Grangetown Energy Recovery Facility

Report to Inform a Habitats Regulations Assessment

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1 Introduction

Overview

1.1 Outline planning consent has been granted for the construction of an Energy Recovery Facility (ERF) and associated development at a site known as Grangetown Prairie (planning reference R/2019/0767/OOM).

1.2 The planning process included consultation with Natural England that confirmed that a Habitats Regulations Assessment was required because of the site's proximity to, and potential to impact on, the following European designated sites: Teesmouth and Cleveland Coast SPA and Ramsar. An HRA Screening Report (see Section 5 for further explanation of the 'screening' process) was subsequently prepared (JBA Consulting, 2019) and submitted alongside the planning application. The Screening Report concluded that '*no likely significant effects were identified from the proposed works*' and that '*the HRA process for the project will not be required to proceed to an Appropriate Assessment*'.

1.3 In correspondence dated 20 January 2020 (reference 304948, Andrew Whitehead, Team Leader - Sustainable Development, Marine & Wildlife Licensing Northumbria Area Team) Natural England objected to the proposed development and advised Redcar and Cleveland Borough Council that they considered that it was '*not possible to conclude that the proposal is unlikely to result in significant effects on the European sites in question*'. Consequently the need to carry out an 'appropriate assessment' was considered to be triggered. In particular, Natural England requested that an air quality assessment was completed that considered the operation of the ERF and the effects of emissions on designated site habitats and species, i.e., the qualifying features of the European designated sites.

1.4 In subsequent correspondence to Redcar and Cleveland Borough Council dated 26 March 2020 (reference 312932, Andrew Whitehead, Team Leader - Sustainable Development, Marine & Wildlife Licensing Northumbria Area Team) Natural England withdrew their objection to the proposed development, advising that they no longer believed that the proposal was likely to have a significant effect on the European sites in question. This conclusion was reached following the submission of further information in the form of an 'appropriate assessment' (JBA Consulting, 2020).

1.5 Following the withdrawal of Natural England's objection, outline planning consent was granted. Condition 3 of the decision notice states:

1.6 '*Upon the approval of the Reserved Matters, and prior to the implementation of the approved scheme, the development shall be the subject of an updated Habitats Regulations Assessment and additional supplementary air quality assessment. The HRA and additional air quality assessment shall confirm, based on the approved detail of the development and its processes, the conclusions of the Environmental Impact Assessment and Air Quality Assessment that the development will not give rise to significant adverse impacts on designated sites. Where significant impacts not previously identified are assessed to arise from the approved detailed scheme, the additional information shall set out those mitigation measures to be employed to minimise or eliminate such impacts*.'

1.7 A planning application was subsequently submitted to Redcar and Cleveland Council for the discharge of conditions 3, 4, 8, 9, 10, 11, 12, 13, 14 and 16 of outline planning permission R/2019/0767/OOM. Natural England provided a response to this application (reference: 427563, dated 22 May 2023) in which further information was requested. This document has been updated to include the requested information (updates are shown as underlined text).

1.8 This document presents the results of an updated HRA (a shadow HRA[1]), which provides information that will help Redcar and Cleveland Council to discharge its duties as the 'competent authority' as defined under Regulation 63(1) of the Conservation of Habitats and Species Regulations 2017[2] (as amended - hereafter referred to as the 'Habitats Regulations').

[1] Under the Conservation of Habitats and Species Regulations 2017 the 'competent authority' is responsible for completing a Habitats Regulations Assessment (HRA). If an HRA is carried out by a third party with the objective of it being adopted by the competent authority, this is often referred to as a shadow HRA.

[2] Following the UK's exit from the European Union, the 2017 Regulations have been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

1.9 It should be noted that it has not been possible to visit the site during the preparation of this assessment due to ongoing remediation work. This is not considered to be a limitation as previous surveys have established site conditions prior to this work commencing. The loss of habitats and disturbance associated with these works is likely to have reduced the value of the site to qualifying features (birds) associated with the Teesmouth and Cleveland Coast SPA and Ramsar site.

Site description

1.10 The site (the 'Site') is located on land to the east of John Boyle Road and to the west of Tees Dock Road, Grangetown, Redcar and Cleveland. The central Ordnance Survey Grid Reference (OSGR) for the site is NZ543213. The location of the Site is shown on Figure 1 in Section 12.

1.11 BSG Ecology understands from FCC Environment that Site remediation works have been carried out by South Tees Development Corporation (STDC). This has resulted in the removal of all vegetation within the Site.

Project Description

1.12 FCC Environment is one of three bidders in a confidential bidding process looking to secure a long-term contract to build and operate an Energy from Waste facility with the Joint Authorities. The Tees Valley Authorities (TVA), Durham County Council and Newcastle City Council (the Councils) have joined together to create an opportunity for a contractor to design, build, finance and operate (DBFO) a new Energy Recovery Facility (ERF) to be located in the Tees Valley on a mandated site owned by the South Tees Development Corporation (STDC).

1.13 The mandated site is on a large industrial brownfield site within the Redcar and Cleveland Borough Council administrative area: this is the site of the former British Steel works in Grangetown, an area known as Grangetown Prairie. The site is approximately 25 acres in total.

1.14 Outline planning consent has been granted by Redcar and Cleveland Borough Council (planning reference R/2019/0767/OOM) for an ERF facility that could treat 450,000 tonnes per annum of waste and export up to 49.9 MWH of electricity. The developed site will also include landscaping, internal access roads and car parking areas.

Report Structure

1.15 This report documents the HRA for the proposed Energy Recovery Facility. It identifies, analyses and quantifies (where possible) potential negative impacts on the relevant European sites. The report is structured as follows:

- Chapter One: sets out the purpose of the report and provides an overview of the project.
- Chapter Two: describes the Habitats Regulations Assessment process.
- Chapter Three: sets out the scope of the assessment and how this has been derived.
- Chapter Four: identifies the European sites that may potentially be impacted by the project, together with ecological information about each site.
- Chapter Five: sets out the screening for any Likely Significant Effects.
- Chapter Six: describes the Appropriate Assessment, which includes mitigation measures where appropriate.
- Chapter Seven: presents the conclusions of the assessment.

Consultation

1.16 FCC Environment has engaged with Natural England through the Discretionary Advice Service (DAS), which involved a meeting on 24 November 2021 between Nick Lightfoot and Lewis Pemberton (Natural England), David Molland (FCC), Tim Heard, Sarah Burley and Sara Maile (ECL), Steven Betts (BSG Ecology) and Sam Thistlethwaite (Identity Consult Planning).

1.17 Natural England provided the following advice in relation to the draft shadow HRA that had been sent to them in advance of the meeting:

- Modelling locations TCC10, 11, 12 and 13 are considered to be the most sensitive ecological receptors due to the habitats that are present, i.e., mudflats (at Seal Sands), saltmarsh and sand dunes.
- The mudflats at Seal Sands provide an important feeding area for SPA and Ramsar qualifying birds and eutrophication is currently resulting in the formation of algal mats that make feeding difficult for some species.
- Saltmarsh may be used by some SPA and Ramsar qualifying birds for feeding and so needs to be considered in the HRA.
- Sand dune is not important for SPA and Ramsar qualifying birds but is important as a qualifying feature of the Teesmouth and Cleveland Coast SSSI (this habitat does not need to be considered within the HRA).
- Table 8 of the draft HRA refers to the release of waterborne non-synthetic compounds as being unlikely. Further explanation is required as to why this is unlikely.
- The HRA needs to consider deposition to the River Tees and estuary and nutrient enrichment of the water.

1.18 Natural England provided comments on the application to discharge conditions of planning permission R/2019/0767/OOM (reference 427563, dated 22 May 2023). In its consultation response Natural England advised that '*additional assessment is now needed over and above the applicant's submitted information to inform HRA*'. It also advised that HRA screening is required for the effects of the proposed development on water quality.

1.19 Natural England advises that '*In view of the need to address the 'restore' conservation objective, reference to high 'background' levels of deposition does not obviate the need for new development to assess and, where necessary, mitigate additional aerial emissions. Natural England advises that further explanation is needed to support the report's conclusion that aerial emissions from the proposal would have no significant effects upon the supporting habitats considered*.'

1.20 Natural England also recommended that further consideration of the appropriate assessment for this development should include the following:

- Trends of nitrogen deposition and other pollutants in the local area;
- Duration of air quality effects on relevant habitats (stable coastal sand dune grassland - calcareous);
- Reversibility of effects and scope for reductions in background levels taking account of national and regional trends and relevant initiatives which can be relied upon to reduce background levels at the site;
- If required, any mitigation measures proposed and evidence that avoidance and mitigation measures must be capable of preventing adverse effects on site integrity over the full lifetime of the plan or project.

1.21 This report has been updated to address the above points that have been raised by Natural England. The individual points have been addressed as follows:

- Water quality impacts and effects are considered in sections 3.4 and 3.7 and in Table 8.
- Trends in air quality are considered in sections 6.9 to 6.22.
- Duration of air quality effects on relevant habitats are considered in sections 6.134 to 6.137.
- Reversibility of effects are considered in sections 6.138 to 6.143.

1.22 In addition, further survey work has been undertaken by the Industry Nature Conservation Association (INCA) to assess the suitability of dune habitat for SPA birds and to assess the current status of the dune vegetation in relation to nitrogen deposition. The results of this work are summarised in sections 4.4 to 4.12 and are presented in a separate report (INCA, 2023 – see Appendix 1).

1.23 Additional mitigation measures are not considered to be necessary in light of the conclusions of the updated assessment.

Contributors

1.24 The report has been prepared by Steven Betts, who has worked in the ecological sector for more than 27 years. During this time he has contributed to a wide range of projects, both as author and technical reviewer. This has included the preparation of and contributions to numerous HRAs for projects that have included an energy recovery facility, housing developments, powerline projects, solar schemes and wind farms.

1.25 The report has been reviewed by Dr Roger Buisson. Roger is a highly experienced professional ecologist with over 30 years' experience. He has managed or contributed to numerous projects that have included a requirement for HRA.

1.26 Further details of the experience and qualifications of the above can be found at http://www.bsg-ecology.com/people/.

2 Habitats Regulations Assessment

Legislation and policy

2.1 This section describes the legislation and policy as it applies now that the UK has left the European Union.

2.2 Guidance from Defra has been provided on the application of the relevant legislation in the post-Brexit period in their policy paper published on 01 January 2021 available at https://www.gov.uk/government/publications/changes-to-the-habitats-regulations-2017/changes-to-the-habitats-regulations-2017.

2.3 The Conservation of Habitats and Species Regulations 2017 (as amended) provide for the protection of particular habitats, plants and animals through the creation of, and specific decision-making procedures applied to, the 'national site network' (Regulation 3 'Interpretation'). This 'national site network' includes Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) that were designated or classified both in that period when the UK was a member of the EU and designated since the UK has left the EU.

2.4 It is UK Government policy (in England this is identified in paragraph 181 of the National Planning Policy Framework, 2021) that all competent authorities should treat candidate SACs (cSACs) and potential SPAs (pSPAs) as being within the provisions of the Conservation of Habitats and Species Regulations 2017 (as amended).

2.5 In this report the term 'European Sites' is used to refer collectively to SACs, cSACs, SPAs and pSPAs. Although they are referred to as the 'national site network' in those recently amended parts of the Habitats Regulations, the decision-making procedures concerning HRA, as set out in Regulation 63, continue to refer to them as 'European Sites' (as does much of the available guidance) and for that reason in this report they are referred to collectively as European Sites.

Habitats Regulations Assessment process

2.6 The requirements of the Habitats Regulations with regard to the implications of plans or projects are set out within Regulation 63 of the Habitats Regulations. The step-based approach implicit within this regulation is referred to as a 'Habitats Regulations Assessment', which is the term that has been used throughout this report.

2.7 It is a requirement of any public body (referred to as a competent authority within the Habitats Regulations) to undertake a Habitats Regulations Assessment (HRA) when they are proposing to carry out a project, implement a plan or authorise another party to carry out a plan or project. Competent authorities are required to record the process undertaken, ensuring that there will be no adverse effects on the integrity of any European Site, as a result of a plan or project whether alone or in combination with other plans or projects. In this case the competent authority is Redcar and Cleveland Borough Council.

Assessment stages

2.8 The assessment of a plan or project goes through a number of stages, with guidance having been published to aid competent authorities fulfil their responsibilities (e.g., Defra, 2021). Those stages are summarised in Table 1 below.

***Table 1**: Stages in the Habitats Regulations Assessment process*

Stage	Description	Legislative Context
Purpose	Determines if the purpose of the plan or project is directly connected with, or necessary, to the management of a European Site. If it is, then no further assessment is necessary	Regulation 63(1)(b)
Scoping	The identification of any European Site that might be within scope of a HRA, i.e., those European Sites should be taken forward to the screening stage based on a wide consideration of spatial and ecological factors. Such European Sites may be located within the plan or project area but may also include sites located in neighbouring authority areas.	
Screening	Assessment of whether a plan or project, either alone or in combination with other plans or projects, is likely to have a significant effect on any European Sites' qualifying features (habitats and species) and the achievement of the European Site's conservation objectives. This is also known as the 'test of likely significant effect' (ToLSE).	Regulation 63(1)(a)
Appropriate Assessment	Consideration of the impacts of the proposals to determine whether or not it is possible to conclude with certainty that the project will not result in any adverse effect on the integrity of any European Site, either alone or in combination with other plans or projects and with reference to the European Site's conservation objectives. This is also known as the test of 'adverse effect on integrity' (AEoI). At this stage consent may be granted for the plan or project if it is possible to conclude with certainty that the proposal will not result in any adverse effect on the integrity of any European Site, either alone or in combination with other plans or projects.	Regulation 63(5)
If it cannot be concluded with certainty that the proposal will not result in any adverse effect on the integrity of any European Site then proceed to:		
Assessment of alternative solutions	Assess whether there is an alternative solution to the plan or project, i.e., one that avoids adverse effects on European Sites. If no such alternative solution exists, the process continues to an assessment of whether there are 'imperative reasons of overriding public interest' (IROPI) for the plan or project to proceed.	Regulation 64(1)
Assessment of IROPI	Assess whether a plan or project can be justified as being needed for 'imperative reasons of overriding public interest' (IROPI).	Regulation 64(1)
Compensatory measures	Identify and secure any necessary compensatory measures to ensure that the overall coherence of the 'national site network' is protected.	Regulation 68

Applying Case law to the HRA process

2.9 The Court of Justice of the European Union (CJEU) and UK Court judgments have identified that in the HRA process the assessment may not have lacunae (gaps or omissions) and must contain complete, precise and definitive findings capable of removing all reasonable scientific doubt as to the effects of the proposed works on the European Site concerned. Court judgments have identified that in the HRA process all aspects of the plan or project which can, by themselves or in combination with other plans or projects, affect the conservation objectives of European Sites concerned must be identified in the light of the best scientific knowledge available in the field.

2.10 A CJEU judgment in 2018 (People Over Wind and Sweetman, 12 April 2018, C-323/17) has provided clarification as to when avoidance or reduction (i.e., mitigation) measures can be considered within the HRA process. The headline for the case is:

> "*In the light of all the foregoing considerations, the answer to the question referred is that Article 6(3) of the Habitats Directive must be interpreted as meaning that, in order to determine whether it is necessary to carry out, subsequently, an appropriate assessment of the implications, for a site concerned, of a plan or project, it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*".

2.11 This case means that a competent authority cannot rely on avoidance or reduction measures that allow a conclusion of 'no likely significant effect' to be reached: instead, it is necessary to accept that there is a 'likely significant effect' in the absence of these measures, and move to the next stage, i.e., appropriate assessment, at which point such mitigation measures can be considered. This judgment is accounted for in this report.

2.12 A further CJEU judgment (Holohan & Ors. v An Bord Pleanála, 7 November 2018, C-461/17) provides further clarification about the HRA process, requiring that all habitats and species associated with a European Site (irrespective of whether or not they are qualifying features) must be considered in the assessment if impacts on those non-qualifying habitats or species are liable to affect the conservation objectives of the European Site through, for instance, effects on ecological processes or food chains. This judgment is also accounted for in this report.

2.13 It is noted that relevant case law still applies following the UK's departure from the EU, and that the 2017 Regulations amendments in The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, will apply.

Functionally linked land

2.14 A development has the potential to impact a European site either directly, for example as a result of land-take, or indirectly, for example as a result of changes in air quality. When assessing impacts it is important to note that impacts need to be considered on 'functionally linked land'. Functionally linked land can be defined as follows (Chapman & Tyldesley, 2016):

2.15 '*the term 'functional linkage' refers to the role or 'function' that land or sea beyond the boundary of a European site might fulfil in terms of ecologically supporting the populations for which the site was designated or classified. Such land is therefore 'linked' to the European site in question because it provides an important role in maintaining or restoring the population of qualifying species at favourable conservation status*.'

2.16 In this report consideration has been given to whether or not the proposed development will impact land that is functionally linked to a European site.

3 Scope of the Assessment

Overview

3.1 There are no standard criteria for determining the spatial scope of an HRA and so the decision to include or exclude European sites from an assessment needs to be supported by application of the source-pathway-receptor conceptual model, which highlights whether there is any potential pathway that connects the development to any European sites. In this case the spatial scope of the assessment is informed by identifying the impacts that could potentially arise as a result of the development, assessing the spatial and temporal scope of those impacts and understanding the effects on sensitive receptors that might arise.

Potential impact mechanisms

3.2 Potential impacts that may arise from the construction phase of the proposed development have been identified as follows:

- Degradation of habitats as a result of excavation work, material storage and mobile plant tracking; such impacts will be limited in their extent to the Site with no construction activity proposed outside the Site boundary.
- Degradation of habitats arising from pollution, in particular airborne (e.g., dust) and water-borne (e.g., silt) pollutants; such impacts will be limited in their extent to the Site and the adjacent area.

3.3 Impacts that may arise during the operational phase of the proposed development will be limited to changes in air quality arising from the operation of the energy recovery facility. No further degradation of habitat arising from excavation work, material storage and mobile plant tracking etc is likely during this phase of the development.

3.4 In Natural England's response to the application for the discharge of conditions (reference: 427563, dated 22 May 2023), it was requested that the scope of the assessment for the operational phase of the proposed development is extended to include site drainage. It is considered that, in the absence of mitigation measures, discharges via site drainage could result in impacts on the quality of the water environment. This document has been updated to include this impact mechanism.

3.5 The decommissioning phase of the proposed development is expected to result in similar impacts to those described for the construction phase of the development. Air quality impacts will be limited to dust generated during the decommissioning works, with other aerial discharges having ceased prior to this phase of the development. Habitat degradation will be limited to the landscaped habitats that have developed within the Site during its operational life.

