 dB re 1 μ Pa SPL _{peak} and single strike SEL source levels of 192.8 dB re 1 μ Pa ² s	N/A	Estimated diameter of 762mm Hammer energy of 25kJ
Description of sheet piles	Modelling based on tubular pile of 0.6m in diameter Hammer energy of 120kJ 207.5 dB re 1 μ Pa SPL _{peak} and single strike SEL source levels of 182.6 dB re 1 μ Pa ² s	N/A	Hammer energy of 25kJ
Description of dredging	N/A	165.0 dB re 1 μ Pa SPLRMS @ 1 m (Backhoe) 175.6 dB re 1 μ Pa SPLRMS @ 1 m (TSHD)	Backhoe
Method of piling	Impact piling	N/A	Impact piling
Method of dredging	N/A	Backhoe and trailer suction hopper dredging (TSHD)	Backhoe
Timing of piling activity – tubular piles	Piling time of 1 hour	N/A	Piling time of 5 minutes
Timing of piling activity – sheet piles	Piling time of 1 hour	N/A	Piling time of 15 minutes

Project design or environmental parameter	Port of Cromarty Firth	Victoria Harbour, Hartlepool	Facility
Timing of dredging activity	N/A		

4.1.9 Noise modelling results from the Port of Cromarty Firth are included in **Table 4-2**. Note that this supersedes the table included within the ES Chapter 17.

Table 4-2 Impact ranges to fish species from underwater noise generating activities

Project (source)	Activity and parameters modelled	Species	Threshold	Impact range (and area)
Invergordon Service Base Phase 4 Development (Port of Cromarty Firth, 2018)	Impact piling <ul style="list-style-type: none"> 2 m cylindrical piles 500kJ hammer energy 60 strikes per minute Piling period of 1 hour Worst-case source noise levels of 217.7 dB re 1 μPa SPL_{peak} @ 1m and 192.8 dB re 1 μPa²s SEL_{ss} @ 1m Stationary animal model 	Fish - No swim bladder	Recoverable injury 213 dB re 1 μ Pa unweighted SPL_{peak} (Popper <i>et al.</i> , 2014)	<10m
			Mortality and potential mortal injury 219 dB re 1 μ Pa unweighted SEL_{cum} (Popper <i>et al.</i> , 2014)	<10m
			Recoverable injury 216 dB re 1 μ Pa ² s unweighted SEL_{cum} (Popper <i>et al.</i> , 2014)	10m
		Fish - Swim bladder is not involved in hearing	Recoverable injury 207 dB re 1 μ Pa unweighted SPL_{peak} (Popper <i>et al.</i> , 2014)	<10m
			Mortality and potential mortal injury 210 dB re 1 μ Pa unweighted SEL_{cum} (Popper <i>et al.</i> , 2014)	30m
			Recoverable injury 203 dB re 1 μ Pa ² s unweighted SEL_{cum} (Popper <i>et al.</i> , 2014)	100m
		Fish - Swim bladder is involved in hearing	Recoverable injury 207 dB re 1 μ Pa unweighted SPL_{peak} (Popper <i>et al.</i> , 2014)	<10m
			Mortality and potential mortal injury 207 dB re 1 μ Pa unweighted SEL_{cum} (Popper <i>et al.</i> , 2014)	50m
			Recoverable injury 203 dB re 1 μ Pa ² s unweighted SEL_{cum} (Popper <i>et al.</i> , 2014)	100m

Project (source)	Activity and parameters modelled	Species	Threshold	Impact range (and area)
	Impact piling <ul style="list-style-type: none"> • Sheet piles • 120kJ hammer energy • 60 strikes per minute • Piling period of 1 hour • Worst-case source noise levels of 207.5 dB re 1 μPa SPL_{peak} @ 1m and 182.6 dB re 1 μPa²s SEL_{ss} @ 1m • Stationary animal model 	Fish - No swim bladder	Mortality and potential mortal injury 219 dB re 1 μ Pa unweighted SEL _{cum} (Popper <i>et al.</i> , 2014)	No impact
			Recoverable injury 216 dB re 1 μ Pa ² s unweighted SEL _{cum} (Popper <i>et al.</i> , 2014)	<10m
		Fish - Swim bladder is not involved in hearing	Mortality and potential mortal injury 210 dB re 1 μ Pa unweighted SEL _{cum} (Popper <i>et al.</i> , 2014)	<10m
			Recoverable injury 203 dB re 1 μ Pa ² s unweighted SEL _{cum} (Popper <i>et al.</i> , 2014)	<10m
		Fish - Swim bladder is involved in hearing	Recoverable injury 203 dB re 1 μ Pa ² s unweighted SEL _{cum} (Popper <i>et al.</i> , 2014)	<10m
Victoria Harbour, Hartlepool (PD Teesport, 2018)	Dredging <ul style="list-style-type: none"> • Trailer Suction Hopper Dredging (TSHD) • 175.6 dB re 1 μPa SPL_{RMS} @1m • 24 hours of activity • Stationary animal model 	All fish species	Injury and TTS 170 dB re 1 μ Pa (for 48 hours) unweighted SPL _{RMS} continuous sound (Popper <i>et al.</i> , 2014)	<10m
			Injury and TTS 158 dB re 1 μ Pa (for 12 hours) unweighted SPL _{RMS} continuous sound (Popper <i>et al.</i> , 2014)	<10m
	Dredging <ul style="list-style-type: none"> • Backhoe dredger • 165.0 dB re 1 μPa SPL_{RMS} @1m • 24 hours of activity • Stationary animal model 	All fish species	Injury and TTS 170 dB re 1 μ Pa (for 48 hours) unweighted SPL _{RMS} continuous sound (Popper <i>et al.</i> , 2014)	<10m
			Injury and TTS 158 dB re 1 μ Pa (for 12 hours) unweighted SPL _{RMS} continuous sound (Popper <i>et al.</i> , 2014)	<10m

Potential for a barrier to fish migrations due to piling activities

Barrier to Fish Migrations from Sheet Piling

- 4.1.10 While sheet piling is occurring in June, July and early August, there are some overlaps with fish migration periods (**Plate 4-1**). Juvenile eels migrate from April to September, juvenile smelts from April to June, and adult sea trout all year round.
- 4.1.11 During sheet piling, eels have a maximum impact range of 10m (for recoverable injury) and are more sensitive to noise impacts (due to them having a swim bladder that is involved in hearing). Sea trout and smelt also have impact ranges of up to 10m. The sensitivity for all fish species, for noise impacts, is therefore medium.
- 4.1.12 For eels and sea trout, there is the potential for a barrier to migration, as the Haven is only 100m wide at the Facility at high tide, and 40m at low tide. However, due to the low impact ranges for sheet piling (of up to 10m), there would still be areas within the Haven that would not be impacted by noise, allowing eels and sea trout to travel past the Facility while sheet piling was occurring. In addition, as eels and sea trout migrate nocturnally, and the piling for the Facility is restricted to daytime hours only (from either 7am to 7pm, or 8am to 8pm), there would be limited potential for any barrier effect to their migration as a result of sheet piling. Therefore, there would be a negligible magnitude to both eel and sea trout juveniles.
- 4.1.13 As for sea trout, smelt have impact ranges for sheet piling of up to 10m. This would allow for smelt to travel past the Facility while piling was occurring, and therefore there is a negligible magnitude of impact to smelt.