Scope of the assessment

3.6 The Zone of Influence (ZoI) for the proposed development is the area over which ecological features may be affected by biophysical changes as a result of the proposed work and associated activities. This may extend beyond the Site boundary. The ZoI has been used to determine the extent of the desk study, baseline ecological surveys and biological / non-biological (air quality) assessments.

3.7 During the construction stage of the proposed development the ZoI is considered to be the Site and a buffer area around it within which impacts may occur depending upon the sensitivity of the ecological receptors being considered. In this assessment the following ZoIs have been adopted:

- Degradation of habitats (habitat loss and disturbance) – This will be limited to the Site and immediate environs, i.e., a precautionary ZoI of 100 m. Consideration needs to be given to direct impacts on European sites and to impacts on land that is functionally linked to a European site (see Section 2.14 et seq.).
- Degradation of habitats (airborne pollution) - Air quality impacts due to dust production may potentially impact on sensitive ecological features. Current guidance (Holman *et al*, 2014) advises that construction-related dust impacts only need to be considered for important ecological features within 50 m of the proposed development boundary. Guidance on mineral developments (IAQM, 2016) advises that a significant effect from dust is unlikely beyond 400 m of the proposed development boundary (this higher figure has been adopted on a precautionary basis for the purposes of the HRA).

- Degradation of habitats (waterborne pollution) – Water-borne pollutants, such as silt, fuel and oils, have the potential to impact on habitats downstream of the pollution source. Whilst this type of pollution can potentially be wide-ranging, its effects will be limited to the receiving watercourse. It is understood that the site is not currently drained following the completion of remediation works (Doran Consulting, 2021); however, the site has been understood to previously drain to the adjacent Holme Beck culvert, which runs northwards along the western site boundary, in turn out-falling to the Cleveland Channel and onwards to the tidal Tees Estuary. The previous surface water drainage arrangements may have provided a route whereby pollutants could find their way into the Tees Estuary. At the point any pollutant enters the estuary it is likely to be subject to some dilution, mixing and dispersal, although this may be reduced within the confines of an estuarine environment. Approximately 7 km downstream the River Tees discharges to the open sea, at which point dilution, mixing and dispersal are likely to be significant. For this reason 7 km has been set as the ZoI.

3.8 During the operation phase a ZoI of 10 km has been adopted. As the proposed development will generate less than 50 MW, the ZoI for the project is taken to be 10 km from the proposed works location to follow DEFRA air emission guidance (DEFRA, 2016).

3.9 In summary, the following potential types of adverse effect, with their associated ZoI, have been considered in this assessment:

- Degradation of habitats (habitat loss and disturbance) (ZoI is 100 m from the Site);
- Degradation of habitats (airborne pollution - dust) (ZoI is 400 m from the Site);
- Degradation of habitats (waterborne pollution) (ZoI is 7 km from the Site);
- Degradation of habitats (airborne pollution – gaseous and particulate pollutants) (ZoI is 10 km from the Site.

3.10 Taking into account these impact mechanisms and the ZoIs that have been adopted for the assessment, the HRA has considered impacts on the following European sites:

- Teesmouth and Cleveland Coast SPA;
- Teesmouth and Cleveland Coast Ramsar;
- North York Moors SAC; and
- North York Moors SPA.

3.11 No other European sites have been identified where the impacts and effects of the proposed development need to be considered.

4 Information on the Relevant European Sites

4.1 Set out below is information relating to the Teesmouth and Cleveland Coast SPA (Table 2), Teesmouth and Cleveland Coast Ramsar (Table 3), North York Moors SAC (Table 4) and North York Moors SPA (Table 5) and the reference sources of information used. The following information is provided for each site:

- Site name and code
- Year classified/designated/listed
- Area
- Qualifying interest features
- Conservation objectives
- Distance between nearest component of European Site and the quarry
- Sources of information

***Table 2**: Teesmouth and Cleveland Coast SPA*

Site name: Teesmouth and Cleveland Coast SPA
Site code: UK9006061
Year designated: Designated on 1 April 2005
Area: 12210.62 ha
Component SSSIs: Durham Coast SSSI, Teesmouth and Cleveland Coast SSSI.
Qualifying interest features: The site qualifies under Article 4 of the Birds Directive (2009/147/EC) as it regularly supports more than 1% of the Great Britain populations of the following species listed in Annex I of the EC Birds Directive: • Avocet (*Recurvirostra avosetta*), Breeding • Sandwich tern (*Thalasseus sandvicensis*), Non-breeding • Little tern (*Sternula albifrons*), Breeding • Common tern (*Sterna hirundo*), Breeding • Ruff (*Calidris pugnax*), Non-breeding The site also regularly supports more than 1% of the biogeographic population of two regularly occurring migratory species not listed in Annex I of the EC Birds Directive: • Redshank (*Tringa totanus*), Non-breeding • Knot (*Calidris canutus*), Non-breeding The site qualifies under Article 4 of the Birds Directive (2009/147/EC) as it is used regularly by over 20,000 waterfowl (waterfowl as defined by the Ramsar Convention) or 20,000 seabirds in any season: • Waterbird assemblage, Non-breeding – average number of individuals 26,014
Conservation objectives: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features, • The structure and function of the habitats of the qualifying features, • The supporting processes on which the habitats of the qualifying features rely, • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.
Distance: The development site is 1.4 km from the nearest part of the SPA.

Site name: Teesmouth and Cleveland Coast SPA
Sources of information: Site citation - http://publications.naturalengland.org.uk/file/4903947418730496 JNCC Natura 2000 Data Form - http://publications.naturalengland.org.uk/file/3209673 (2012) Conservation Objectives - http://publications.naturalengland.org.uk/file/4849489020190720 Regulation 33 Conservation Advice - http://publications.naturalengland.org.uk/file/3208616 (2012) Site Improvement Plan – http://publications.naturalengland.org.uk/publication/5803888850501632

***Table 3**: Teesmouth and Cleveland Coast Ramsar*

Site name: Teesmouth and Cleveland Coast Ramsar
Site code: UK0019859
Year designated: Designated on 15 August 1995
Area: 1247.31 ha
Component SSSIs: Durham Coast SSSI, Teesmouth and Cleveland Coast SSSI.
Qualifying interest features: The site qualifies under Ramsar criterion 5 because it supports: • An assemblage of international importance – 9,528 waterfowl (5 year peak mean 1998/99-2002/2003). The site qualifies under Ramsar criterion 6 because it supports the following species/populations, which occur at levels of international importance: • Redshank (*Tringa totanus*), Non-breeding • Knot (*Calidris canutus*), Non-breeding
Conservation objectives: There are no specific conservation objectives for the Ramsar site; however, as the site is of importance for species that are also qualifying features of the SPA, it has been assumed that the SPA conservation objectives are also relevant for the Ramsar site. Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species. • The structure and function (including typical species) of qualifying natural habitats. • The structure and function of the habitats of qualifying species. • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely. • The populations of qualifying species, and, • The distribution of qualifying species within the site.
Distance: The development site is 1.7 km from the nearest part of the Ramsar site.

Site name: Teesmouth and Cleveland Coast Ramsar
Sources of information: Site citation - https://jncc.gov.uk/jncc-assets/RIS/UK11068.pdf JNCC Natura 2000 Data Form – n/a Conservation Objectives – n/a Conservation Objectives Supplementary Advice – n/a Site Improvement Plan – n/a Proposed targets for SAC Conservation Objectives – n/a

***Table 4**: North York Moors SAC*

Site name: North York Moors SAC
Site code: UK0030228
Year designated: Designated on 1 April 2005
Area: 44053.29 ha
Component SSSI: North York Moors SSSI.
Qualifying interest features: Qualifying habitats: The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I: • 4010 Northern Atlantic wet heaths with *Erica tetralix*. • 4030 European dry heaths Qualifying habitats: Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 7130 Blanket bogs (* if active bog) * Priority feature
Conservation objectives: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: • The extent and distribution of the qualifying natural habitats, • The structure and function (including typical species) of the qualifying natural habitats, and, • The supporting processes on which the qualifying natural habitats rely.
Distance: The development site is 9.4 km from the nearest part of the SAC.
Sources of information: Site citation - http://publications.naturalengland.org.uk/file/5868610203418624 JNCC Natura 2000 Data Form - https://jncc.gov.uk/jncc-assets/SAC-N2K/UK0030228.pdf Conservation Objectives - http://publications.naturalengland.org.uk/file/5052053512781824 Conservation Objectives Supplementary Advice - http://publications.naturalengland.org.uk/file/5324037278662656 Site Improvement Plan – http://publications.naturalengland.org.uk/publication/6110322049941504

***Table 5**: North York Moors SPA*

Site name: North York Moors SPA
Site code: UK0019859
Year designated: 12 May 2000
Area: 44,087.68 ha
Component SSSIs: North York Moors SSSI.
Qualifying interest features: Qualifying species: The site qualifies under article 4.1 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the Great Britain population of the following two species listed in Annex I in any season: • Merlin *Falco columbarius* • Golden Plover *Pluvialis apricaria* Non-qualifying species of interest: In addition, the site supports a rich upland breeding bird assemblage which includes Short-eared owl *Asio flammeus*, peregrine *Falco peregrinus* and hen harrier *Circus cyaneus* (all Annex I species), together with redshank *Tringa totanus*, red grouse *Lagopus lagopus scoticus* and a nationally important population of curlew *Numenius arquata*.
Conservation objectives: Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features, • The structure and function of the habitats of the qualifying features, • The supporting processes on which the habitats of the qualifying features rely, • The population of each of the qualifying features, and, • The distribution of the qualifying features within the site.
Distance: The development site is 9.4 km from the nearest part of the SPA.
Sources of information: Site citation - http://publications.naturalengland.org.uk/file/4889831448510464 JNCC Natura 2000 Data Form - https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9020325.pdf Conservation Objectives - http://publications.naturalengland.org.uk/file/4525396477607936 Conservation Objectives Supplementary Advice - http://publications.naturalengland.org.uk/file/6752904849653760 Site Improvement Plan – http://publications.naturalengland.org.uk/publication/6110322049941504

Teesmouth and Cleveland Coast SPA / Ramsar: site condition

4.2 Natural England has not published the results of a comprehensive condition assessment for the Teesmouth and Cleveland Coast SPA and Ramsar site and it is not known if such an assessment has been carried out.

4.3 Natural England publishes condition assessments for SSSIs, the Teesmouth and Cleveland Coast SSSI being the component SSSI for the Teesmouth and Cleveland Coast SPA / Ramsar that is located closest to the proposed development site. Whilst this information can be helpful in terms of establishing the baseline conditions of a European site, in this case the condition assessment is incomplete for the Teesmouth and Cleveland Coast SSSI. The summary data available for the SSSI indicates that 0.77% is in 'favourable' condition, 9.98% is in 'unfavourable declining' condition and 89.25% is 'not recorded'. Two management units are reported to be in 'unfavourable declining' condition due to declining numbers of certain species: unit 8 (Seal Sands) and unit 26 (Bran Sands).

Effects of nitrogen deposition on dune vegetation

4.4 APIS reports that dune systems '*are adapted to low levels of mineral N availability: increasing the availability of N will threaten the competitive balance between species leading to changes in composition and loss of habitat species constants*'. Increased nitrogen levels therefore have the potential to speed up succession between the different dune stages. APIS also notes that '*Nitrogen retention in sand dune soils is poor, due to the low levels of organic matter, so that excess N will be leached* (ten Harkel *et al*., 1998; Hall *et al*., 2011)'. However, it is still possible that sufficient N can be retained to cause adverse effects.

4.5 Research into the effects of nitrogen inputs on dune habitats (Jones *et al*., 2004) found that this resulted in increased marram cover and sward height. Whilst such an effect was noted, the effects were most pronounced where high levels of deposition occurred (annual rates of nitrogen deposition >15kg/N/ha/yr). At lower levels of deposition there was much less variation in vegetation height and cover, i.e., the deleterious effects of nitrogen are most apparent at higher levels of deposition.

Site survey and assessment 2023

4.6 In September 2023 the INCA completed an assessment of the impacts of nitrogen deposition on tern nesting sites in the outer Tees Estuary. The assessment considered three locations where suitable tern nesting habitat may currently be present or may be present in the future following restoration:

- Seaton Snook (NZ537268)
- Seal Sands Peninsula (NZ537262)
- South Gare (NZ558278)

4.7 These locations were selected based on the results of air quality modelling (see below) that indicate that the proposed development may result in increased nitrogen deposition at Seal Sands Peninsula (modelling point TCC14).

4.8 The assessment completed by INCA scoped out common tern as the species has never been known to nest at any of these sites: suitable nesting habitat, such as islands and artificial rafts within lagoons, is absent at these locations.

4.9 INCA reports that no little terns have bred at any of the three sites since 2018, although in 2021 one pair did manage to fledge a single juvenile from a nest on the developing cobble berm immediately south of the North Gare breakwater (at NZ540282). During the five-year period since 2018, the species has abandoned Crimdon Denemouth in favour of the foreshore at Seaton Carew, where in 2021 89 chicks fledged from 91 hatched (Teesmouth Bird Club, 2021).

4.10 In its assessment INCA notes that the extent of suitable nesting habitat is extremely limited at all of the above sites, and that recreational disturbance is an important factor at two of the sites. Predation by both mammals (in particular fox and hedgehog) and birds (especially corvids, raptors and gulls) is also likely to reduce breeding success.

4.11 An assessment of Seaton Snook on 5 September 2023 by INCA found that there has been considerable accretion of sand at this location. The substrate is predominantly sandy, with a minimal shingle component and virtually no cobbles. The distance between the strandline (high water mark) and established dune vegetation is less than 10 m, and as a result the habitat is suboptimal for breeding little terns, which prefer a more heterogenous substrate covering a much larger area above the high-water mark. The assessment found no evidence that nutrient enrichment, such as from nitrogen deposition, is influencing the dune vegetation.

4.12 An assessment of land at South Gare on 1 September 2023 by INCA found that a fenced off area (to encourage little tern nesting) that previously supported a sparsely vegetated area of sand and shingle, has changed as a result of sand accumulation. The shingle has almost entirely been buried by sand and vegetation has established on the accumulated sand, leaving no more than 10% bare sand. The vegetation is typical of establishing dune with species indicative of nutrient enrichment being limited to occasional curled dock *Rumex crispus* and a few individual specimens of thistle *Cirsium* spp.

4.13 INCA reports that the Seal Sands Peninsula is an artificially created spit which separates Seal Sands and Seaton Channel from the River Tees. It is steep-sided throughout and for approximately half of its length it is little more than the width of the access road. The extent of tidal influence means that suitable habitat for nesting terns is extremely limited. The sides of the Peninsula rise steeply precluding nesting by terns. No areas of the shingle/cobble habitat that would be required by nesting little terns is present.

4.14 In summary, the dune habitats at Seaton Snook, South Gare and Seal Sands Peninsula are considered to be unsuitable for nesting terns. This is primarily due to the absence of suitable substrate with wind-blown sand covering significant areas. Whilst dune vegetation has started to develop on the accumulated sand, there is no evidence that vegetation development is being influenced by nitrogen deposition. Recreational disturbance is also an important factor that is likely to limit the suitability of these sites for nesting birds.

Teesmouth and Cleveland Coast SPA / Ramsar: site vulnerabilities

4.15 Known threats and pressures on the SPA (as listed on the JNCC Natura 2000 Data Form) are 'Outdoor sports and leisure activities, recreational activities' (G01), 'Pollution to surface waters (limnic & terrestrial, marine & brackish)' (H01), 'Human induced changes in hydraulic conditions' (J02), 'Industrial or commercial areas' (E02) and 'Fishing and harvesting aquatic resources' (F02). The Site Improvement Plan (Natural England, 2014a) lists the following threats and pressures: physical modification; public access/disturbance; land-take; water pollution; fisheries (commercial and recreational); undergrazing; inappropriate water levels; predation; coastal squeeze; change to site conditions; air pollution (specifically the effects of nitrogen deposition on little tern).

North York Moors SAC / SPA: site condition

4.16 Natural England has not published the results of a comprehensive condition assessment for the SAC but it has published a summary of the 'Monitored features on unit' for the SAC[3], and this provides a summary assessment for each qualifying feature in each management unit within the component SSSI.

4.17 The content of the 'Monitored features on unit' table can be summarised as follows:

- H4010 Northern Atlantic wet heaths with *Erica tetralix* is in 'favourable' condition in management units 19, 39, 98, 99 and 166. The habitat is reported to be in 'unfavourable recovering' condition in all other management units where it occurs, with the exception of management unit 186 where it is in 'unfavourable' condition.
- H4030 European dry heaths is in 'favourable' condition in management units 5, 15, 17, 23, 27, 39, 68, 98, 99, 166 and 187. The habitat is reported to be in 'unfavourable recovering' condition in all other management units where it occurs, with the exception of management units 4, 32, 96 and 186 where it is in 'unfavourable' condition, and management unit 72 where it is in 'unfavourable declining' condition.

[3] 'Monitored features on unit' is published as a summary table that can be accessed at https://designatedsites.naturalengland.org.uk/SiteSACFeaturesMatrix.aspx?SiteCode=UK0030228&SiteName=North%20York%20Moors%20SAC. No information is provided about the data that has informed this assessment and when it was collected.

- H7130 Blanket bog is reported to be in ‘unfavourable recovering’ condition in all management units where it occurs, with the exception of management unit 186 where it is in ‘unfavourable’ condition.

4.18 No condition assessment has been published for the North York Moors SPA (i.e., for the habitats that support the qualifying features – birds). As the SPA shares the same boundary as the SAC, the monitoring data summarised above is considered to apply.

North York Moors SAC / SPA: site vulnerabilities

4.19 Known threats and pressures on the SAC (as listed on the JNCC Natura 2000 Data Form) are ‘Changes in abiotic conditions’ (M01), ‘Air pollution, air-borne pollutants’ (H04), ‘Invasive non-native species’ (I01), ‘Interspecific floral relations’ (K04) and ‘Fire and fire suppression’ (J01).

4.20 Known threats and pressures on the SPA are ‘Invasive non-native species’ (I01), ‘Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)’ (F03), ‘Changes in abiotic conditions’ (M01), ‘Fire and fire suppression’ (J01) and ‘Air pollution, air-borne pollutants’ (H04).

4.21 The Site Improvement Plan (Natural England, 2014b) lists the following threats and pressures for the SAC and SPA: climate change; air pollution (atmospheric nitrogen deposition); disease; invasive species; rotational burning; mineral and waste planning; game management; changes in species distribution; agriculture; energy production; wildfire/arson.