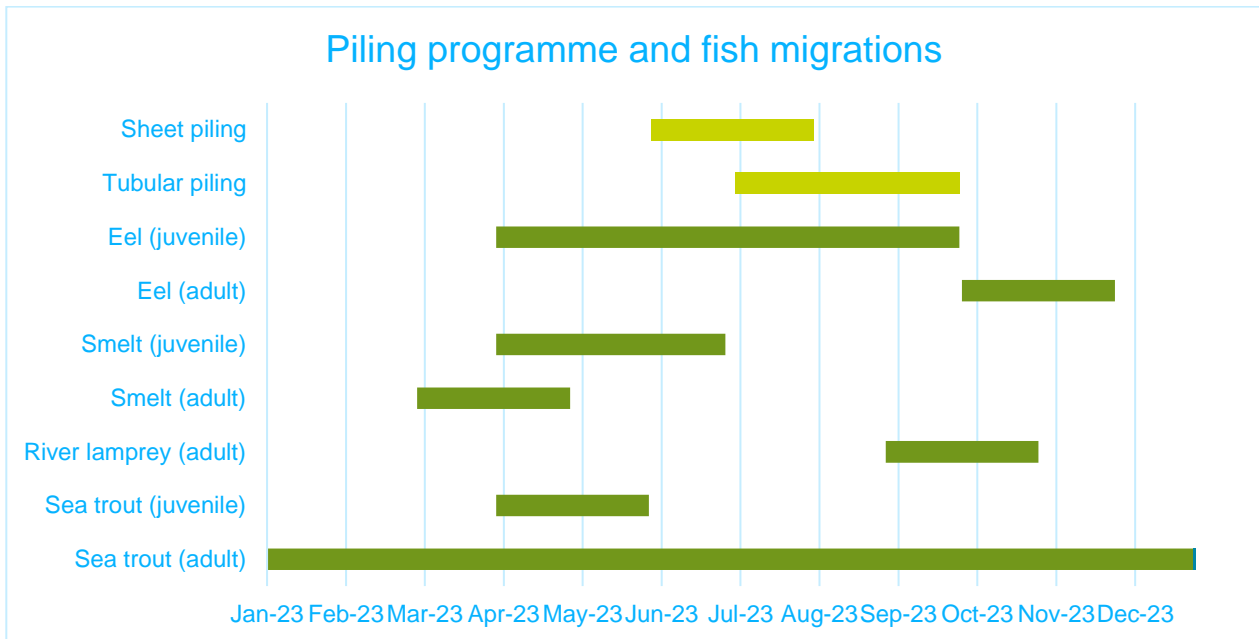


Plate 4-1 Overlap of piling activities at the Facility, and fish migration periods

Barrier to Fish Migrations from Tubular Piling

- 4.1.14 For tubular piling, which will be undertaken from July to September, there is the potential for an overlap with the migration periods of juvenile eels (from April to September) and adult sea trout (year-round) (**Plate 4-1**).
- 4.1.15 For tubular piling, eels and sea trout have a maximum impact range of 100m and are more sensitive to noise impacts (due to them having a swim bladder), river lamprey have a lower sensitivity (as they have no swim bladder), with a maximum impact range for tubular piling of 10m. The sensitivity for all fish species, for noise impacts, is medium.
- 4.1.16 As for sheet piling above, for eels and sea trout, there is the potential for a barrier to migration, as the Haven is between 40m and 100m wide at the Facility (dependent on the tide), and noise impact ranges have the potential to be greater (or the same) as that distance. However, as for sheet piling, as eels and sea trout migrate nocturnally, and the piling for the Facility is restricted to daytime hours only (from either 7am to 7pm, or 8am to 8pm), there would be limited potential for any barrier effect to their migrations as a result of tubular piling. Therefore, there would be a negligible magnitude to both eel and sea trout juveniles.
- 4.1.17 The river lamprey is not as sensitive to underwater noise impacts and has a maximum impact range of 10m for tubular piling. This would allow for individuals to travel past the Facility while piling was occurring, and therefore there is a negligible magnitude of impact to river lamprey.

Summary of Impact Assessment

4.1.18 Taking into account the receptor sensitivity (of medium) and the potential magnitude of the effect (of negligible in all cases), the impact significance is of **minor adverse** impact.

Table 4-3 Summary of impact assessment for the potential for a barrier to fish migrations

Impact	Magnitude	Sensitivity	Significance
Barrier to fish migrations due to piling	Negligible	Medium	Minor adverse

Potential for a barrier to fish migrations due to dredging activities

4.1.19 The exact timing of dredging activities is not yet known, however, it will not take place during the migration periods for either juvenile smelt or sea trout, or adult smelt migration periods (from March to June) (**Plate 4-22**). In addition, as for piling, it will take place in the daytime only, and therefore will not coincide with either eel, sea trout or river lamprey migrations (as these species all migrate nocturnally). The juvenile river lamprey are thought to spend most of their time in the mud and so are not often observed and can spend up to five years in mud habitats before metamorphosing into adults and migrating downstream (Canal and River Trust [REDACTED])

[REDACTED] This species is also not recognised as a species of particular concern for vulnerability to underwater noise. Therefore, there would be a limited potential for impact to either eel, sea trout, river lamprey or smelt, and a negligible magnitude of impact is predicted. In addition, the dredging is such that the plume is only expected to be localised and would disperse rapidly with the currents. Chapter 16 (Estuarine Processes) of the ES investigated the potential plume from dredging and concluded that the suspended sediment concentrations that would be expected during dredging are much lower than the natural variability in The Haven and would have a negligible effect.

4.1.20 Noise impacts to all fish species are expected at a maximum of 10m only, and this would allow for individuals to travel past the Facility while dredging was occurring, therefore there is a negligible magnitude of impact to all other fish species that may be migrating past the Facility while dredging was being undertaken.