Qualifying Features Present in Vicinity of Proposed Works

4.22 Summary information on the European site qualifying features that have been recorded in the vicinity of the site is presented in a previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020). No ecological survey of the site and the surrounding area has been completed in 2021 due to ongoing remediation work, which has meant that the site could not be accessed. For this reason the original summary information presented in JBA Consulting (2020) is reproduced below.

4.23 ‘*An ecological assessment of the site was undertaken by Hartlepool Borough Council (HBC) in August 2019 and a further assessment was undertaken by HBC and JBA Consulting in November 2019, in which no qualifying species were identified using or flying over the proposed works site (HBC, 2019), however this data is limited due to only two visits being undertaken throughout the year.*

4.24 *A further desk-based assessment was undertaken after the site visit gathering data from the Environmental Records Information Centre North East, Durham Bird Club and Teesmouth Bird Club. The results of the assessment identified no qualifying species within 2 km of the proposed works site most likely due to large areas surrounding the site being inaccessible to the public (including the site itself).*

4.25 *No habitats were recorded on site during the site visit that would be suitable or provide support for foraging or breeding species related to the European designated sites. The area is highly industrial with no suitable habitats or land functionally linked to the European designated sites apparent in the vicinity of the proposed works site*.’

4.26 ‘*Industrial buildings are dominant in the landscape with areas of brownfield present in the gaps where developments have become derelict or been demolished in the past. Mudflats and intertidal substrate foreshores are present within the designated sites around 1.6 km and 1.5 km away respectively from the proposed works site*.’

Habitat sensitivity

4.27 Habitats are sensitive to deposition of pollutants carried in the air, which may result in eutrophication and acidification. Deposition occurs both in the form of dry deposition and wet deposition and the exposure to pollutants through deposition is described with reference to Critical Loads and Critical Levels. Critical loads are defined as (Holman *et al*., 2019):

4.28 "*Deposition flux of an air pollutant below which significant harmful effects on sensitive ecosystems do not occur, according to present knowledge. Usually measured in units of kilograms per hectare per year (kg/ha/yr)*."

4.29 Critical levels are defined as (Holman *et al*., 2019):

4.30 "*The concentration of an air pollutant above which adverse effects on ecosystems may occur based to present knowledge*."

4.31 The critical loads used to assess the impact of compounds deposited to land which result in eutrophication and acidification are expressed in terms of kilograms of the relevant pollutant deposited per hectare per year (for example for nitrogen the unit is kg N/ha/yr) and kilo-equivalents H+ ions deposited per hectare per year (keq/ha/yr).

4.32 The unit of 'equivalent' (eq) is used, rather than a unit of mass, for the purposes of assessing acidification from multiple pollutants. The unit eq. (1 keq ≡ 1,000 eq) refers to molar equivalent of potential acidity resulting from, for example, sulphur, oxidised and reduced N, as well as base cations.

4.33 Critical loads are set by the United Nations Economic Commission for Europe (UNECE) Convention on Long-Range Transboundary Air Pollution. Natural England site-specific critical loads for SPA, SAC and SSSI sites in England are established from The Working Group on Effects of the UNECE Convention on Long Range Transboundary Air Pollution. The information is available via the Air Pollution Information Service (APIS, http://www.apis.ac.uk/) which contains information on applicable critical loads for various habitats and species.

4.34 The critical loads used in this assessment are presented in Table 6 and Table 7. These include a range for each site. The lower end of the range has been used for a conservative assessment.

Table 6*: Nitrogen Nutrient Critical Loads (source: Air Pollution Information Service (APIS)) *denotes priority habitats*

Site	**Habitat / Ecosystem**	**N Critical Load (CL) range (kg N/ha/yr)**
Teesmouth and Cleveland Coast SPA / Ramsar	Shifting coastal dunes*	10-20
	Coastal stable dune grasslands - acid type*	8-10
	Coastal stable dune grasslands - calcareous type*	10-15
	Pioneer, low-mid mid-upper saltmarshes	20-30
North York Moors SPA / SAC	Raised and blanket bogs	5-10
	Northern wet heath: *Erica tetralix* dominated	10-20
	Dry Heaths	10-20

4.35 Natural England has advised (letter received from Nick Lightfoot dated 13 January 2022, reference: DAS A002818 / 371306) that the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), it is more appropriate to adopt a Critical Load range of 10-15 kgN/ha/yr (instead of 8-10 kgN/ha/yr for acid type dunes).

4.36 Information presented on the APIS website indicates that dune habitats are an important habitat as they have the potential to support qualifying features of the Teesmouth and Cleveland Coast SPA / Ramsar. Dunes may potentially be used by breeding tern species; however, these habitats are not likely to be of importance for other SPA / Ramsar qualifying features.

4.37 The information on the Natural England designated sites website[4] provides information on the key breeding grounds of terns. This states that little terns have had breeding sites at Crimdon Denemouth (15 km north of the Site) and more recently at Seaton Carew (7 km north of the Site); common terns have breeding grounds on the coast, beside inland freshwater-bodies (RSPB Saltholme, 4 km north-west of the Site; No. 4 Brinefield south of Greatham Creek, 4.5 km north-west of the Site; and on rafts at Cowpen Marsh, 6 km north-west of the Site, and Portrack Marsh, 7.5 km west of the Site). There are no breeding sites in the immediate vicinity of the Tees Estuary.

4.38 Whilst a Critical Load range of 10-15 kg N/ha/yr has been used for 'Coastal stable dune grasslands - calcareous type', this is a precautionary approach as there is no evidence that this habitat is used by breeding terns in a location where air quality impacts are predicted.

***Table 7**: Acid Deposition Critical Loads for qualifying features (habitats) or habitats that support qualifying features (birds)*

Site	**Habitat**	**Acidity CLminN-CLmaxN (keq /ha/yr)**	**Acidity CLmaxS (keq /ha/yr)**
Teesmouth and Cleveland Coast Ramsar/SPA/SSSI	Acid grassland	MinCLminN: 0.223 | MaxCLminN: 0.438 MinCLMaxN: 1.998 | MaxCLMaxN: 4.508	MinCLMaxS: 1.56 | MaxCLMaxS: 4.07
	Calcareous grassland	MinCLminN: 0.856 |MaxCLminN: 1.071 MinCLMaxN: 4.856 | MaxCLMaxN: 5.071	CLmaxS: 4
North York Moors SPA/SAC	Bogs	MinCLminN: 0.321 | MaxCLminN: 0.321 MinCLMaxN: 0.504 | MaxCLMaxN: 0.705	MinCLMaxS: 0.183 | MaxCLMaxS: 0.384
	Dwarf shrub heath	MinCLminN: 0.499 | MaxCLminN: 1.25 MinCLMaxN: 0.792 | MaxCLMaxN: 4.962	MinCLMaxS: 0.15 |MaxCLMaxS: 4.07

APIS advises that where the total acid nitrogen deposition is greater than the Nmin, the sum of acid nitrogen, sulphur and hydrochloric (and other contributors like hydrofluoric) acid deposition should be compared against the Nmax value

4 https://designatedsites.naturalengland.org.uk/Marine/MarineSiteDetail.aspx?SiteCode=UK9006061&SiteName=teesmouth&SiteNameDisplay=Teesmouth%20and%20Cleveland%20Coast%20SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=7&HasCA=1#SiteInfo

5 Identification of any Likely Significant Effects

The 'Screening' process

5.1 The term 'screening' is routinely adopted to describe the initial stages of the Habitats Regulations Assessment. The purpose of screening is to:

- Identify all aspects of the project that are not likely to have a significant effect on a European site, either alone or in combination with other plans or projects. These can then be screened out from further assessment.
- Identify those aspects of the project where it is likely to have a significant effect on a European site, either alone or in combination with other plans or projects. These aspects will require 'appropriate assessment' and mitigation measures may need to be introduced.

Likely significant effects

5.2 Current guidance defines a 'likely' effect as one that cannot be ruled out on the basis of objective information. In the Waddenzee case the European Court of Justice provides further clarity on this point, advising that a project should be subject to appropriate assessment '*if it cannot be excluded, on the basis of objective information, that it will have a significant effect on the site, either individually or in combination with other plans and projects*'[5]. Therefore, 'likely' should be interpreted as a significant effect that, objectively, cannot be ruled out.

5.3 An effect may be significant if it undermines the conservation objectives for the European site. The assessment of whether a potential effect is significant for the site's interest features must consider, amongst other things, the characteristics and specific environmental conditions of the site concerned. The Advocate General's Opinion for the Sweetman case C-127/02[6] provides further clarification, stating that consideration of the likelihood of a significant effect is simply a case of determining whether the plan or project is capable of having a significant effect.

5.4 As previously noted the judgment CJEU judgment C-323/17 (People Over Wind) means that it is not possible to rely on mitigation measures that allow a conclusion of 'no likely significant effect' to be reached. This judgment has been taken into account in this assessment.

Testing for likely significant effects of the project alone

5.5 The following section of this report presents a screening of likely significant effects. This fulfils the requirement of Regulation 63 of the Habitats Regulations that a proposed project is assessed to determine whether or not it is likely to have a significant effect on the qualifying features (species and habitats) of any European Site, either alone or in combination with other plans or projects.

5.6 As part of the screening process, it is noted that the project is not directly connected with or necessary to the management of any European Site.

5.7 A previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020) included an assessment of likely significant effects for various potential impacts that could arise as a result of the proposed development. The results of this assessment are summarised in Table 8 and the results of the previous assessment have been updated to consider the results of this assessment.

[5] See paragraph 45 of European Court of Justice case C-127/02 dated 7th September 2004, 'the Waddenzee ruling'.

[6] Sweetman v. An Bord Pleanála, Case C-258/11, CJEU judgment 11 April 2013.

***Table 8**: Assessment of likely significant effects (JBA Consulting, 2020)*

Impact	**Rational**
Teesmouth and Cleveland Coast SPA / Ramsar	
Noise/vibration disturbance	Due to the distance of the SPA from the proposed works area (1.6 km and 1.4 km respectively) it is not anticipated that the qualifying features of the SPA will be impacted. No Likely Significant Effect
Visual disturbance	Due to the distance of the SPA from the proposed works area and the roads in the area already being subjected to large volumes of traffic, it is not anticipated that the qualifying features of the SPA will be impacted. No Likely Significant Effect
Introduction of synthetic compounds – Normal operating conditions (Emissions)	The assessment (JBA Consulting, 2020) concluded that the Process Contribution (PC) was 3.3% of the Air Quality Assessment Level (AQAL) and therefore could not be screened out as insignificant. However, baseline annual mean NOx concentrations at the Teesmouth and Cleveland Coast exceeded the critical level regardless of the emissions from the proposed development. The conclusion of this assessment has been applied to the screening of likely significant effects for the proposed development. **Likely Significant Effect**
Introduction of synthetic compounds – Abnormal or emergency operating conditions (Emissions)	Potential releases of synthetic compounds into both the atmosphere and the water environment during abnormal or emergency operating conditions may cause an adverse impact on breeding and foraging bird species. However, baseline annual mean NOx concentrations at the Teesmouth and Cleveland Coast exceed the critical level regardless of the emissions associated with the proposed development. The PC was found to be 3.3% of the AQAL and therefore could not be screened out as insignificant. The conclusion of this assessment has been applied to the screening of likely significant effects for the proposed development. **Likely Significant Effect**
Introduction of non-synthetic compounds – Normal operating conditions	The proposed development site has been subject to remediation, which has now been completed. When this is taken into account alongside statutory facility design requirements, it is highly unlikely that non-synthetic compounds will be released into the water environment during the construction and operation of the facility. No Likely Significant Effect

Impact	Rational
Introduction of non-synthetic compounds – Abnormal or emergency operating conditions	The proposed development site has been subject to extensive remediation, which has now been completed. When this is taken into account alongside statutory facility design requirements, it is highly unlikely that non-synthetic compounds will be released into the water environment during the construction and operation of the facility, including abnormal or emergency operating conditions. It is expected that the facility design shall include backup measures in case of an emergency thereby ensuring that normal operation conditions are achieved. Therefore, potential releases of non-synthetic compounds into both the atmosphere and the water environment are unlikely, and it therefore follows that such releases are unlikely to cause an adverse impact on breeding and foraging bird species. No Likely Significant Effect
Changes in nutrient loading from waste discharge	A range of pollution prevention measures have been incorporated into the design including oil separators, bespoke drainage solutions for oil/chemical delivery and storage areas and an automatic site shut-off valve to allow the site drainage system to be isolated from the receiving watercourse during a potential pollution event (Doran Consulting, 2021). The drainage solution for the oil and ammonia delivery area comprises a dedicated drainage channel/gully system, which isolates the delivery area (tanker parking area) from the adjacent hardstanding drainage system (Doran Consulting, 2021). Surface water collected from this area will drain to a remote below ground storage tank during periods of delivery. The foul water generated from the site will be collected via a proposed foul drainage system and discharged to a pumping station. The pumping station will pump flows to the proposed foul drainage network (Doran Consulting, 2021). Overall, it is concluded that the design for the proposed ERF includes a number of measures that will ensure that pollutants are not released from the site into the local surface water network. Nutrient loading from waste discharge in the watercourse is not anticipated. The proposed facility will not require any such discharges to be made. No Likely Significant Effect

Impact	Rational
Changes in organic loading from waste discharge	A range of pollution prevention measures shall be incorporated including oil separators, bespoke drainage solutions for oil/chemical delivery and storage areas and an automatic site shut-off valve to allow the site drainage system to be isolated from the receiving watercourse during a potential pollution event (Doran Consulting, 2021). The drainage solution for the oil and ammonia delivery area comprises of a dedicated drainage channel/gully system, which isolates the delivery area (tanker parking area) from the adjacent hardstanding drainage system (Doran Consulting, 2021). Surface water collected from this area shall drain to a remote below ground storage tank during periods of delivery. The foul water generated from the site will be collected via a proposed foul drainage system and discharged to a pumping station. The pumping station will pump flows to the proposed foul drainage network (Doran Consulting, 2021). Overall, it is concluded that the design for the proposed ERF includes a number of measures that will ensure that pollutants are not released from the site into the local surface water network. Organic loading from waste discharge in the watercourse is not anticipated. The proposed facility will not require any such discharges to be made. No Likely Significant Effect
Introduction of Invasive Non native Species (INNS)	It is not anticipated that the project will cause the direct spread of INNS to the SPA as site remediation is taking place resulting in the clearance of all vegetation. No INNS have been reported as being present within the site during previous survey (INCA, 2019). No Likely Significant Effect
Air pollution – Construction Activities / Traffic	Elevations in vehicle movements during construction or decommissioning are expected to be temporary. During the operation of the facility, exact levels of traffic movements are unknown; however, no significant effects are considered likely taking into account the already high levels of traffic within the area. Traffic related air pollution it is not expected to cause an adverse impact on breeding and foraging bird species within the sensitive sites. No Likely Significant Effect

Impact	Rational
North York Moors SAC / SPA	
Introduction of synthetic compounds	Due to the distance from the proposed works area[7], any accidental releases of synthetic compounds into the atmosphere are unlikely to cause an adverse impact on the SAC habitats. Modelling shows no significant effects are likely. No Likely Significant Effect
Introduction of non-synthetic compounds	Due to the distance from the proposed works area, any accidental releases of non-synthetic compounds into the atmosphere are unlikely to cause an adverse impact on the SAC habitats. Modelling shows no significant effects are likely. No Likely Significant Effect
Introduction of Invasive Non native Species	It is not anticipated that the project will cause the direct spread of INNS to the SAC / SPA due to the separation distance and the fact that site remediation has resulted in vegetation clearance within the site. No INNS have been reported as being present within the site during previous survey (INCA, 2019). No Likely Significant Effect
Air pollution	Natural England data on impact zones estimates that impacts on the SAC will not occur beyond 5 km. Thus, due to the distance from the proposed works area, air pollution is unlikely to cause an adverse impact on the SAC habitats. Modelling shows no significant effects are likely No Likely Significant Effect

Potential In-combination Effects: local planning

5.8 A previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020) included a review of planning applications that could be viewed via the Redcar and Cleveland Borough Council planning portal (https://planning.redcar-cleveland.gov.uk/) and the Hartlepool Borough Council planning portal (http://eforms.hartlepool.gov.uk/portal/servlets/ApplicationSearchServlet). This review of planning applications has been updated as part of this assessment.

5.9 A total of eight projects have been identified that could potentially act in-combination with the proposed ERF facility. An assessment of these applications is summarised in Table 9.

[7] The site is 1.4 km from the nearest part of the SPA and 1.7 km from the nearest part of the Ramsar site.

***Table 9**: Projects considered as part of the assessment of in-combination effects*

Development type / planning reference	**Assessment**
Power Station Development (R/2018/0098/FF) Approx. 550 m south-east of the Grangetown ERF site.	Examination of aerial imagery (Google Earth Pro) shows that the facility has been constructed. The only in-combination effects anticipated from this project is air pollution (including the introduction of synthetic and non-synthetic compounds into the atmosphere) during the operational stage.
Power Station Development (R/2008/0671/EA) Approx. 1.5 km north of the Grangetown ERF site.	Examination of aerial imagery (Google Earth Pro) shows that the facility has been constructed. The only in-combination effects anticipated from this project is air pollution (including the introduction of synthetic and non-synthetic compounds into the atmosphere) during the operational stage.
Demolition of South Bank Works Temporary Storage Facility (R/2019/0427/FFM) Includes the Grangetown ERF site.	An ecology report (INCA, 2019) concluded that no significant effects were likely on European sites and their qualifying features. Measures are proposed to mitigation pollution related impacts on the Tees Estuary and associated habitats. No in-combination effects are likely.
Train Maintenance and Fuelling Facility (R/2019/0245/SC) Approx. 1.6 km to the north-east of the Grangetown ERF site.	The proposed Maintenance and Fuelling Facility is 2.4 km from the estuary and is separated from the estuary by existing development. Current land use and operational activities lead to the conclusion that the site and adjacent land are unlikely to be functionally linked to a European site. No in-combination effects are likely.
Northern Gateway Container Terminal (R/2006/0433/OO) Approx. 2.0 km to the north-east of the Grangetown ERF site.	The ecological assessments that supported the planning application concluded that no intertidal mudflats would be lost as a result of the development. No significant effects were identified for SPA / Ramsar bird species feeding in the estuary or using the site itself for feeding or roosting. No in-combination effects are likely for disturbance related impacts. In-combination effects on air quality may arise as a result of increased ship movements.
Peak Resources Refinery (R/2017/0876/FFM) Approx. 1.4 km to the east of the Grangetown ERF site	The ES for the development concluded that construction activities on the site are not considered to present a risk of disturbance to species at the SPA / Ramsar. Standard mitigation for the control/avoidance of pollution events would be implemented to prevent potential adverse effects and the site is over 3 km from the SPA / Ramsar. The proposed development was considered to have no significant effects on Teesmouth and Cleveland Coast SPA / Ramsar. No in-combination effects are likely.
Residential Development (R/2014/0372/OOM) Approx. 460 m to the south-west of the Grangetown ERF site	Natural England advised that the proposal is unlikely to have a significant effect on any European site and can therefore be screened out from any requirement for further assessment. They advised that due to the location of the proposed site in relation to the nearest designated sites, together with its setting surrounded by existing residential and industrial development, the proposed site is not likely to have significant value as functional land for SPA interest features. No in-combination effects are likely.

Potential In-combination effects: major infrastructure projects

5.10 A previous HRA that supported Outline planning application reference R/2019/0767/OOM (JBA Consulting, 2020) considered in-combination effects arising from four major infrastructure projects (since JBA Consulting, 2020, was prepared, no new projects have been brought forward in the NSIP decision making process[8]). These are summarised as follows:

Tees Combined Cycle Power Plant (CCPP)

5.11 A gas fired combined cycle gas turbine (or CCGT) power station will be located at the site of the former Teesside Power Station on Greystone Road, Grangetown at OSGR NZ 56642 20384 approximately 2.5 km south-east of the ERF proposed site (https://infrastructure.planninginspectorate.gov.uk/projects/north-east/tees-ccpp/).

5.12 The HRA for this project concluded that there were no likely significant effects on the Teesmouth and Cleveland Coast SPA / Ramsar or the North York Moors SAC / SPA from the proposed development. A Development Consent Order was granted on 05 April 2019 for this project. No in-combination effects are likely.

York Potash Harbour Facilities Order

5.13 This development includes the installation of wharf/jetty facilities, associated dredging operations, and construction of a storage building and connecting conveyor. The development will be located at Bran Sand, Teesport at OSGR NZ 55035 24937 approximately 3.6 km north of the ERF proposed site (https://infrastructure.planninginspectorate.gov.uk/projects/north-east/york-potash-harbour-facilities-order/).

5.14 An 'Appropriate Assessment' has been undertaken because of likely significant effects arising from the proposed development. The applicant's HRA Report concluded that the Harbour Facility application alone, and in-combination with other plans and projects, would not adversely affect the integrity of the Teesmouth and Cleveland Coast SPA and Ramsar sites. Natural England agreed with this conclusion. A Development Consent Order for the York Potash Harbour Facilities Order was granted on 20 July 2016. No in-combination effects are likely.

Teesside Cluster Carbon Capture and Usage project

5.15 A 'full chain' carbon capture, utilisation and storage (CCUS) project, comprising a combined cycle gas turbine electricity generating station, is to be located in the vicinity of the Sahaviriya Steel Industries (SSI) Steel Works Site, Redcar at OSGR NZ 56971 25200 approximately 4.6 km north-east of the ERF proposed site (https://infrastructure.planninginspectorate.gov.uk/projects/northeast/teesside-cluster-carbon-capture-and-usage-project/).

5.16 An HRA has not been completed for this project, but an assessment of impacts on European designated sites is recommended in the Scoping Opinion. As a result it is not possible to predict any likely significant effects on the European designated sites.

Conclusion of screening assessment

5.17 Taking into account the identified impact mechanisms and applying the precautionary principle, it has been assumed that changes in air quality resulting from the proposed development are likely to have a significant effect on some of the qualifying features of the Teesmouth and Cleveland Coast SPA and Ramsar. It therefore follows that the requirement for an 'appropriate assessment' under Regulation 63(5) of the Habitats Regulations is triggered.

5.18 No other likely significant effects have been identified for the development when considered alone and in-combination with other plans and projects and with reference to Teesmouth and Cleveland Coast SPA and Ramsar.

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[8] The PINS NSIP website (https://infrastructure.planninginspectorate.gov.uk/projects/) has been reviewed as part of this assessment and no new projects have been identified in the vicinity of the proposed ERF.

5.19 No likely significant effects have been identified for the development when considered alone and in-combination with other plans and projects and with reference to the North York Moors SAC and SPA. These sites have therefore been screened out of the appropriate assessment.

6 Appropriate Assessment

Scope of the Appropriate Assessment

6.1 The appropriate assessment has been informed by the results of an air quality assessment completed by Environmental Compliance Limited (ECL, 2021). The European sites that have been screened into the appropriate assessment are Teesmouth and Cleveland Coast SPA and Ramsar site.

6.2 The Conservation Objectives for the two European Sites are described in Section 4. The assessment has taken into account the Holohan v An Bord Pleanala ECJ case (C-462/17), which requires that an assessment considers habitats and species, within or outside of a European site boundary, if they are necessary for the conservation of the qualifying features (habitat types and species) of a European site.

Summary of the air quality modelling approach

6.3 An air quality assessment has been carried out by ECL using the latest version of the ADMS modelling package to determine the impact of emissions to air on local European sites, from the proposed ERF's two emission points (referred to as A1, NZ 54379 21412, and A2, NZ 54381 21408). The results presented in the tables below are for a modelled stack height of 90 m for both the A1 and the A2 emission points.

6.4 The assessment was undertaken on the basis of a worst-case scenario, which involves the following assumptions:

- The release concentrations of the pollutants will be at the permitted emission limit values ("ELVs") on a 24 hour basis, 365 days of the year. In practice, when the plant is operating, the release concentrations will be below the ELVs, and, for most pollutants, considerably so. Taking shutdowns for planned maintenance into account, the plant will not operate for 365 days.
- The highest predicted pollutant ground level concentrations ("GLCs") for the six years of meteorological data (five years, 2016 – 2020 inclusive, from the Loftus recording station and one year, 2020, of site-specific numerical weather prediction ("NWP") data) for each averaging period (annual mean, hourly, etc.) have been used.

6.5 The maximum predicted annual mean GLCs of oxides of nitrogen (NOx), sulphur dioxide (SO_2), hydrogen fluoride (HF) and ammonia (NH3) were compared with the Critical Levels for the Protection of Ecosystems or Vegetation detailed in the Environment Agency's online guidance[9].

6.6 Using ADMS, the rates of deposition for acids (nitrogen and sulphur, as kilo-equivalents) and nutrient nitrogen were predicted for all relevant habitat sites. These rates were then compared to the critical loads for the type and location of each habitat (in the interest of being conservative, the habitat with the lowest lower critical load has been selected).

6.7 Modelling points (specific locations shown on Figure 2) were selected to include key sensitive ecological receptors (see Table 13 and associated table notes). Modelling points TCC10 to TCC13 have been included specifically to assess air quality impacts on coastal priority habitats.

6.8 The operating regime for the ERF will be approximately 8,000 hours a year (91%). Due to the Installation being a twin line incinerator, it is considered a rare occurrence when both lines will be non-operational and therefore, not producing its own electricity thereby requiring public supply from the grid. An estimated worst case 10 day shutdown per year is anticipated when both lines will be shutdown. The figure is therefore based on parasitic load including heating, lighting and ventilation when the process is not running. No treatment is taking place within the waste transfer station building and this operation will only be undertaken during process shutdown.

[9] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

Baseline data trends and source attribution (source: APIS)

6.9 Baseline air quality data have been obtained from the APIS website for three locations in the Tees Estuary where sand dune habitat is present. These locations are (see INCA, 2023, for locations and habitat descriptions):

- Seaton Snook
- South Gare
- Seal Sands peninsula (modelling point TCC14 is located on Seal Sands peninsula)

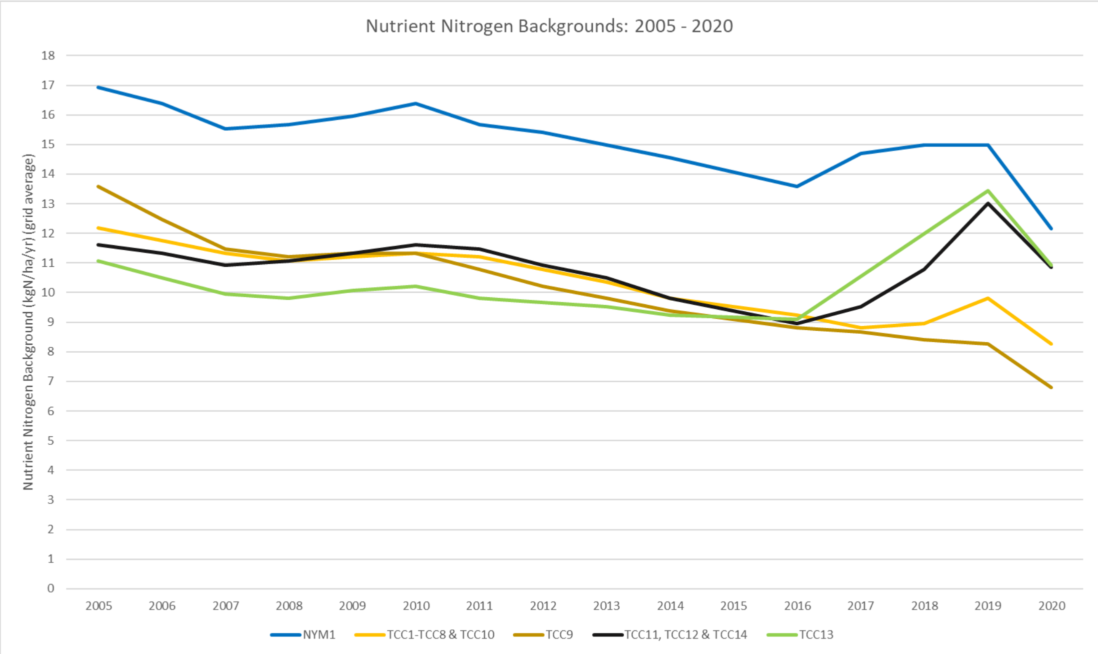
6.10 The APIS website indicates that baseline nitrogen deposition (grid average) at South Gare is 10.1 kgN/ha/yr and at Seaton Snook it is 10.9 kgN/ha/yr, i.e., there is a small exceedance of the lower critical load level for 'Coastal stable dune grasslands -calcareous type'. No data are available for Seal Sands peninsula and so the data for Seaton Snook have been used instead.

6.11 The APIS website indicates that baseline nitrogen oxide levels at South Gare is 17.7 ug/m^3, at Seaton Snook it is 20.6 ug/m^3 and at Seal Sands peninsula it is 20.6 ug/m^3. These baseline values are well below the critical level of 30 ug/m^3 that has been set for vegetation that supports SPA birds.

6.12 The APIS website indicates that baseline ammonia levels at South Gare is 1.3 ug/m^3, at Seaton Snook it is 1.4 ug/m^3 and at Seal Sands peninsula it is 1.4 ug/m^3. These baseline values are well below the critical level of 3 ug/m^3 that has been set for vegetation that supports SPA birds.

6.13 Baseline data for nutrient nitrogen have been obtained from the APIS website for the period 2005 to 2020. Data for the modelling points (TCC1 to TCC14) are presented in Graph 1 below, together with data for the North York Moors SAC / SPA. A gradual downward trend is apparent for all modelling points, although an increase followed by a decline is noted for the period 2016 – 2020. It is not known what caused the increase during this period, and it is not known if the trajectory is for levels to reduce beyond those recorded pre-2016. The data available for 2020 appear to show that the overall downward trend is continuing. The available data do not indicate that nutrient nitrogen levels are increasing.

***Graph 1**: Nutrient nitrogen background levels for the period 2005 – 2020.*



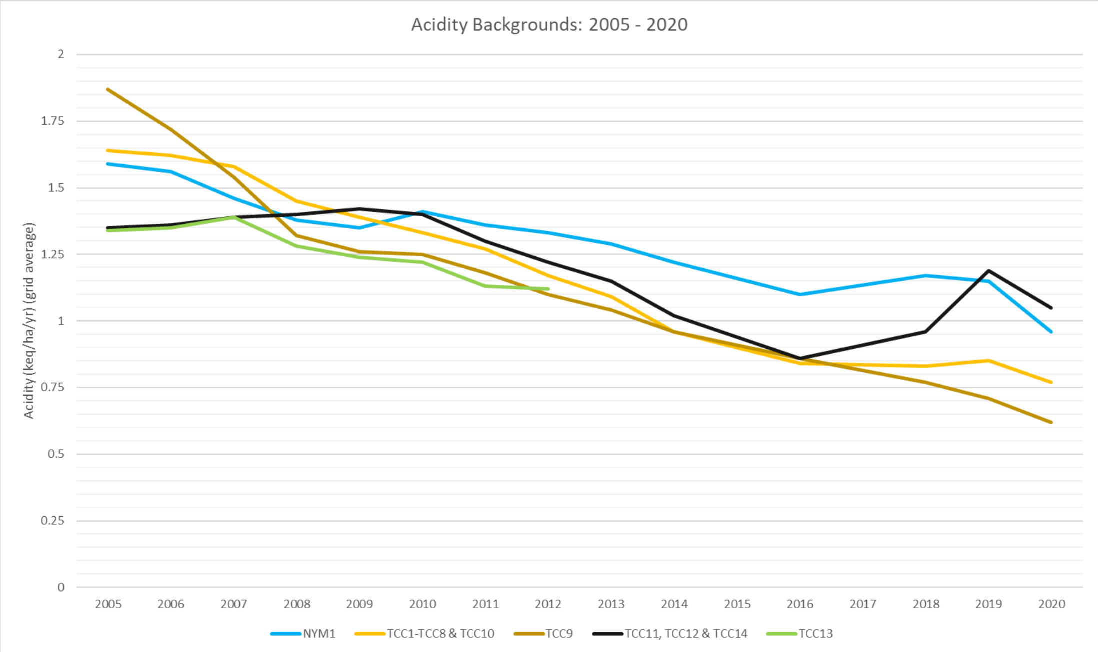
6.14 Detailed grid information available on the APIS website show a declining trend for nitrogen deposition at South Gare: levels decline from 14.69 kgN/ha/yr in 2003 to 12.66 kgN/ha/yr in 2020. This equates to an annual reduction of 0.12 kgN/ha/yr. No trend data are available for Seal Sands peninsula or Seaton Snook (data available for the adjacent grid square show a decline from 14.77 kgN/ha/yr in 2003 to 13.74 kgN/ha/yr in 2020).

6.15 Trend data on the APIS website also show a declining trend for nitrogen oxide from a peak of 33.24 ug/m³ in 2010 to 17.69 ug/m³ in 2020. This equates to an annual reduction of 1.55 ug/m³ per year.

6.16 Trend data on the APIS website for South Gare show an increasing trend for ammonia from a low of 0.85 ug/m³ in 2009 to 1.32 ug/m³ in 2020 (with a peak of 1.46 ug/m³ in 2018). This equates to an annual increase of 0.04 ug/m³ per year. These levels fall well below the critical level of 3 ug/m³ that has been set for vegetation that supports SPA birds. Whilst the trend data show a decline from 2018 to 2020 it is not known if this is likely to be sustained and so an overall increasing trend has been assumed. If an annual increase of 0.04 ug/m³ is assumed to continue, the critical level is not likely to be reached for over 40 years. Whilst it is not possible to predict technological advancement or policy interventions, it is reasonable to assume that ammonia levels are likely to stabilize or reduce over this time period.

6.17 Baseline data for acidity have also been obtained from the APIS website for the period 2005 to 2020. Data for the modelling points (TCC1 to TCC14) are presented in Graph 2 below, together with data for the North York Moors SAC / SPA. A downward trend is apparent for all modelling points, although, as noted above for nutrient nitrogen, an increase followed by a decline is noted for the period 2016 – 2020 for most modelling points. The data available for 2020 appear to show that the overall downward trend is continuing. The available data do not indicate that acidity levels are increasing.

***Graph 2**: Acidity background levels for the period 2005 – 2020.*



6.18 Source attribution data obtained from the APIS website show that the current background levels for nitrogen deposition are derived from a range of area sources rather than point sources. Source attribution is summarized in Table 10 below, which shows that at least 79.6% of current background levels is attributable to the following sources: other transport; livestock; Europe import; international shipping; road transport; fertilizer application. These are all sources that will require Government intervention to promote change through, for example, policy change.

6.19 When considered against the pollutant sources identified in Table 10, the proposed Grangetown ERF will represent a very small contribution to background levels.

6.20 Trend data available on the APIS website (nitrogen deposition sources ranked by total Nitrogen deposition from combined UK sources) show that 'other transport' (see Table 10) is the only source that exhibited an increase between 2012 and 2018. Overall, the trend data show that 63.9% of contributions are exhibiting declining trends: the net change based on the trend data presented in Table 10 is a net reduction of 2.44 KgN/ha/yr.

***Table 10**: Source attribution for nitrogen deposition (sources ranked by total Nitrogen deposition (KgN/ha/yr) from combined UK sources)*

Rank	Source	KgN/ha/yr	%	Trend (2012-2018) KgN/ha/yr
1	Other transport	3.28	20.7	↑ (2.16-3.29)
2	Livestock	3.23	20.4	↓ (4.22-3.24)
3	Europe import	2.01	12.7	↓ (3.51-2.02)
4	International Shipping	1.33	8.4	↓ (1.72-1.34)
5	Road transport	1.17	7.4	↓ (1.55-1.18)
6	Fertiliser application	0.81	5.2	↓ (0.99-0.82)
7	Non-agricultural waste	0.75	4.8	No change (0.76-0.76)
8	Non-agricultural non-abatable	0.75	4.7	↓ (0.88-0.75)
9	Non-agricultural abatable	0.48	3	↓ (0.53-0.48)
10	Others	0.34	2.1	N/A

6.21 Trend data available on the APIS website (local contributions to Nitrogen deposition (KgN/ha/yr) from UK sources) show that six sources exhibited an increase between 2012 and 2018. 'Other transport' was the largest contributor – the remaining five sources increased by less than 0.07 KgN/ha/yr during the period 2012 to 2018: this equates to an annual increase of less than 0.01 kgN/ha/yr. Overall, the trend data show that 44.5% of contributions are from sources exhibiting declining trends and 52.1% of contributions are from sources exhibiting increasing trends (3.3% are from a source when no trend data are available). The net change based on the trend data presented in Table 11 is a net increase of 1.03 KgN/ha/yr.