4.1.21 As noted above, the sensitivity for all fish species, for noise impacts, is medium.

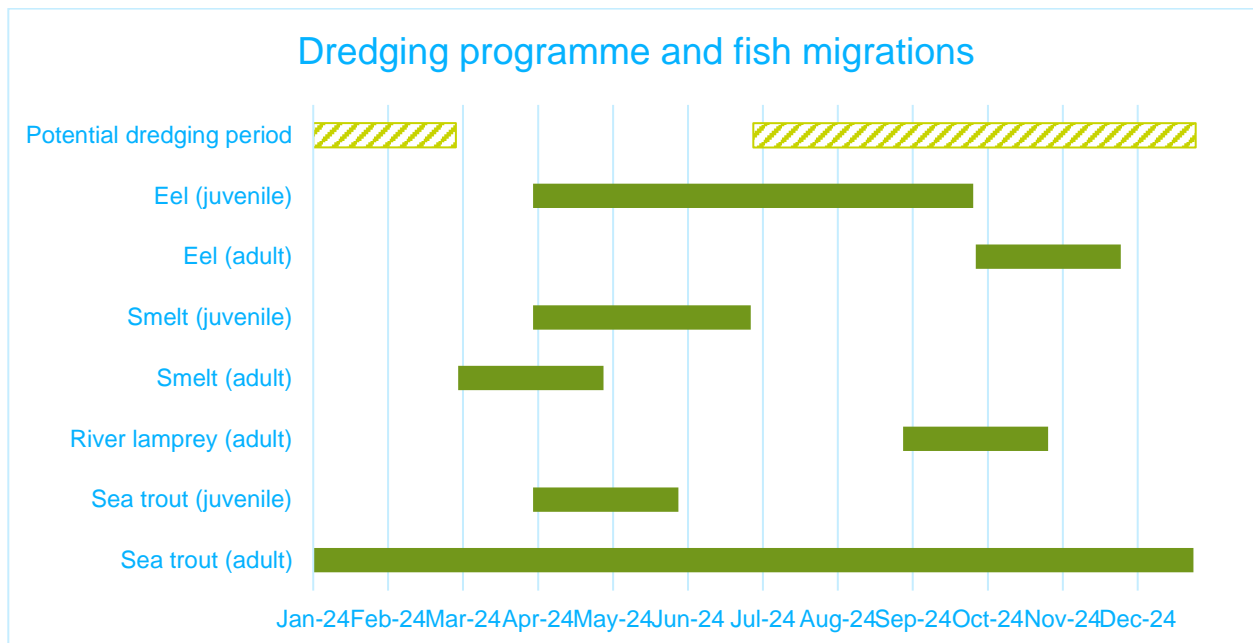


Plate 4-2 Dredging programme and fish migration overlaps

Summary of Impact Assessment

4.1.22 Taking into account the receptor sensitivity (of medium) and the potential magnitude of the effect (of negligible in all cases), the impact significance is of minor adverse impact.

Table 4-4 Summary of impact assessment for the potential for a barrier to fish migrations

Impact	Magnitude	Sensitivity	Significance
Barrier to fish migrations due to dredging	Negligible	Medium	Minor adverse

Table 4-5 Updates to Table 17-43 of Chapter 17 of the ES

Potential impact	Receptor	Assessment in ES			Updated Assessment		
		Impact range (and area)	Maximum number of individuals (% of reference population)	Magnitude	Impact range (and area)	Maximum number of individuals (% of reference population)	Magnitude
Increased levels of suspended sediments (from dredging) impacting fish migration and behaviour	Fish species	10s meters	N/A	Medium	No update however mitigation to avoid migration periods and dredging during night-time are acknowledged	N/A	Negligible
Underwater noise	Fish species	10-50 meters	N/A	Negligible to Low	10 meters	N/A	Negligible

4.2 Assessment for Habitat Loss due to Proposed Works for Wharf Construction

- 4.2.1 Chapter 17 of the ES, paragraphs 17.8.12 – 17.8.29 assess the impacts of habitat loss during construction. These assessments use baseline information that have now been updated, and the following sections outline the same impact assessments utilising the updated baseline information.
- 4.2.2 As completed within Chapter 17 of the ES, paragraph 17.8.29 concluded a moderate adverse impact significance on saltmarshes, where the magnitude of impact was assessed as medium and the sensitivity medium. The impact significance is reduced to minor adverse with the proposed mitigation and net gain measures in place.
- 4.2.3 The habitat loss as a result of the proposed wharf has been assessed in the ES and the area and impact has not changed. Natural England has stated that they would like consideration of an update to the status of the saltmarsh from poor condition to moderate condition based on their survey results as included above in **Table 2-1** and based on the priority status of this habitat for Lincolnshire. The condition assessment has been taken from monitoring reports undertaken for the Environment Agency where the saltmarshes in this area were repeatedly described as in poor condition (Holden, 2017). The potential to change from poor condition to moderate will be considered in the updated OLEMS document to be submitted to the Examination at Deadline 2 which will include an update to the biodiversity net gain calculation.
- 4.2.4 In order to determine the potential impact on saltmarshes in Lincolnshire, further calculations have been undertaken to illustrate the loss of saltmarsh in context of the amount of such habitat in Lincolnshire. The amount of saltmarsh in Lincolnshire is estimated at around 4,223 ha (page 102, Boorman, 2003) and the proposed wharf will result in the loss of 1ha of saltmarsh. This results in a loss of 0.02% of the saltmarsh from the Lincolnshire coast. The original ES gave an impact significance of **moderate adverse** for loss of saltmarsh. This was mostly due to the habitat provided for birds rather than the narrow strip of saltmarsh that would be lost. In light of the very small percentage loss from Lincolnshire this assessment still stands. To offset this loss however, opportunities for creation/restoration of marsh are being investigated and will be reported in the updated OLEMS document. Therefore, it is not proposed that there would by any change to the impact significance level, and the residual assessment of **minor adverse** remains.

Table 4-6 Updates to Table 17-43 of Chapter 17 of the ES

Potential impact	Receptor	Assessment in ES			Updated Assessment		
		Impact range (and area)	Maximum number of individuals (% of reference population)	Magnitude (pre-mitigation)	Impact range (and area)	Maximum number of individuals (% of reference population)	Magnitude (pre-mitigation)
Loss and/or change to estuarine habitats and associated species within the footprint of the wharf and dredging area	Saltmarsh	1 ha	N/A	Medium	1 ha – 0.02% of Lincolnshire saltmarshes	N/A	Medium (no change)

4.3 Potential for Air Quality Impacts to Coastal Habitats during Operation

4.3.1 ES Chapter 14 Air Quality (document reference 6.2.14(1), APP-052) and paragraphs 17.8.149 and 17.8.240 – 17.8.246 of Chapter 17 Marine and Coastal Ecology (document reference 6.2.17, APP-055) assess the impact of increased air quality emissions on sensitive habitats, as a result of the construction and operation phases of the Facility. Minor adverse impact significance was concluded for both phases.

Monitoring

4.3.2 Comments from Natural England stated that monitoring cannot be considered as mitigation as it does not negate the impact to sensitive features. Further details of the monitoring and what it will be looking to identify are also sought by Natural England.

4.3.3 The reference to monitoring was included in regard to the continuous emissions monitoring system which will be used at the Facility to ensure that emissions are within the regulatory limits. As such, the predicted impacts would not be of any greater significance than those predicted as these emission limits must be met to ensure compliance with the Environmental Permit. Furthermore, data provided in the 2020 Tolvik report³, which provides operating and compliance statistics on Energy from Waste (EfW) plants throughout the UK, compares emissions from EfW plants with the emission limits, as shown in **Plate 4-3**.

³ Tolvik Consulting (2021) UK Energy from Waste Statistics 2020

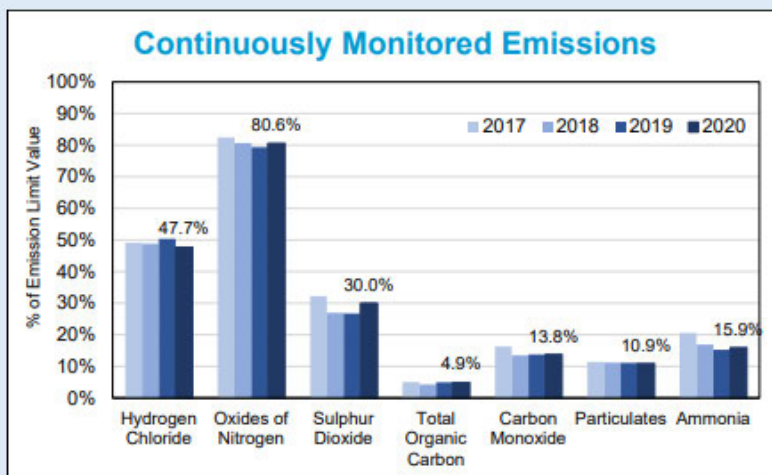


Figure 28: Continuously Monitored Emissions to Air Source: APR

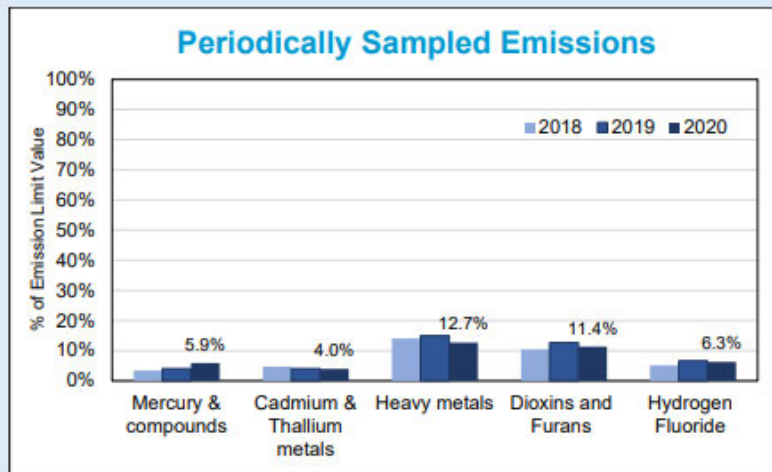


Figure 29: Periodically Monitored Emissions to Air Source: APR

Plate 4-3 Comparison of monitored emissions with the emission limit values from EfW plants in the UK

4.3.4 The conclusion of the assessment, as presented in ES Chapter 17 Marine and Coastal Ecology, is that the predicted impacts would be of minor adverse significance, which is not considered to be significant in EIA terms. In addition to the fact that the actual emissions are expected to be lower than those assessed, mitigation measures were not considered to be required.