***Table 11**: Source attribution for nitrogen deposition (Local contributions to Nitrogen deposition (KgN/ha/yr) from sources UK)*

Rank	Source	KgN/ha/yr	%	Trend (2012-2018) KgN/ha/yr
1	Other transport	3.02	31.9	↑ (1.87-3.02)
2	Livestock	2.33	24.6	↓ (2.42-2.33)
3	Others	0.72	7.6	N/A
4	Non-agricultural waste	0.66	6.91	↑ (0.59-0.66)
5	Non-agricultural non-abatable	0.59	6.21	↓ (0.60-0.59)
6	Road transport	0.58	6.11	↓ (0.75-0.58)
7	Fertiliser application	0.54	5.71	↑ (0.51-0.54)
8	Non-agricultural abatable	0.40	4.2	↑ (0.38-0.40)
9	International Shipping	0.32	3.4	↑ (0.29-0.32)
10	Republic of Ireland NH3 sources	0.31	3.3	N/A

6.22 Trend data available on the APIS website (long range contribution to Nitrogen deposition (KgN/ha/yr) from sources UK) show that all listed sources exhibited a decrease between 2012 and 2018. The net change based on the trend data presented in Table 12 is a net reduction of 2.89 KgN/ha/yr.

***Table 12**: Source attribution for nitrogen deposition (long range contribution to Nitrogen deposition (KgN/ha/yr) from sources UK)*

Rank	Source	KgN/ha/yr	%	Trend (2012-2018) KgN/ha/yr
1	Europe import	1.87	29.1	↓ (3.04-1.87)
2	Others	1.48	23.1	N/A
3	International Shipping	1.02	15.9	↓ (1.43-1.02)
4	Livestock	0.91	14.1	↓ (1.8-0.91)
5	Road transport	0.6	9.29	↓ (0.8-0.6)
6	Fertiliser application	0.28	4.4	↓ (0.48-0.28)
7	Other transport	0.27	4.2	↓ (0.29-0.27)

Air quality modelling data

Overview

6.23 The air quality modelling undertaken by ECL considered a number of different ecological receptors, which are listed in Table 13.

6.24 The Critical Loads for deposition that have been used in the assessment are presented in Tables 6 and 7 for each of the ecological receptors (designated sites) that have been considered.

***Table 13**: Ecological Receptors Considered for the Assessment (see Figure 2)*

ECL Receptor Ref.	Name (a)	Designation (a)	Easting (X) (a)	Northing (Y) (a)	Distance from Source (b) (m)	Heading (degrees)
NYM1	North York Moors	SAC, SPA	458895	512978	9565	152
TCC1	Teesmouth and Cleveland Coast (c)	SPA, SSSI	453277	522462	1524	314
TCC2			454760	523212	1842	12
TCC3			454282	523483	2075	357
TCC4			452203	521269	2181	266
TCC5		SPA, Ramsar	453002	522482	1745	308
TCC6			452430	521870	2003	283
TCC7			451970	521355	2410	269
TCC8			454304	524213	2804	358
TCC9			455670	524302	3167	24
TCC10			450882	522960	3825	294
TCC11			453572	525627	4294	349
TCC12			451681	525099	4570	324
TCC13			456614	525978	5085	26
TCC14(d)		SSSI	453880	526160	4776	354

Notes to Table 13
(a) The European sites included were identified using the Multi-Agency Geographic Information System for the Countryside ("MAGIC") portal and via the EA's pre-application advice Nature and Heritage Conservation Screening Report (reference EPR/ZP3309LW/A001).
(b) Distances are measured as the crow flies from the approximate nearest point of the boundary of the ecological receptor / coastal priority habitat location to the 'Source'. The 'Source' is the approximate halfway location between the two emission points associated with the incinerator – location coordinates: 454379 (X), 521410 (Y).
(c) Please note that, as the Teesmouth and Cleveland Coast SPA/Ramsar covers a large area and is broken up into many different segments, depending on the designation and coastal priority habitat, to account for any variations to the predicted PCs with changing meteorological effects – multiple boundary points have been selected in numerous compass directions from the proposed Installation.
(d) For details of TCC14 see Section 6.48 'Revised Modelling'.

Airborne NO_X, SO_2 and NH_3 concentrations

6.25 A summary of site-specific baseline concentrations of NO_X, SO_2 and NH_3, as provided by APIS, is presented in Table 14. In Table 15 background nutrient nitrogen and acid deposition concentrations are provided, as provided by APIS. Background concentrations for each ecological receptor have been obtained at the same point as listed in Table 13, i.e., the closest grid square to the point of the site used in the assessment.

6.26 Comparison of the baseline data presented in Tables 14 and 15 with the Critical Load ranges presented in Tables 6 and 7 reveals that there is already exceedance of the Critical Load for most pollutants when considered in the absence of the proposed development.

***Table 14**: Baseline Concentrations of NOX, SO2 and NH3*

ECL Receptor Reference	Name and Designation(s)	Background Concentration [a]			
		NO_X (µg/m³)		SO_2 (µg/m³)	NH_3 (µg/m³)
		Annual Mean	24 Hour Mean [b]	Annual Mean	Annual Mean
NYM1	North York Moors – SAC, SPA	8.67	10.23	0.91	1.95
TCC1	Teesmouth and Cleveland Coast – SPA, SSSI [c]	25.65	30.27	3.05	1.6
TCC2		35.78	42.22		
TCC3					
TCC4		28.89	34.09		
TCC5	Teesmouth and Cleveland Coast – SPA and Ramsar [c]	25.65	30.27	3.05	1.6
TCC6		28.89	34.09		
TCC7		27.59	32.56		
TCC8		49.1	57.94		
TCC9		27.93	32.96	3.89	1.42
TCC10		21.62	25.51	3.05	1.6
TCC11		41.45	48.91	2.38	1.71
TCC12		19.51	23.02	2.38	1.71
TCC13		21.52	25.39	0 [d]	0.89
TCC14[e]	SSSI	24.14	28.49	2.38	1.71

Notes to Table 14
(a) Background concentrations for the relevant ecological habitats have been taken from the APIS website for the closest grid square to the site (data year: 2017-2019).
(b) The 24-hour mean baseline concentration is twice the annual mean multiplied by a factor of 0.59, in accordance with the H1 guidance.
(c) Please note that, as the Teesmouth and Cleveland Coast SPA/Ramsar covers a large area and is broken up into many different segments, depending on the designation and coastal priority habitat, to account for any variations to the predicted PCs with changing meteorological effects – multiple boundary points have been selected in numerous compass directions from the proposed Installation.
(d) With APIS reporting a concentration of 0 µg/m, it is suspected this value is erroneous. In the interest of being conservative the SO2 value from TCC11 (i.e., the receptor closest in distance to TCC13) of 2.38 µg/m will be used for calculating the SO2 PECs for TCC13.
(e) For details of TCC14 see Section 6.48 'Revised Modelling'.

***Table 15**: Background Nutrient Nitrogen and Acid Deposition*

ECL Receptor Reference	Name and Designation(s)	Nutrient Nitrogen Background (kgN/ha/yr) [(a)]	Acid Deposition Background - (keq/ha/yr) [(b)]		
			Total	Nitrogen	Sulphur
NYM1	North York Moors – SAC, SPA	14.98	1.46	1.36	0.18
TCC1	Teesmouth and Cleveland Coast – SPA, SSSI [(b)]	8.96	1.19	1.03	0.2
TCC2		8.96	1.19	1.03	0.2
TCC3		8.96	1.19	1.03	0.2
TCC4		8.96	1.19	1.03	0.2
TCC5	Teesmouth and Cleveland Coast – SPA and Ramsar [(b]	8.96	1.19	1.03	0.2
TCC6		8.96	1.19	1.03	0.2
TCC7		8.96	1.19	1.03	0.2
TCC8		8.96	1.19	1.03	0.2
TCC9		8.4	1.2	1.01	0.23
TCC10		8.96	1.19	1.03	0.2
TCC11		10.78	1.31	1.07	0.28
TCC12		10.78	1.31	1.07	0.28
TCC13		9.1	0.95	0.75	0.25
TCC14[(d)]	SSSI	10.78	1.31	1.07	0.28

Notes to Table 15
(a) Background concentrations for nutrient nitrogen deposition have been taken from the APIS website (specifically the *APIS GIS map tool*) for the relevant grid square. The concentrations provided are the grid averages, with 2018 selected as the midyear for all sites with the exception of TCC13 (with 2016 being the latest available midyear).
(b) Background concentrations for acid deposition have been taken from the APIS website for the closest grid square to the site (data year: 2017-2019).
(c) Please note that, as the Teesmouth and Cleveland Coast SPA/Ramsar covers a large area and is broken up into many different segments, depending on the designation, to account for any variations to the predicted PCs with changing meteorological effects – multiple boundary points have been selected in numerous compass directions from the proposed Installation.
(d) For details of TCC14 see Section 6.48 'Revised Modelling'.

Deposition parameters - sensitive habitats

6.27 Deposition of nitrogen and acids at European sites was also included in the assessment. The pollutant deposition rates (as detailed in AQTAG06) for grassland were utilised for all European sites considered.

6.28 For acidification impacts, the deposition of oxides of nitrogen, ammonia, sulphur dioxide and hydrogen chloride are considered. For nutrient nitrogen, the deposition of the oxides of nitrogen and ammonia are included.

Table 16: Pollutant Emission Rates – Daily ELVs

Pollutant	ELV [(a)(b)] (mg/Nm^3)	A1 & A2 (g/s)
NOx as NO_2	120	5.06
SO_2	30	1.27
HCl	6	0.253
HF	1	0.0422
NH_3	10	0.422

Notes to Table 16
(a) Concentrations are at reference conditions i.e., 273K, 1 atmosphere, 11% oxygen, dry.
(b) Unless stated otherwise, the BAT-AEL[10]s have been used (new plant, high end).

[10] Best Available Technique – Associated Emission Level

Assessment of significance of impact guidelines – ecological receptors, Critical Levels and/or Loads

6.29 EA Operational Instruction 67_12[11] states that a detailed assessment is required where modelling predicts that the long-term Process Contribution (PC) is greater than 1% for European sites, and the Predicted Environmental Concentration (PEC) is greater than 70% for European sites.

6.30 For short-term emissions, modelling is required at European sites where the PC is greater than 10% of the critical level.

6.31 Following detailed assessment, if the PEC is less than 100% of the appropriate environmental criterion, then it can be assumed there will be no adverse effect for European Sites.

6.32 Information presented on the APIS website for the Teesmouth and Cleveland Coast SPA indicates that Sandwich tern and little tern are the only species that are sensitive to nutrient nitrogen effects on the broad habitat that they rely on. Effects on northern shoveler are considered to be site-specific but they are typically found in greatest numbers in several locations around the North Tees Marshes.

6.33 The broad habitat for shoveler is listed as supralittoral sediment and the relevant nitrogen critical load class is considered for coastal stable dune grasslands. The potential effects on northern shoveler relate to food chain effects with nutrient inputs affecting the freshwater habitats that support the invertebrate/zooplankton that shoveler feed on. Modelling point TCC10 covers freshwater habitats and so the results of modelling at this point have been used to determine whether or not effects on shoveler need to be considered.

6.34 Examination of the coastal priority habitat mapping available on the MAGIC website indicates that dune grassland only occurs along the coast and not at any of the air quality modelling point (it is c.1.8 km north of TCC9). Table 32 shows that intertidal mudflat is the only coastal priority habitat that occurs within the middle and inner estuary (and consequently at or near any of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs.

6.35 Information presented on the APIS website for the SPA indicates that Sandwich tern and little tern are the only species sensitive to NOx effects on the broad habitat (effects on northern shoveler are considered to be site-specific and have not been considered here for the reasons set out previously). The broad habitat is listed as supralittoral sediment. As noted above, examination of the coastal priority habitat mapping available on the MAGIC website indicates that intertidal mudflat is the only coastal priority habitat that occurs within the middle and inner estuary (and consequently at or near any of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs (see Table 32).

6.36 APIS does not provide data for the Ramsar site but as this site is designated for the same bird species as the SPA, it is reasonable to assume that the site should be treated in the same way. The ‘noteworthy’ plant species associated with the Ramsar site are not likely to be associated with intertidal mudflats (and consequently are not likely to occur at any of the air quality modelling locations in the estuary) – they are species that are typically associated with sand dune or saltmarsh or coastal grazing marsh habitats (modelling points have been selected to include locations where these habitats occur).

6.37 Table 17 shows that for NOx exceedance of the long-term PC is predicted at modelling points TCC2 (1.59%), TCC3 (1.003%) and TCC9 (1.28%). The data show that the background levels already exceed the long-term Critical Level in the absence of development. Table 19 similarly shows exceedance of the long-term PC for NH_3 at modelling points TCC2 (1.33%) and TCC9 (1.07%). Table 32 shows that no coastal priority habitats are likely to be affected by NOx, with intertidal mudflats being the only coastal priority habitat near any modelling points. It is therefore concluded that the process contribution is very small in a situation where background levels are already elevated and sensitive habitats are not present at (or near) those modelling points where exceedance is predicted.

[11] EA Operational Instruction 67_12 Detailed assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation, V2, 27.3.15.

6.38 Table 20 shows predicted exceedances for hydrogen fluoride, with exceedance of the 1% threshold possible at all modelling points except TCC11. The predicted exceedance ranges from 1.07% to 3.74%; however, even though hydrogen fluoride exceedance of the 1% threshold is predicted at all but one modelling location, the predicted levels still fall well below the weekly critical level even when current baseline levels are factored in. Reports in the public domain for similar assessments have used the 10% significance criterion for both the weekly and daily hydrogen fluoride PCs (Tim Heard, ECL, pers. comm.). As the guidance is somewhat vague and does not explicitly state whether the weekly CL should be treated as long-term or not, to adopt a conservative approach ECL has assessed the weekly PCs against the stricter 1% screening criterion.

6.39 As noted above, no coastal priority habitats are likely to be affected by hydrogen fluoride, with intertidal mudflats being the only coastal priority habitat near any modelling points.

6.40 Table 21 shows predicted exceedance for nitrogen deposition at modelling points TCC1, TCC2, TCC3, TCC5, TCC6, TCC8, TCC9 and TCC13. Predicted exceedance of the lower CL ranges from 1.23% to 2.62%. Predicted exceedance of the upper CL ranges from 1.03% to 2.10%. The data show that the background levels already exceed the lower CL, i.e., there is exceedance in the absence of development.

Table 18 below shows that there is no predicted exceedance for SO2 at any modelling points. Similarly, Table 22 below shows that there is no predicted exceedance for acid deposition at any modelling points.

***Table 17**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	Long Term PC (μg/m³)	Long Term Critical Level (CL) (μg/m³)	Long Term PC as a % of the CL (μg/m³)	Background (μg/m³)	PEC (μg/m³)	PEC as %age of CL	Short Term PC (μg/m³)	Short Term Critical Level (CL) (μg/m³)	Short Term PC as a % of the CL (μg/m³)
NYM1	North York Moors - SAC / SPA	0.0404	30	0.13%	n/a	n/a	n/a	0.530	75	0.71%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.229		0.76%	n/a	n/a	n/a	4.66		6.21%
TCC2		**0.477**		**1.59%**	35.78	36.26	**121%**	4.04		5.39%
TCC3		**0.301**		**1.003%**		36.08	**120%**	3.60		4.80%
TCC4		0.133		0.44%	n/a	n/a	n/a	2.75		3.67%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.217		0.72%	n/a	n/a	n/a	4.63		6.17%
TCC6		0.228		0.76%	n/a	n/a	n/a	3.36		4.48%
TCC7		0.123		0.41%	n/a	n/a	n/a	2.43		3.24%
TCC8		0.213		0.71%	n/a	n/a	n/a	2.50		3.34%
TCC9		0.383		**1.28%**	27.93	28.31	94%	2.12		2.83%
TCC10		0.119		0.40%	n/a	n/a	n/a	1.64		2.19%
TCC11		0.105		0.35%	n/a	n/a	n/a	1.33		1.77%
TCC12		0.0722		0.24%	n/a	n/a	n/a	1.26		1.68%
TCC13		0.246		0.82%	n/a	n/a	n/a	1.46		1.95%

6.41 A summary of maximum predicted GLCs of oxides of nitrogen at the identified European sites is presented in Table 17. In accordance with the H1 guidance, the significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.42 It can be seen from the data in Table 17 that the daily mean oxides of nitrogen PCs are all less 10% of the respective critical level and therefore, are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered. For the annual mean oxides of nitrogen PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2, TCC3 and TCC9. Consequently, PECs will need to be calculated for these receptors.

6.43 Making use of the relevant background NO_X concentration, the PECs for TCC2, TCC3 and TCC9 are 36.26 μg/m³, 36.08 μg/m³ and 28.31 μg/m³, respectively. The PECs as a percentage of the annual critical level would therefore be 121% (TCC2), 120% (TCC3) and 94% (TCC9). Whilst it can be assumed for TCC9 that there will be no adverse effect (i.e., the PEC is less than 100% of the critical level), the PECs for both TCC2 and TCC3 are potentially significant.

Table 18*: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)
NYM1	North York Moors - SAC / SPA	0.0101	20	0.05%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0574		0.29%
TCC2		0.120		0.60%
TCC3		0.0755		0.38%
TCC4		0.0333		0.17%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0545		0.27%
TCC6		0.0573		0.29%
TCC7		0.0307		0.15%
TCC8		0.0536		0.27%
TCC9		0.0962		0.48%
TCC10		0.0262		0.13%
TCC11		0.0226		0.11%
TCC12		0.0153		0.08%
TCC13		0.0518		0.26%

6.44 A summary of maximum predicted GLCs of sulphur dioxide at the identified European sites are presented in Table 18. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. In Table 18, any significant impacts are highlighted in bold.

6.45 It can be seen from the data in Table 18 that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

***Table 19**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	NH_3 (annual mean) - When Lichens and Bryophytes are not present					
		Long Term PC ($\mu g/m^3$)	**Long Term Critical Level (CL) ($\mu g/m^3$)**	**Long Term PC as a % of the CL ($\mu g/m^3$)**	**Background ($\mu g/m^3$)**	**PEC ($\mu g/m^3$)**	**PEC as %age of CL**
NYM1	North York Moors - SAC / SPA	0.00337	3	0.11%	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0191		0.64%	n/a	n/a	n/a
TCC2		**0.0398**		**1.33%**	1.60	1.64	55%
TCC3		0.0251		0.84%	n/a	n/a	n/a
TCC4		0.0111		0.37%	n/a	n/a	n/a
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0181		0.60%	n/a	n/a	n/a
TCC6		0.0190		0.63%	n/a	n/a	n/a
TCC7		0.0102		0.34%	n/a	n/a	n/a
TCC8		0.0178		0.59%	n/a	n/a	n/a
TCC9		**0.0320**		**1.07%**	1.42	1.45	48%
TCC10		0.00812		0.27%	n/a	n/a	n/a
TCC11		0.00701		0.23%	n/a	n/a	n/a
TCC12		0.00471		0.16%	n/a	n/a	n/a
TCC13		0.0159		0.53%	n/a	n/a	n/a

6.46 A summary of maximum predicted GLCs of ammonia at the identified European sites are presented in Table in 19. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.47 It can be seen from the data in Table 19 that the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the European sites assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2 and TCC9. Consequently, PECs will need to be calculated for these receptors.