Consideration of impacts on the Habitat Mitigation Area

4.3.5 The construction phase dust assessment methodology is taken from Institute of Air Quality Management guidance⁴ and is used to determine the level of dust risk of a development and assign appropriate mitigation to ensure that impacts would not be significant. As such, the proposed mitigation measures for dust which

⁴ Institute of Air Quality Management (IAQM) (2016) Guidance on the Assessment of Dust from Demolition and Construction

would be implemented during construction would also provide appropriate protection to the Habitat Mitigation Area. These measures will be secured via the Code of Construction Practice (CoCP).

4.3.6 Impacts upon the Habitat Mitigation Area and other areas of saltmarsh within The Haven have been considered and are presented in an updated Chapter 14 Air Quality (document reference 6.2.14(1)) which has been submitted to the examination at Deadline 1, in response to Natural England's Relevant Representations. Figures 14.6, 14.9 and 14.10 (document reference 6.3.22(1)) which show contour plots of plume dispersion from the Facility have also been updated to show other areas of saltmarsh within the Haven. More detailed evidence for the use of the 200 $\mu\text{g m}^{-3}$ Critical Level is also provided in Appendix 14.4 (document reference 9.8).

4.3.7 **Table 4-6** summarises the air quality assessment for the Habitat Mitigation Area, which demonstrates that the Critical Loads or Levels are not exceeded.

Table 4-7 Results of air quality assessment on the Habitat Mitigation Area (PC – Process Contribution, PEC – Predicted Environmental Concentration, CL – Critical Load)

Grid Ref of Max Impact Location	Project Alone		In-Combination					
	PC	PC/CL	Biomass UK No. 3 Ltd PC	In-Combination PC	% CL	BG	PEC	PEC/CL
NO_x Annual Mean ($\mu\text{g.m}^{-3}$)								
534547, 341773	2.63	8.78%	0.66	3.29	10.98 %	10.5	13.8	46%
NO_x 24hr Mean ($\mu\text{g.m}^{-3}$)								
534446, 341874	26.8	13.4%	5.6	32.4	16.2%	21.1	53.5	27%
SO₂ Annual Mean ($\mu\text{g.m}^{-3}$)								
534547, 341773	0.653	3.27%	0.17	0.82	4.12%	1.02	1.84	11%
NH₃ Annual Mean ($\mu\text{g.m}^{-3}$)								
534547, 341773	0.217	7.24%	0.017	0.23	7.81%	1.84	2.07	69%
HF 24hr Mean ($\mu\text{g.m}^{-3}$)								
534547, 341773	0.098	1.96%	0.035	0.133	2.66%	0.00000 25	0.13	3%
HF Weekly Mean ($\mu\text{g.m}^{-3}$)								
534446, 341874	0.047	9.39%	0.0072	0.054	10.8%	0.00000 25	0.05	11%
Nutrient Nitrogen (kgN/ha/yr)								
534547, 341773	1.39	6.97%	0.180	1.575	7.87%	17.2	18.8	94%

Calculation of emissions

4.3.8 Section A14.3 of ES Appendix 14.2 Dispersion Modelling Methodology (document reference 6.4.15(1)) sets out how emissions from the Facility were calculated. The assessment was undertaken using five years of meteorological data, and the reported results are the maxima of all annual datasets at the point of maximum impact within each site. The reported 24-hour concentrations are reported as 100th percentile (i.e., maximum) concentrations. The emissions from the Facility were also calculated based on NO_x, SO₂, hydrogen fluoride and ammonia being emitted at their respective limits, which is considered to be conservative as, during typical operating conditions, emissions can be expected to be lower (see **Plate 4-3**). The reported results are therefore considered to be conservative.

Operational phase assessment

4.3.9 The 1% threshold used in the assessment is a threshold of insignificance; impacts which are below 1% of a Critical Load or Level are considered to be within a natural range of fluctuation and effects are unlikely to be measurable or perceptible. Impacts above 1% of the Critical Load or Level are not necessarily significant impacts; they require further consideration in terms of the total Predicted Environmental Concentration (PEC) in relation to the Critical Load or Level (i.e., including background) and consideration of other factors such as habitat condition, response and sensitivity.

4.3.10 The PEC values at all sites, for all parameters, were below the Critical Loads and Levels, with the exception of nitrogen deposition at the Havenside Local Nature Reserve (LNR), which was predicted to be 101% of the most stringent Critical Load for saltmarsh. For all other parameters and sites, it is therefore expected that significant impacts would not occur as the total concentrations and deposition do not exceed the threshold above which the risk of harm to the habitats is increased (i.e., the Critical Loads and Levels), despite the magnitude of the contribution from the Facility.

4.3.11 The Havenside LNR experiences the largest impact from the Facility due to its proximity, and this area also experiences higher background nitrogen deposition than The Wash, likely due to its location closer to the centre of Boston. However, as previously noted and as shown in **Plate 4-3**, it is expected that emissions of oxides of nitrogen and ammonia, which both contribute to nitrogen deposition, would be emitted at lower levels than the modelled emission limits. As such, it is expected that actual deposition within the Havenside LNR would be below the Critical Load.

4.3.12 As noted in the monitoring section above, as impacts were not considered to be

significant in EIA terms, mitigation measures were not required. The continuous emissions monitoring at the Facility will ensure that impacts are no greater than predicted, and as shown in **Plate 4-3**, emissions from the Facility are expected to be significantly lower than those assessed based on emission limits. .

- 4.3.13 As noted above, although the Facility was predicted to result in impacts greater than 1% of the Critical Loads and Levels, this does not mean that significant effects will occur. Within The Wash, the total nitrogen deposition PEC, including the contribution from the Facility, was predicted to be 63% of the most stringent Critical Load. As the Critical Load is not exceeded, significant changes in species composition within the saltmarsh is not anticipated, as Critical Loads are set at a level below which significant harmful effects have not been shown to occur. Furthermore, the additional in-combination contribution of the Facility plus other projects in the area was predicted to be 2.13% of the Critical Load, which is not considered to constitute excessive additional nutrient loading.
- 4.3.14 The contribution from the Facility predicted in the assessment at the Havenside LNR is considered to be conservative, as emissions of nitrogen oxides and ammonia would be lower than the modelled emission limits. As such, significant impacts on saltmarsh are unlikely to occur. Assessment of the habitat mitigation area is included above in Paragraphs 5.3.5 – 5.3.7.
- 4.3.15 With regard to the referenced studies by Natural England (Deegan *et al.*, 2007, 2018; Penk, 2020), as noted by CIEEM⁵ and on APIS⁶, studies of saltmarsh sensitivity to nitrogen deposition typically use unrealistic nitrogen doses and input methods which would be significantly in excess of any nitrogen which would be deposited from the atmosphere. Furthermore, it is stated in paragraph 17.8.243 of Chapter 17 Marine and Coastal Ecology and noted on APIS that deposition of nitrogen is likely to be of low importance for saltmarsh systems as inputs are typically significantly lower than the large loadings of nutrients from river and tidal inputs, which is also expected to be the case in The Wash and The Haven.
- 4.3.16 Given the above, it is not expected that The Wash or the Havenside LNR would experience increases in nitrogen loading of a sufficient magnitude which would give rise to changes in species composition or other such adverse impacts. In addition, airborne deposition is not expected to be such a significant contributor to total nitrogen loadings within the saltmarsh in comparison to other sources.

⁵ CIEEM (2021) *Advisory Note: Ecological Assessment of Air Quality Impacts*

⁶ APIS – Nitrogen Deposition: Coastal Saltmarsh [REDACTED]