6.48 The relevant background NH_3 concentrations for TCC2 and TCC9 are 1.64 $\mu g/m^3$ and 1.45 $\mu g/m^3$, respectively. The PECs as a percentage of the annual critical level would therefore be 55% (TCC2) and 48% (TCC9). It can therefore be assumed that there will be no adverse effect on the European sites assessed (i.e., the PECs are less than 100% of the critical level).

***Table 20**: Comparison of Maximum Predicted HF PCs with Critical Levels at European Sites*

ECL Receptor Ref.	Receptor Name	Weekly PC (µg/m³)	Weekly Critical Level (CL) (µg/m³)	Weekly PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL	Daily PC (µg/m³)	Daily Critical Level (CL) (µg/m³)	Daily PC as a % of the CL (µg/m³)
NYM1	North York Moors - SAC / SPA	0.00238	0.5	0.48%	n/a	n/a	n/a	0.00442	5	0.09%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	**0.0146**		**2.92%**	0.003*	0.02	4%	0.0389		0.78%
TCC2		**0.0187**		**3.74%**		0.02	4%	0.0337		0.67%
TCC3		**0.0120**		**2.40%**		0.02	3%	0.0300		0.60%
TCC4		**0.0118**		**2.37%**		0.01	3%	0.0229		0.46%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	**0.0149**		**2.98%**		0.02	4%	0.0386		0.77%
TCC6		**0.0145**		**2.90%**		0.02	4%	0.0280		0.56%
TCC7		**0.0104**		**2.07%**		0.01	3%	0.0203		0.41%
TCC8		**0.00864**		**1.73%**		0.01	2%	0.0209		0.42%
TCC9		**0.00808**		**1.62%**		0.01	2%	0.0177		0.35%
TCC10		**0.00651**		**1.30%**		0.01	2%	0.0140		0.28%
TCC11		0.00452		0.90%	n/a	n/a	n/a	0.0115		0.23%
TCC12		**0.00514**		**1.03%**	0.003*	0.01	2%	0.0106		0.21%
TCC13		**0.00533**		**1.07%**		0.01	2%	0.0126		0.25%

Notes to Table 20

*Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005µg/m³ with an elevated background of 0.003µg/m³ where there are local anthropogenic emission sources (12).

6.49 A summary of maximum predicted GLCs of hydrogen fluoride at the identified European sites are presented in Table 20. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.50 It can be seen from the data in Table 20 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

(12) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

6.51 For the weekly mean HF PCs, a conservative approach has been taken and the significance of impacts have been assessed against the 1% criterion for long-term predictions. Consequently, the weekly average HF PCs are greater than 1% of the critical level for TCC1-TCC10 (inclusive) and TCC12 and TCC13 - and are therefore potentially significant. NYM1 and TCC11 are less than 1% of the critical level therefore no further assessment is required.

6.52 For the ecological receptors with PCs that are potentially significant PECs will need to be calculated. Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005 µg/m^3 with an elevated background of 0.003 µg/m^3 where there are local anthropogenic emission sources (13). In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m^3) will be used for the purposes of calculating the PECs.

6.53 The maximum weekly HF PC occurs at TCC2 and therefore the worst-case PEC would be 0.0217 µg/m^3 (or 4.34% of the weekly critical level). It can therefore be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level). Consequently, the same can be concluded for all other locations considered.

(13) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

***Table 21**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at European Sites*

ECL Receptor Ref.	Description	Habitat Type	Nitrogen Deposition Rate (kgN/Ha/yr)	Lower Critical Load (kgN/Ha/yr)	Upper Critical Load (kgN/Ha/yr)	PC as a Percentage of Lower Critical Load	PC as a Percentage of Upper Critical Load	Background (kgNha/yr)	PEC (kgN/ ha/yr)	PEC as %age of Lower Critical Load	PEC as %age of Upper Critical Load
NYM1	North York Moors - SAC	Blanket Bogs - Raised and blanket bogs	0.0153	5	10	0.31%	0.15%	n/a	n/a	n/a	n/a
	North York Moors - SPA	European Golden Plover - Reproducing - Montane habitats	0.0153	5	10	0.31%	0.15%	n/a	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA	Sandwich Tern - Concentration - Supralittoral sediment - Coastal stable dune grasslands (acid type)	0.106	10	15	**1.06%**	0.71%	8.96	9.07	91%	60%
TCC2			0.202			**2.02%**	**1.35%**		9.16	92%	61%
TCC3			0.138			**1.38%**	0.92%		9.10	91%	61%
TCC4			0.0631			0.63%	0.42%	n/a	n/a	n/a	n/a
TCC1 - TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal	N/A								
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	Sandwich Tern / Little Tern - Supralittoral sediment (acidic type)	0.0995	10	15	0.99%	0.66%	8.96	9.06	n/a	n/a
TCC6			0.107			**1.07%**	0.71%		9.07	91%	60%
TCC7			0.0578			0.58%	0.39%	n/a	n/a	n/a	n/a
TCC8			0.0945			0.95%	0.63%	8.96	9.06	n/a	n/a
TCC9			0.168			**1.68%**	**1.12%**	8.4	8.57	86%	57%
TCC10			0.0522			0.52%	0.35%	n/a	n/a	n/a	n/a
TCC11			0.0453			0.45%	0.30%	n/a	n/a	n/a	n/a
TCC12			0.0306			0.31%	0.20%	n/a	n/a	n/a	n/a
TCC13			0.103			**1.03%**	0.69%	9.1	9.21	92%	61%
TCC14		Coastal stable dune grasslands (calcareous type)	0.0432	10	15	0.43%	0.29%	n/a	n/a	n/a	n/a

6.54 A summary of maximum predicted nutrient nitrogen deposition rates at the identified European Sites and SSSIs are presented in Table 21. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 4.24, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

6.55 In Table 21, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.56 It can be seen from the data in Table 21 that there are predicted exceedances for nitrogen deposition at a number of modelling points, although this is based on the more cautious assessment for Coastal stable dune grasslands (acid type). When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is only exceedance of the lower Critical Load at modelling points TCC1, TCC2, TCC3, TCC5, TCC6, TCC9 and TCC 13. There is only exceedance of the upper Critical Load at modelling points TCC2 and TCC9. Using the more conservative Critical Load range there are no PECs greater than 100%.

6.57 It should be noted that, as APIS does not provide data for Ramsar sites, as the Ramsar site is noted for the same bird species as the SPA, it is reasonable to assume that the site should be treated in the same way. Consequently, the SPA habitat interest and feature with the lowest lower critical load assigned to it has also been selected for the Ramsar site considered.

6.58 It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

***Table 22**: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at European Sites*

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CLMaxN (keq/ha/yr)	CLMaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
NYM1	North York Moors – SAC (Blanket Bogs – Raised and blanket bogs)	0.00109	1.36	0.00119	0.18	0.321	0.504	0.183	1.36	0.181	0.46%	n/a	n/a
	North York Moors – SPA (European Golden Plover – Reproducing – Montane habitats)	0.00109	1.36	0.00119	0.18	0.178	0.471	0.150	1.36	0.181	0.48%	n/a	n/a
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	0.00754	1.03	0.00833	0.20	0.856	4.856	4.00	1.04	0.208	0.33%	n/a	n/a
TCC2		0.0157	1.03	0.0173	0.20	0.856	4.856	4.00	1.05	0.217	0.68%	n/a	n/a
TCC3		0.00984	1.03	0.0109	0.20	0.856	4.856	4.00	1.04	0.211	0.43%	n/a	n/a
TCC4		0.00449	1.03	0.00495	0.20	0.856	4.856	4.00	1.03	0.205	0.19%	n/a	n/a

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal											
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.00708	1.03	0.00783	0.20	0.856	4.856	4.00	1.04	0.208	0.31%	n/a	n/a
TCC6		0.00759	1.03	0.00838	0.20	0.856	4.856	4.00	1.04	0.208	0.33%	n/a	n/a
TCC7		0.00411	1.03	0.00453	0.20	0.856	4.856	4.00	1.03	0.205	0.18%	n/a	n/a
TCC8		0.00673	1.03	0.00742	0.20	0.856	4.856	4.00	1.04	0.207	0.29%	n/a	n/a
TCC9		0.0120	1.01	0.0132	0.23	0.856	4.856	4.00	1.02	0.243	0.52%	n/a	n/a
TCC 10		0.00372	1.03	0.00411	0.20	0.856	4.856	4.00	1.03	0.204	0.16%	n/a	n/a
TCC 11		0.00322	1.07	0.00354	0.28	0.856	4.856	4.00	1.07	0.284	0.14%	n/a	n/a
TCC 12		0.00218	1.07	0.00239	0.28	0.856	4.856	4.00	1.07	0.282	0.09%	n/a	n/a
TCC 13		0.00734	0.75	0.00808	0.25	0.856	4.856	4.00	0.758	0.258	0.20%	n/a	n/a

<u>Notes to Table 22</u>

PC N = Process contribution from nitrogen and ammonia (dry deposition only)

PC S = Process contribution from sulphur (dry deposition) and hydrogen chloride (wet and dry deposition)

PEC = Predicted environmental concentration

BG = Background concentration

CL = Critical Load

6.59 A summary of maximum predicted acid deposition rates at the identified European Sites and SSSIs are presented in Table 22, with the deposition velocities for grassland utilised for all European sites assessed.

6.60 In Table 22, any PCs greater than 1% of the critical load, and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.61 It can be seen from the data in Table 22 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC2, TCC3 and TCC9.

6.62 Following the calculation of the PECs, for the modelled points with potentially significant PCs on acid deposition rates, it can be seen from the data in Table 22 that the PECs are all less than 100% of the critical load (i.e., for TCC2, TCC3 and TCC9). It can therefore be assumed that there will be no adverse effects on these sites.

Revised Modelling

6.63 In January 2022 ECL repeated the modelling work for the proposed ERF using different input parameters (ECL, 2022). This was in response to a decision by FCC Environment to design, build and operate the ERF based on these new parameters. Specifically the revised modelling was based on an Emissions Limit Value (ELV) for NOx of 100 mg/Nm^3 (reduced from an ELV for NOx of 120 mg/Nm^3 – see Table 16).

6.64 In addition, a new modelling point – TCC14 – was added (OSGR NZ 53880 26160). This modelling point is located within the SSSI immediately to the north of modelling point TCC11: it covers a location where saltmarsh and sand dune is present.

6.65 The revised modelling shows a slight reduction in the PCs for the scenarios where the NH_3 is at the BAT-AEL. For the scenarios where the NH_3 emission rate (at the HZI confirmed normal operating scenario concentration of 3.5 mg/Nm^3) a slight increase is observed due to the lowering of the NO_X from 120 mg/Nm^3 to 100mg/Nm^3. Overall the results are fairly similar to the previous results discussed earlier in this report. For the modelled point TCC14 it displays similar PCs to that of the nearby TCC11: the PCs are slightly greater at TCC11 with the ERF modelled in isolation and are greater at TCC14 for the cumulative scenario.

6.66 The SO_2, NH_3 and HF results presented in the 2022 ECL report did not change with the NOX ELV reduction (from 120 mg/Nm^3 to 100 mg/Nm^3) and therefore the results are the same as presented in Tables 18 to 20 of this report.

6.67 The revised modelling data (Table 27 in ECL, 2022) show that there are predicted exceedances for Nitrogen deposition at modelling points TCC1, TCC2, TCC3, TCC6, TCC9 and TCC13, with the remaining sites screening out as insignificant. At these modelling locations the lower Critical Load is exceeded for Coastal stable dune grasslands (calcareous type) (i.e., a Critical Load range of 10-15 kgN/ha/yr). However, the upper Critical Load is only exceeded at TCC2 and TCC9, both locations only supporting mudflat habitats. The PECs have been calculated for the modelling points where exceedance is identified and all are less than 100% of the critical level. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

6.68 The revised modelling data (Table 28 in ECL, 2022) show that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC2, TCC3 and TCC9. Following the calculation of the PECs for the modelled points with potentially significant PCs on acid deposition rates, all PECs are less than 100% of the critical load (i.e., for TCC2, TCC3 and TCC9). It can therefore be assumed that there will be no adverse effects on these sites.

In-combination assessment

6.69 ECL has carried out a cumulative assessment, the methods and detailed results being presented in a separate report (ECL, 2022).

6.70 In addition to the effect of the proposed ERF, there are several other developments in the surrounding area which may have an effect on ecological receptors when considered in combination. Existing emissions within the area are considered to already be accounted for in background air quality data.

6.71 The developments that ECL were aware of (at time of writing), but which have been excluded from the assessment are as follows:

- Potential new Energy from Waste ("EfW") site opening in 2026 at the former SSI steelworks site, which is situated approximately 1.6 km east-north-east from the proposed FCC Installation. This information was obtained from pre-release statements only and no further data are available: consequently this development has not been considered.
- Dockside Road (1) and Dockside Road (2) Teeside Renewable Energy Centre, operated by PD Ports, is expected to be operational within the next few years. Situated approximately 1.7 km to the west of the proposed development, this information was obtained from pre-release statements only and no further data are available: consequently this development has not been considered.
- Wilton 11 EfW, operated by Suez / Sembcorp is situated approximately 2.1 km east from the proposed development. Despite being operational since around 2018, no data are publicly available in relation to the input data required to model the site. An information request has been sent by ECL to the EA; however, at time of writing no suitable data were available.
- Haverton Hill household waste recycling centre and North East Energy Recovery Centre, both operated by Suez, are located approximately 6.5 km to the west from the proposed development. It is considered by ECL, given their distance from the proposed development, that it will not be necessary to include them in the cumulative assessment.
- Tees Eco Energy, which is currently proposed (planning and permitting granted). This site is situated approximately 6.7 km to the west from the proposed development. It is considered, given the distance of Tees Eco Energy from the proposed development, that it will not be necessary to be include it in the cumulative assessment.

6.72 The development that has been included in the cumulative assessment is the Redcar Energy Centre ("REC"). The REC will be situated at land formerly occupied by Redcar Bulk Terminal (approximately 4.8 km to the north of the proposed development) and is due to be commissioned circa 2024 to 2025. Consequently, the emissions arising from the two stacks associated with its two process lines have been incorporated into the cumulative impact assessment undertaken as part of this study. This has been carried out making use of the emissions data disclosed in the air quality chapter submitted as part of the planning application documentation for REC[14].

[14] Planning Application Reference Number: R/2020/0411/FFM. Available online via: https://planning.redcar-cleveland.gov.uk/Planning/Display?applicationNumber=R%2F2020%2F0411%2FFFM

***Table 23**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL	Short Term PC (µg/m³)	ShortTerm Critical Level (CL) (µg/m³)	Short Term PC as a % of the CL (µg/m³)
NYM1	North York Moors - SAC / SPA	0.0654	30	0.22%	n/a	n/a	n/a	0.696	75	0.93%
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.295		0.98%	n/a	n/a	n/a	4.68		6.24%
TCC2		**0.662**		**2.21%**	35.780	36.44	**121%**	4.06		5.42%
TCC3		**0.433**		**1.44%**		36.21	**121%**	3.60		4.81%
TCC4		0.183		0.61%	n/a	n/a	n/a	2.75		3.66%
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.276		0.92%	n/a	n/a	n/a	4.64		6.18%
TCC6		0.279		0.93%	n/a	n/a	n/a	3.37		4.49%
TCC7		0.172		0.57%	n/a	n/a	n/a	2.43		3.24%
TCC8		**0.396**		**1.32%**	49.10	49.50	**165%**	3.35		4.47%
TCC9		**0.674**		**2.25%**	27.930	28.60	95%	6.05		8.07%
TCC10		0.159		0.53%	n/a	n/a	n/a	1.69		2.26%
TCC11		0.253		0.84%	n/a	n/a	n/a	4.29		5.72%
TCC12		0.145		0.48%	n/a	n/a	n/a	2.01		2.68%
TCC13		**0.861**		**2.87%**	21.52	22.38	75%	5.18		6.91%

6.73 A summary of maximum predicted GLCs of oxides of nitrogen at the identified European sites is presented in Table 23. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.74 It can be seen from the data in Table 23 that the daily mean oxides of nitrogen PCs are all less than 10% of the respective critical level and therefore, are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

6.75 For the annual mean oxides of nitrogen PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2, TCC3, TCC8, TCC9 and TCC13. Consequently, the PECs have been calculated for these receptors.

6.76 Using the background NO_X concentrations the PEC assessment for TCC2, TCC3, TCC8, TCC9 and TCC13 is shown in Table 23.

6.77 It can be seen from the results in Table 23, that whilst it can be assumed for TCC9 and TCC13 that there will be no adverse effect (i.e., the PECs are less than 100% of the critical level), the PECs for TCC2, TCC3 and TCC8 are potentially significant.

6.78 The data show that the ambient background levels at TCC2, TCC3 and TCC8 already exceed the long-term critical level in the absence of the development (i.e., a concentration that is 119% of the critical level at TCC2 and TCC3 and a concentration that is 164% of the critical at TCC8).

6.79 The results of revised modelling carried out by ECL in 2022 (Table 43 in ECL, 2022) show that no adverse effect can be assumed for TCC9, TCC13 and TCC14 (i.e., the PECs are less than 100% of the critical level); however, the PECs for TCC2, TCC3 and TCC8 are potentially significant (as the PECs are 121%, 121% and 165% respectively). The data show that the ambient background levels at TCC2, TCC3 and TCC8 already exceed the long-term critical level in the absence of the development (i.e., a concentration that is 119% of the critical level at TCC2 and TCC3 and a concentration that is 164% of the critical at TCC8).