Inclusion of ammonia

- 4.3.17 As noted in Paragraph 14.4.35 of Chapter 14 Air Quality, the only designated ecological site within 200 m of the road network is the South Forty Foot Drain Local Wildlife Site (LWS); all other sites are located significantly further from the road network which would be utilised by construction or operational phase vehicles generated by the Facility. As such, it is not expected that any other designated sites would be affected by contributions of ammonia from road traffic.
- 4.3.18 Paragraph 14.4.35 also notes that the number of project-generated vehicles was below the screening criteria during both the construction and operational phases; as such, impacts of emissions (including ammonia) from road traffic would not be significant. The total NO_x and nitrogen contributions from traffic on the nearest road to the South Forty Foot Drain site were included within the total PEC values reported in Table 14-25 and Table 14-33 of Chapter 14 Air Quality. The additional consideration of ammonia from this source would increase the total nitrogen deposition experienced at this location, however the area of the site within 200 m of the road is less than 1% of the total area of the LWS. Given that the project would not give rise to a significant increase in ammonia emissions or associated nitrogen deposition, the impacts of ammonia from road traffic are not considered to be significant.
- 4.3.19 With regard to ammonia from vessels, the principal source of emissions of ammonia would be from vessels utilising Selective Catalytic Reduction (SCR), which primarily uses injected ammonia to reduce NO_x emissions. The International Maritime Organisation (IMO) has been introducing increasingly stringent emission standards on vessels under Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL). The North Sea is a designated Emission Control Area (ECA) and, as such, the most stringent Tier III NO_x emission standards apply for all vessels constructed on or after 1st January 2021. The Tier III NO_x emission standards impose a reduction in NO_x of approximately 80% and 75% in comparison to Tier I and II standards respectively; in order to achieve this emission reduction, SCR is one of the techniques which may be used. However, as this emission reduction technique is only required for vessels constructed on or after 1st January 2021, it is unlikely that a significant proportion of vessels travelling along The Haven, or which would be utilised by the Facility, would be using SCR technology. Furthermore, for older vessels which are not required to use emission reduction technologies, the ammonia content within liquid fuel is expected to be negligible. As such, any ammonia emitted from vessels would be expected to have a negligible effect on designated ecological sites.

4.3.20 Natural England state that there are other sensitive habitats in addition to saltmarsh that should be considered. As noted in Section 14.4.61, and listed in Table 14-9 of Chapter 14 Air Quality (document reference 6.2.14(1)), the citations for the LWSs and LNR include other habitats. However, there were no suitably appropriate habitats listed within the APIS database to assign Critical Loads. Therefore, impacts in relation to Critical Loads were only considered within the saltmarsh habitat. If Natural England advises that certain Critical Loads would be appropriate for other habitats within the LWSs and LNR, the predicted impacts will be compared to these Critical Loads. Assessment of the habitat mitigation area is included above in Paragraphs 4.3.5 – 4.3.7.

In-combination assessment update

- 4.3.21 The in-combination concentrations and deposition Process Contribution (PC) values exceeded the 1% threshold but, as noted in the operational phase assessment section above, the PEC did not exceed the lower Critical Loads or Levels at the LNR or LWSs, with the exception of nutrient nitrogen at the Havenside LNR (the total deposition including background was 101% of the most stringent critical load value in the range (20 kgN ha⁻¹ yr⁻¹)). Impacts within the Habitat Mitigation Area are reported in Chapter 14 Air Quality (document reference 6.2.14(1)) , as mentioned above.
- 4.3.22 The in-combination assessment included both the Biomass UK No. 3 Ltd plant and a peaking power plant near to the Facility, although impacts associated with the peaking power plant were only considered at the Havenside LNR as this was the only designated site included within its air quality assessment. No further projects have been identified by stakeholders for consideration within the assessment.
- 4.3.23 The search for in-combination projects was undertaken using Natural England's SSSI Impact Risk Zone criteria, which were applied to all designated sites considered in the assessment. Applications listed on the planning portals for Boston Borough Council, South Holland District Council and East Lindsey District Council were reviewed for projects which would have emissions of the type specified within the SSSI Impact Risk Zone criteria. Projects which carried out air quality assessments as part of the planning application were included within the in-combination assessment.

Table 4-8 Updates to Table 17-43 of Chapter 17 of the ES

Potential impact	Receptor	Assessment in ES			Updated Assessment		
		Impact range (and area)	Maximum number of individuals (% of reference population)	Magnitude	Impact range (and area)	Maximum number of individuals (% of reference population)	Magnitude
Increased emissions to air and deposition on marine and estuarine habitats (construction & operation)	Saltmarsh	Havenside LNR and The Wash	N/A	Negligible during construction Low during operation	Havenside LNR and The Wash	N/A	Negligible during construction (no change) Low during operation (no change)

5 Updates to Habitats Regulations Assessment

5.1 Updates Required for Marine Ecology

- 5.1.1 There is no requirement for an update to the HRA as the issues discussed above do not affecting habitats within a designated site. The assessment of the loss of habitat for the birds has been discussed fully in the HRA addendum specifically for birds.

6 References

Boorman, L.A., 2003 Saltmarsh Review. An overview of coastal saltmarshes, their dynamic and sensitivity characteristics for conservation and management. Available online: [REDACTED]

Holden, E., 2017. *Boston Barrier Tidal Project: 2017 Saltmarsh Survey Report*, s.l.: Environment Agency.

PD Teesport (2018) Hartlepool Approach Channel EIA Report.

Popper, A. et al., 2014. *Sound Exposure Guidelines for Fishes and Sea Turtles*, s.l.: Springer.

Port of Cromarty Firth (2018) *Invergordon Service Base Phase 4 Development Environmental Impact Assessment Report*.