***Table 24**: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL
NYM1	North York Moors - SAC / SPA	0.0164	20	0.08%	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0739		0.37%	n/a	n/a	n/a
TCC2		0.166		0.83%	n/a	n/a	n/a
TCC3		0.109		0.54%	n/a	n/a	n/a
TCC4		0.0460		0.23%	n/a	n/a	n/a
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0691		0.35%	n/a	n/a	n/a
TCC6		0.0699		0.35%	n/a	n/a	n/a
TCC7		0.0430		0.22%	n/a	n/a	n/a
TCC8		0.0991		0.50%	n/a	n/a	n/a
TCC9		0.169		0.84%	n/a	n/a	n/a
TCC10		0.0399		0.20%	n/a	n/a	n/a
TCC11		0.0634		0.32%	n/a	n/a	n/a
TCC12		0.0362		0.18%	n/a	n/a	n/a
TCC13		**0.215**		**1.08%**	2.38	2.60	13%

6.80 A summary of maximum predicted GLCs of sulphur dioxide at the identified European sites are presented in Table 24. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.81 It can be seen from the data in Table 24 that, with the exception of TCC13, the annual mean sulphur dioxide PCs are all less than 1% of the critical levels and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

6.82 For the annual mean sulphur dioxide PCs, the impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC13. It should be noted that the latest background SO_2 concentration at TCC13, as reported by APIS, is 0 µg/m³. However, it is suspected this value is erroneous and in the interest of being conservative the SO_2 value from TCC11 (i.e., the receptor closest in distance to TCC13) of 2.38 µg/m³ has been used for calculating the SO_2 PEC for TCC13.

6.83 Consequently, with a PEC of 2.60 µg/m³ (or 13% of the critical level) at TCC13, it can be assumed there will be no adverse effect (i.e., the PEC is less than 100% of the critical level). The revised modelling data from 2022 show a similar result (ECL, 2022).

Table 25: *Comparison of Maximum Predicted NH_3 PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	NH_3 (annual mean) - When Lichens and Bryophytes are NOT present					
		Long Term PC ($\mu g/m^3$)	**Long Term Critical Level (CL) ($\mu g/m^3$)**	**Long Term PC as a % of the CL ($\mu g/m^3$)**	**Background ($\mu g/m^3$)**	**PEC ($\mu g/m^3$)**	**PEC as %age of CL**
NYM1	North York Moors - SAC / SPA	0.00545	3	0.18%	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	0.0246		0.82%	n/a	n/a	n/a
TCC2		**0.0552**		**1.84%**	1.60	1.66	55%
TCC3		**0.0361**		**1.20%**	1.60	1.64	55%
TCC4		0.0153		0.51%	n/a	n/a	n/a
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	0.0230		0.77%	n/a	n/a	n/a
TCC6		0.0232		0.77%	n/a	n/a	n/a
TCC7		0.0143		0.48%	n/a	n/a	n/a
TCC8		**0.0330**		**1.10%**	1.60	1.63	54%
TCC9		**0.0561**		**1.87%**	1.42	1.48	49%
TCC10		0.0133		0.44%	n/a	n/a	n/a
TCC11		0.0211		0.70%	n/a	n/a	n/a
TCC12		0.0121		0.40%	n/a	n/a	n/a
TCC13		**0.0717**		**2.39%**	0.89	0.962	32%

6.84 A summary of maximum predicted GLCs of ammonia at the identified European sites are presented in Table 25. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.85 It can be seen from the data in Table 25 that the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the European sites assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC2, TCC3, TCC8, TCC9 and TCC13. Consequently, PECs will need to be calculated for these receptors.

6.86 Using the relevant background NH_3 concentrations, the PEC assessment for TCC2, TCC3, TCC8, TCC9 and TCC13 is shown in Table 26. As displayed by the results in Table 25 it can be assumed that there will be no adverse effect on the European sites assessed (i.e., the PECs are all less than 100% of the critical level).

6.87 The revised modelling data from 2022 show a similar result (ECL, 2022 – Tables 45 and 46). For all modelling points it can be assumed that there will be no adverse effect on the ecological sites assessed (i.e., the PECs are all less than 100% of the critical level).

Table 26*: Comparison of Maximum Predicted HF PCs with Critical Levels at European Sites – In-combination*

ECL Receptor Ref.	Receptor Name	Weekly PC (µg/m³)	Weekly Critical Level (CL) (µg/m³)	Weekly PC as a % of the CL (µg/m³)	Background (µg/m³)	PEC (µg/m³)	PEC as %age of CL	Daily PC (µg/m³)
NYM1	North York Moors - SAC / SPA	0.00383	0.5	0.77%	n/a	n/a	n/a	0.00579
TCC1	Teesmouth and Cleveland Coast - SPA (+ SSSI)	**0.0146**		**2.92%**	0.003 *	0.0176	3.52%	0.0390
TCC2		**0.0186**		**3.73%**		0.0216	4.33%	0.0339
TCC3		**0.0121**		**2.42%**		0.0151	3.02%	0.0301
TCC4		**0.0120**		**2.41%**		0.0150	3.01%	0.0229
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	**0.0150**		**3.00%**		0.0180	3.60%	0.0387
TCC6		**0.0148**		**2.95%**		0.0178	3.55%	0.0281
TCC7		**0.0107**		**2.13%**		0.0137	2.73%	0.0203
TCC8		**0.0133**		**2.66%**		0.0163	3.26%	0.0277
TCC9		**0.0177**		**3.55%**		0.0207	4.15%	0.0500
TCC10		**0.00656**		**1.31%**		0.00956	1.91%	0.0141
TCC11		**0.0135**		**2.70%**		0.0165	3.30%	0.0355
TCC12		**0.00769**		**1.54%**		0.0107	2.14%	0.0166
TCC13		**0.0177**		**3.55%**		0.0207	4.15%	0.0428

Notes to Table 26

*Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005µg/m³ with an elevated background of 0.003µg/m³ where there are local anthropogenic emission sources (15).

6.88 A summary of maximum predicted GLCs of hydrogen fluoride at the identified European sites are presented in Table 26. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for SPAs, SACs, Ramsars and SSSIs. Any significant impacts are highlighted in bold.

6.89 It can be seen from the data in Table 26 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all SACs, SPAs, SSSIs and Ramsar sites considered.

(15) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

6.90 For the weekly mean HF PCs, a conservative approach has been taken and the significance of impacts have been assessed against the 1% criterion for long-term predictions. Consequently, the weekly average HF PCs are greater than 1% of the critical level for TCC1- TCC13, inclusive, and are therefore potentially significant. For NYM1 the long-term significance criteria has not been exceeded (being less than 1% of the critical level).

6.91 For the ecological receptors with PCs that are potentially significant PECs will need to be calculated. Monitoring of ambient levels of HF is not currently carried out in the UK. A modelling study has suggested a natural background concentration of 0.0005 µg/m^3 with an elevated background of 0.003 µg/m^3 where there are local anthropogenic emission sources (16). In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m^3) will be used for the purposes of calculating the PECs.

6.92 The maximum weekly HF PC occurs at TCC2 and therefore the worst-case PEC would be 0.0216 µg/m^3 (or 4.33% of the weekly critical level). It can therefore be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

6.93 The revised modelling data from 2022 show a similar result (ECL, 2022). As above, it can be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

(16) EPAQS (February 2006), Guidelines for Halogen and Hydrogen Halides in Ambient Air for Protecting Human Health Against Acute Irritancy Effects

***Table 27**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at European Sites – In-combination*

ECL Receptor Ref.	Description	Habitat Type	Nitrogen Deposition Rate (kgN/Ha/yr)	Lower Critical Load (kgN/Ha/yr)	Upper Critical Load (kgN/Ha/yr)	PC as a Percentage of Lower Critical Load	PC as a Percentage of Upper Critical Load	Background (kgNha/yr)	PEC (kgN/ha/yr)	PEC as %age of Lower Critical Load	PEC as %age of Upper Critic al Load
NYM1	North York Moors - SAC	Blanket Bogs - Raised and blanket bogs	0.0248	5	10	0.50%	0.25%	n/a	n/a	n/a	n/a
	North York Moors - SPA	European Golden Plover - Reproducing - Montane habitats	0.0248	5	10	0.50%	0.25%	n/a	n/a	n/a	n/a
TCC1	Teesmouth and Cleveland Coast - SPA	Sandwich Tern - Concentration - Supralittoral sediment - Coastal stable dune grasslands (acid type)	0.135	10	15	**1.35%**	0.90%	8.96	9.09	91%	n/a
TCC2			0.280			**2.80%**	**1.86%**		9.24	92%	62%
TCC3			0.197			**1.97%**	**1.31%**		9.16	92%	61%
TCC4			0.0835			0.83%	0.56%		n/a	n/a	n/a
TCC1 - TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal	N/A								
TCC5	Teesmouth and Cleveland Coast - SPA / Ramsar	Sandwich Tern / Little Tern - Supralittoral sediment (acidic type)	0.125	10	15	**1.25%**	0.83%	8.96	9.09	91%	61%
TCC6			0.128			**1.28%**	0.85%		9.09	91%	61%
TCC7			0.0776			0.78%	0.52%		n/a	n/a	n/a
TCC8			0.180			**1.80%**	**1.20%**		9.14	91%	61%
TCC9			0.308			**3.08%**	**2.05%**	8.4	8.71	87%	58%
TCC10			0.0668			0.67%	0.45%	n/a	n/a	n/a	n/a
TCC11			0.117			**1.17%**	0.78%	10.78	10.90	**109%**	73%
TCC12			0.0618			0.62%	0.41%	n/a	n/a	n/a	n/a
TCC13			0.418			**4.18%**	**2.79%**	9.1	9.52	95%	63%
TCC14		Coastal stable dune grasslands (calcareous type)	0.151	10	15	**1.51%**	**1.01%**	10.78	10.93	**109%**	73%

6.94 A summary of maximum predicted nutrient nitrogen deposition rates at the identified European Sites and SSSIs are presented in Table 27. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 4.24, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

6.95 In Table 27, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.96 It can be seen from the data in Table 27 that there are predicted exceedances for nitrogen deposition at a number of modelling points, although this is based on the more cautious assessment for Coastal stable dune grasslands (acid type). When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is exceedance of the lower Critical Load at all modelling points except TCC4, TCC7, TCC10 and TCC 12. There is only exceedance of the upper Critical Load at modelling points TCC2, TCC3, TCC8, TCC9 and TCC13. Using the more conservative Critical Load range there are no PECs greater than 100% except at TCC11 (109%).

6.97 It should be noted that, as APIS does not provide data for Ramsar sites, as the Ramsar site is noted for the same bird species as the SPA, it is reasonable to assume that the site should be treated in the same way. Consequently, the SPA habitat interest and feature with the lowest lower critical load assigned to it has also been selected for the Ramsar site considered.

6.98 It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

6.99 The revised modelling completed in 2022 shows similar results (Table 48 in ECL, 2022). There are predicted exceedances for lower critical load for Nitrogen deposition at modelling points TCC1-TCC3 (inclusive), TCC5, TCC6, TCC8, TCC9, TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant (a Critical Load range of 10-15 kgN/ha/yr has been considered). There are only predicted exceedances for the upper critical load for Nitrogen deposition at modelling points TCC2, TCC3, TCC8, TCC9, TCC13 and TCC14.

6.100 The PEC as a percentage of the lower Critical Load is only exceeded at TCC11 and TCC14 (109%). No PECs as a percentage of the upper Critical Load are exceeded. At these modelling points the baseline already exceeds the lower Critical Load.

***Table 28**: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at European Sites – Cumulative*

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
NYM1	North York Moors – SAC (Blanket Bogs – Raised and blanket bogs)	0.00176	1.36	0.00190	0.18	0.321	0.504	0.183	1.36	0.182	0.73%	n/a	n/a
	North York Moors – SPA (European Golden Plover – Reproducing – Montane habitats)	0.00176	1.36	0.00190	0.18	0.178	0.47	0.150	1.36	0.182	0.78%	n/a	n/a
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	0.00961	1.03	0.0105	0.20	0.856	4.856	4.00	1.04	0.211	0.41%	1.25	63%
TCC2		0.0217	1.03	0.0237	0.20	0.856	4.856	4.00	1.05	0.224	0.93%	1.28	64%
TCC3		0.0140	1.03	0.0152	0.20	0.856	4.856	4.00	1.04	0.215	0.60%	1.26	63%
TCC4		0.00594	1.03	0.00648	0.20	0.856	4.856	4.00	1.04	0.206	0.26%	n/a	n/a

***Table 28** (cont.): Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at European Sites – Cumulative*

ADMS Ref.	Site Details	PC N (keq/Ha/yr)	BG N (keq/ha/yr)	PC S (keq/Ha/yr)	BG S (keq/ha/yr)	CL MinN (keq/ha/yr)	CL MaxN (keq/ha/yr)	CL MaxS (keq/ha/yr)	PEC N (keq/ha/yr)	PEC S (keq/ha/yr)	PC as % of CL	Total PEC (keq/ha/yr)	PEC as % of CL
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal											
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.00891	1.03	0.00977	0.20	0.856	4.856	4.00	1.04	0.210	0.38%	n/a	n/a
TCC6		0.00912	1.03	0.0100	0.20	0.856	4.856	4.00	1.04	0.210	0.39%	n/a	n/a
TCC7		0.00553	1.03	0.00602	0.20	0.856	4.856	4.00	1.04	0.206	0.24%	n/a	n/a
TCC8		0.0128	1.03	0.0139	0.20	0.856	4.856	4.00	1.04	0.214	0.55%	1.26	63%
TCC9		0.0219	1.01	0.0238	0.23	0.856	4.856	4.00	1.03	0.254	0.94%	1.29	64%
TCC 10		0.00476	1.03	0.00520	0.20	0.856	4.856	4.00	1.03	0.205	0.21%	n/a	n/a
TCC 11		0.00829	1.07	0.00894	0.28	0.856	4.856	4.00	1.08	0.289	0.35%	n/a	n/a
TCC 12		0.00440	1.07	0.00475	0.28	0.856	4.856	4.00	1.07	0.285	0.19%	n/a	n/a
TCC 13		0.0298	0.75	0.0318	0.25	0.856	4.856	4.00	0.78	0.282	0.79%	1.06	53%

Notes to Table 28

PC N = Process contribution from nitrogen and ammonia (dry deposition only)

PC S = Process contribution from sulphur (dry deposition) and hydrogen chloride (wet and dry deposition)

PEC = Predicted environmental concentration

BG = Background concentration

CL = Critical Load

6.101 A summary of maximum predicted acid deposition rates at the identified European Sites and SSSIs are presented in Table 28, with the deposition velocities for grassland utilised for all European sites assessed.

6.102 In Table 28, any PCs greater than 1% of the critical load, and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.103 It can be seen from the data in Table 28 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points, with the exception of TCC1 - TCC3 (inclusive), TCC8, TCC9 and TCC13.

6.104 Following the calculation of the PECs, for the modelled points with potentially significant PCs on acid deposition rates, it can be seen from the data in Table 28 that the PECs are all less than 100% of the critical load It can therefore be assumed that there will be no adverse effects on these sites.

6.105 The revised modelling data from 2022 show a similar result (ECL, 2022). As above, it can be assumed that there will be no adverse effect (i.e., the PECs are all well below 100% of the critical level).

Discretionary Advice Service Consultation with Natural England

6.106 A meeting was held with Natural England on 24 November 2021 during which ECL advised that NH_3 was the main contributor to nitrogen deposition arising from the proposed development. ECL noted that the modelling approach that had been adopted, where emission rates for NOx and NH_3 had been calculated from Best Available Technique – Associated Emission Levels (BAT-AELs), was likely to have over-estimated actual NH_3 emissions. It was therefore agreed that further modelling would be carried out using actual emissions data from a similar operational facility at the Resource and Energy Recovery Centre at Millerhill, Edinburgh. Further details of the modelling approach are provided in a separate report (ECL, 2022).

6.107 The revised modelling has considered the habitats with the lowest lower and upper critical loads, i.e., a precautionary approach has been adopted. The results of the revised modelling using data from the Millerhill facility show that the revised NH_3 emission rates at all modelling points are less than 1% of the critical load (Table 29). In accordance with published guidance[17], the impacts can therefore be considered insignificant.

***Table 29**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC1 – TCC13 (Installation Only)*

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	10	15	0.0524	0.524%	0.349%	n/a	n/a
TCC2				0.0964	0.964%	0.643%	n/a	n/a
TCC3				0.0637	0.637%	0.425%	n/a	n/a
TCC4				0.0285	0.285%	0.190%	n/a	n/a

[17] Environment Agency online guidance advises that if the short-term PC is less than 10% of the short-term environmental standard and the long-term PC is less than 1% of the long-term environmental standard it can be screened out as insignificant. See https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit#screen-out-insignificant-pcs.

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [a] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal						
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	10	15	0.0482	0.482%	0.321%	n/a	n/a
TCC6				0.0469	0.469%	0.313%	n/a	n/a
TCC7				0.0260	0.260%	0.173%	n/a	n/a
TCC8				0.0437	0.437%	0.291%	n/a	n/a
TCC9				0.0786	0.786%	0.524%	n/a	n/a
TCC10	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	10	15	0.0239	0.239%	0.159%	n/a	n/a
TCC11				0.0216	0.216%	0.144%	n/a	n/a
TCC12				0.0164	0.164%	0.109%	n/a	n/a
TCC13				0.0492	0.492%	0.328%	n/a	n/a
TCC14	Teesmouth and Cleveland Coast (SSSI Coastal stable dune grasslands (calcareous type)	10	15	0.0204	0.204%	0.136%	n/a	n/a

Notes to Table 29

Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

6.108 It can be seen from the data in Table 29 that the maximum nutrient nitrogen deposition rates due to the ERF's PCs, with the revised NH_3 emission rates, are now less than 1% of the critical load at all the modelled points, except TCC2. For TCC2, a small exceedance of the lower critical load is predicted (i.e., with a PC approximately 0.21% above the significance criteria). It is worth noting that the background level for TCC2 is already elevated and exceeds the lower critical load in the absence of the development.

6.109 ECL has created isopleths based on the revised modelling data (ECL, 2021). Figure 3 (reproduced from ECL, 2021) provides the nutrient nitrogen deposition rates in the area surrounding the modelled points.

6.110 In addition, Figure 4 has been included to allow for comparison to be made between the NH_3 emissions at the revised concentration and the NH_3 emissions at the BAT-AELs.

6.111 In Figures 3 and 4, the ecological receptors are represented by the pink annotated pins and the Installation as the red annotated circle. The results displayed are for the worst-case met year for the maximum GLC.

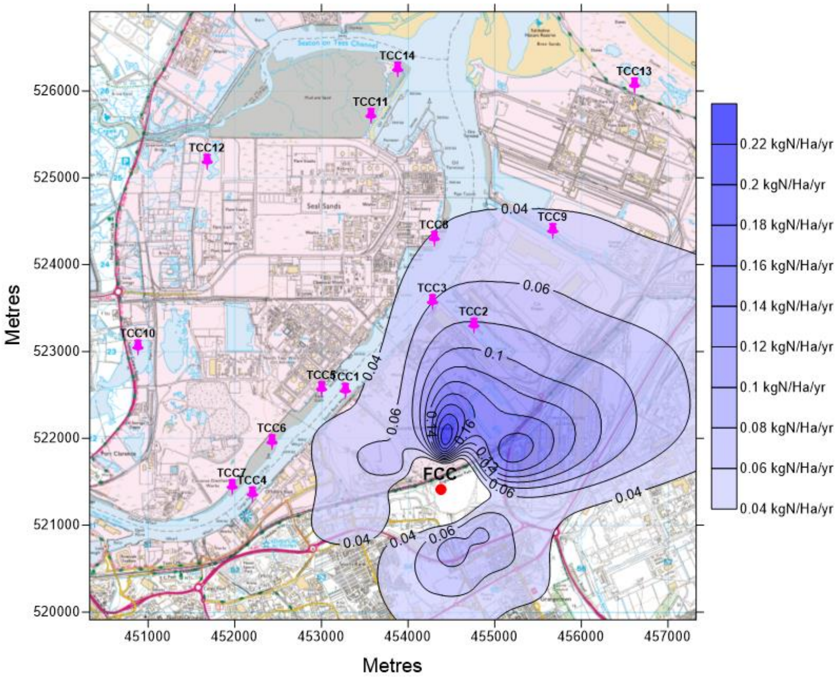


***Figure 3**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (Revised NH_3 Emission Rate) – Met Year 2020 (Source: ECL, 2021)*

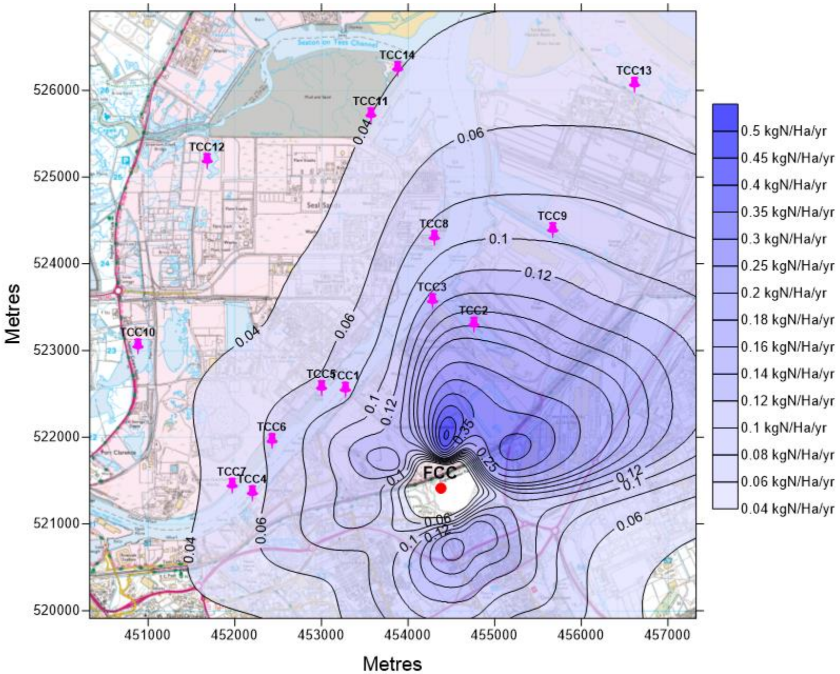


***Figure 4**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (NO_X & NH_3 at BAT-AELs) – Met Year 2020 (Source: ECL, 2021)*

6.112 Modelling of the proposed facility in combination with the Redcar Energy Centre (REC) shows that there are exceedances predicted for nitrogen deposition at modelling points TCC2, 3, 8, 9, 11 and 13 (Table 30). It should be noted that emission rates for NOx and NH_3 had been calculated from BAT-AELs for REC, and are also likely to have over-estimated actual NH_3 emissions.

***Table 30**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC1 – TCC13 (Installation + REC)*

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC as % of Lower Critical Load	PEC as a% of Upper Critical Load
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	10	15	0.0810	0.81%	0.540%	n/a	n/a	n/a	n/a
TCC2				0.176	**1.76%**	**1.18%**	8.96	9.14	91%	61%
TCC3				0.138	**1.38%**	0.92%		9.10	91%	n/a
TCC4				0.0522	0.522%	0.348%	n/a	n/a	n/a	n/a
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal								
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	10	15	0.0741	0.741%	0.494%	n/a	n/a	n/a	n/a
TCC6				0.0679	0.679%	0.453%	n/a	n/a	n/a	n/a
TCC7				0.0478	0.478%	0.319%	n/a	n/a	n/a	n/a
TCC8				0.137	1.37%	0.91%	8.96	9.10	91%	n/a
TCC9				0.223	2.23%	1.48%	8.4	8.62	86%	57%
TCC10	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	8	10	0.0397	0.397%	0.264%	n/a	n/a	n/a	n/a
TCC11				0.0919	0.92%	0.613%	n/a	n/a	n/a	n/a

ADMS Ref.	Site Details	Lower Critical Load (kgN/ha/yr)	Upper Critical Load (kgN/ha/yr)	Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)	PC as a % of Lower Critical Load	PC as a % of Upper Critical Load	Background Concentration (kgN/ha/yr)	PEC (kgN/ha/yr)	PEC as % of Lower Critical Load	PEC as a% of Upper Critical Load
TCC12				0.0475	0.475%	0.316%	n/a	n/a	n/a	n/a
TCC13				0.382	3.82%	2.54%	9.1	9.48	95%	63%
TCC14	SSSI	10	15	0.125	**1.25%**	0.83%	10.78	10.91	**109%**	n/a

Notes to Table 30

Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).

6.113 In Table 30, any PCs greater than 1% of the critical load and PECs greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's) of the critical load are highlighted in bold.

6.114 The data presented in Table 30 show that there are predicted exceedances for nitrogen deposition at modelling points TCC1 - TCC3 (inclusive), TCC8, TCC9, TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant. Where there are predicted exceedances of the critical load, these range from 1.01% to 4.77% of the lower critical load and 1.25% to 3.82% of the upper critical load. It is important to note that the background levels are already elevated and exceed the lower critical load in the absence of the development (as well as the upper critical load for TCC11).

6.115 It should be noted that the habitat with the lowest lower and upper critical load has been selected and used as the basis for the above assessment. As noted in section 4.24, this is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

6.116 When the appropriate Critical Load range is considered for Coastal stable dune grasslands (calcareous type), there is only exceedance of the lower Critical Load at modelling points TCC2, TCC3, TCC8, TCC9, TCC13 and TCC14. There is only exceedance of the upper Critical Load at modelling points TCC2, TCC9 and TCC13. Using the more conservative Critical Load range the only PEC that is greater than 100% is at TCC11 and TCC14 (109%).

6.117 The proposed development operating in isolation does not lead to a breach of the relevant nutrient nitrogen critical loads for any of the modelled points assessed. It is only the cumulative impact of both installations operating simultaneously that result in the exceedances shown in Table 30.

6.118 Table 31 demonstrates the predicted nutrient nitrogen deposition rates associated with the three scenarios that have been modelled by ECL, i.e., the Installation in isolation, REC in isolation and the cumulative scenario of the Installation's and REC's emissions.

***Table 31**: Predicted Nutrient Nitrogen Deposition Rates at Sensitive Habitat Sites (TCC1 – TCC13) For Three Scenarios*

ADMS Ref.	Site Details	Nutrient Nitrogen Deposition Rate [a] [b] (kgN/ha/yr)		
		Installation Only	REC Only	Installation + REC
TCC1	Teesmouth and Cleveland Coast – SPA (Sandwich Tern – Concentration – Supralittoral sediment – Coastal stable dune grassland (acid type))	0.0524	0.0501	0.0810
TCC2		0.0964	0.0799	0.176
TCC3		0.0637	0.0838	0.138
TCC4		0.0285	0.0333	0.0522
TCC1 – TCC4	Teesmouth and Cleveland Coast - SSSI	No information currently held / accessible via APIS' portal		
TCC5	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.0482	0.0465	0.0741
TCC6		0.0469	0.0375	0.0679
TCC7		0.0260	0.0321	0.0478
TCC8		0.0437	0.0986	0.137
TCC9	Teesmouth and Cleveland Coast – SPA / Ramsar (Sandwich Tern / Little Tern – Supralittoral sediment (acidic type))	0.0786	0.144	0.223
TCC10		0.0239	0.0310	0.0397
TCC11		0.0216	0.0714	0.0919
TCC12		0.0164	0.0356	0.0475
TCC13		0.0492	0.356	0.382
TCC14		0.0204	0.105	0.125

Notes to Table 31
(a) Total PC to nutrient nitrogen deposition is derived from the sum of the contribution from Nitrogen and Ammonia (dry deposition only).
(b) The NO_X and NH_3 emission rates for both the Installation and REC are as discussed in Section 10 of ECL (2022).

6.119 The results presented in Table 31 show that, overall, the predicted nutrient nitrogen deposition rates for the REC are greater than those for the Installation.

6.120 ECL (2022) note that the '*greater predicted deposition rate associated with the REC scenario is largely due to REC's closer proximity to a number of the specified ecological points (TCC9, TCC11 and TCC13, in particular)*'. In addition, they also note that '*the emission rates for REC are based on the BAT-AELs*' and therefore it follows that '*When accounting for normal day to day operation, it is anticipated that the actual emission rates for REC, particularly in regard to NH_3, are likely to be lower, as is the case with the FCC Installation*'.

6.121 ECL has produced isopleths (Figure 5) for nutrient nitrogen deposition rates for the installation in combination with REC. In addition, Figure 6 has been included to allow for comparisons to be made between the cumulative emissions with the Installation's actual NH_3 concentration, compared to the BAT-AELs.

6.122 In Figures 5 and 6, the ecological receptors are represented by the pink annotated pins and the Installation and REC as the red annotated circles. The results displayed are for the worst-case met year for the maximum GLC.

Figure 5*: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation (with revised NH3) + REC – NWP 2020 (Source: ECL, 2021)*

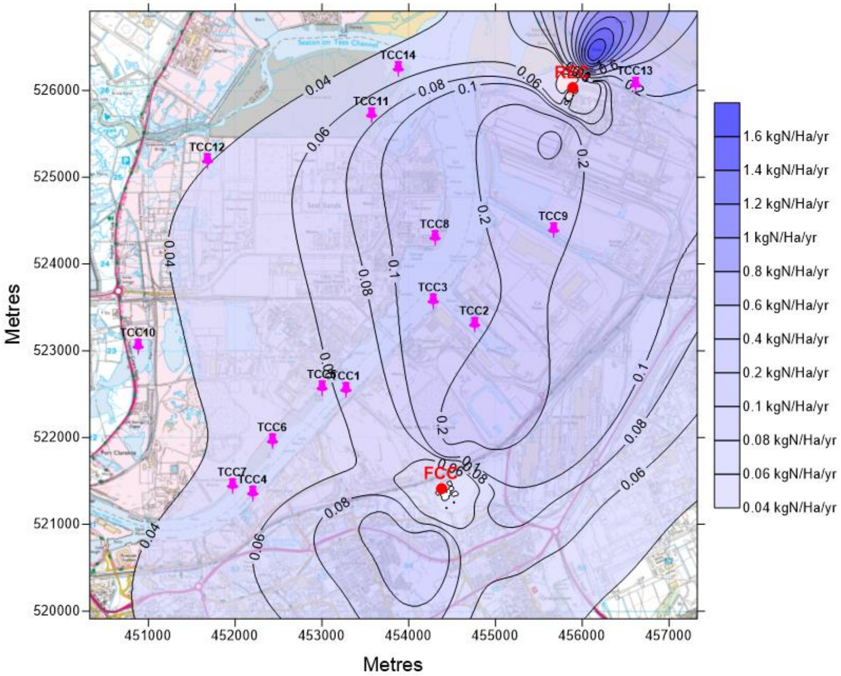
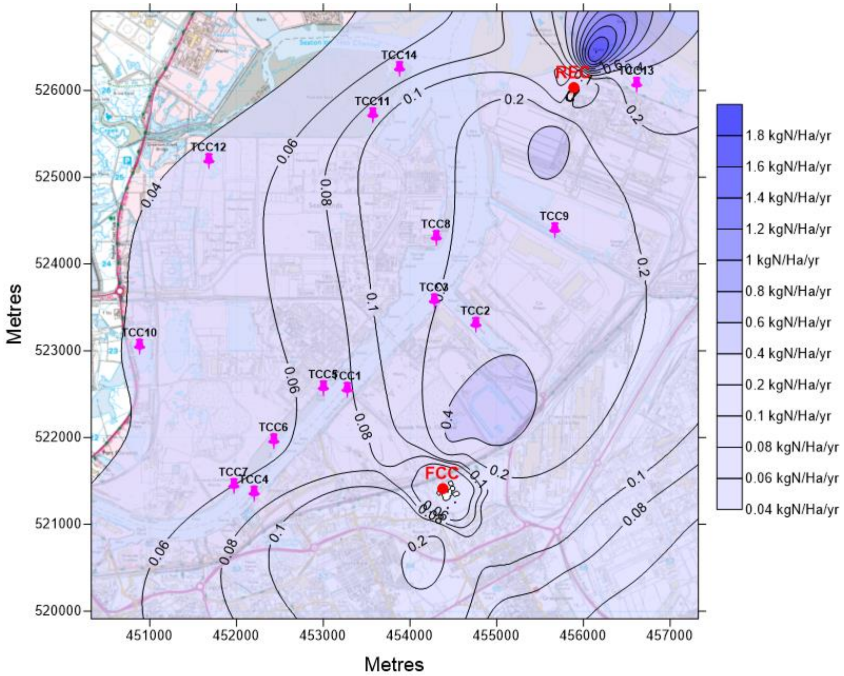


***Figure 6**: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation + REC (BAT-AELs) – NWP 2020 (Source: ECL, 2021)*

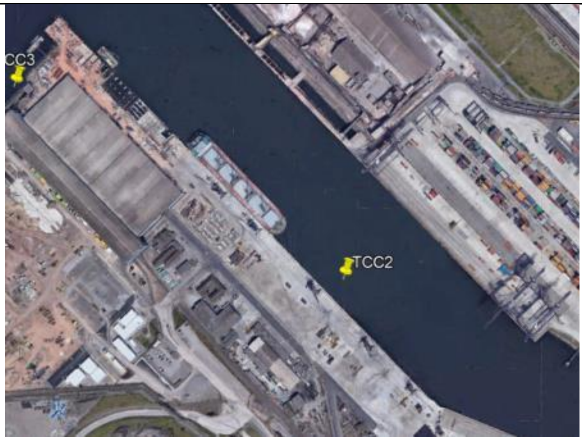


Habitat sensitivity at modelling point

6.123 Table 32 provides an evaluation of the points where modelling has identified a potential exceedance of a critical load or level. In each case the habitats present are identified and related to the qualifying features (birds) of the SPA and Ramsar site. The locations of all air quality modelling points are shown on Figure 2.

6.124 Mapping presented on the MAGIC website shows the locations of coastal priority habitats in relation to the site. It should be noted that the only coastal priority habitat that occurs within the inner and central estuary is intertidal mudflats – all other coastal priority habitats are located at the coast or the extreme outer part of the estuary.

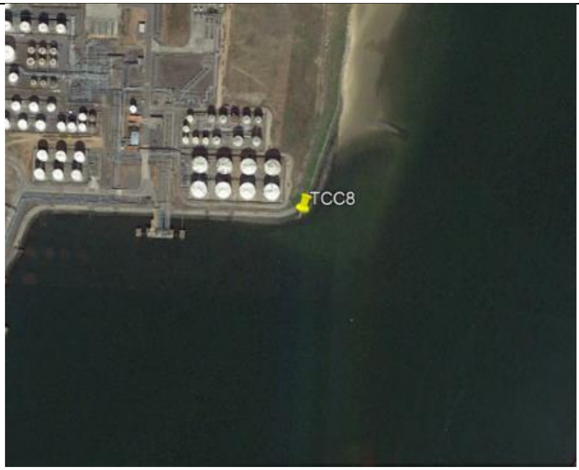
***Table 32**: Evaluation of modelling points*

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC1		TCC1 is located on a section of the estuary where there is a quay consisting of a raised deck supported on pillars. There appears to be minimal if any intertidal habitat – images on Google Earth Pro show water alongside the quay whilst other areas are exposed at low tide (for example TCC5 on the screen capture to the left).	Examination of the Government's MAGIC mapping website shows that the only coastal priority habitat in the area is intertidal mudflat with small areas present between the quay platform and the shore and on the north side of the estuary (at TCC5). Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.110 kgN/ha/yr, which is 1.37% of CL (lower) and 1.10% of CL (upper); the PEC is 113% of CL (lower) and 91% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.139 kgN/ha/yr, which is 1.73% of CL (lower) and 1.39% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC2		TCC2 is located within the Tees Dock which is a facility characterized by reinforced dock walls. There appears to be no intertidal habitat (which is expected for a key dock facility) – images on Google Earth Pro show water alongside the quay whilst elsewhere in the estuary intertidal habitats are shown as being exposed. The same images also indicate that the dock has been a busy facility.	Examination of the Government's MAGIC mapping website shows that there are no coastal priority habitats within or near the dock: the nearest coastal priority habitats are small localised areas of intertidal mudflat in the main estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.210 kgN/ha/yr, which is 2.62% of CL (lower) and 2.10% of CL (upper); the PEC is 115% of CL (lower) and 92% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.287 kgN/ha/yr, which is 3.59% of CL (lower) and 2.87% of CL (upper); the PEC is 116% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
				For NOx the PC is predicted to be 0.477 ug/m^3: this is 1.59% of CL and PEC is 121% of CL. The cumulative assessment shows that for NOx the PC is predicted to be 0.662 ug/m^3: this is 2.21% of CL and PEC is 121% of CL. However, the background concentration is 35.78 ug/m^3, which exceeds the CL. The CL[18] for open water and its associated vegetation has been used for this assessment; however, the only intertidal habitat present in this part of the estuary is mudflat.
TCC3		TCC3 is located on the southern bank of the main estuary close to the Tees Dock. The quayside appears to be characterized by a boulder reinforced slope with adjacent sections with retaining walls. There appears to be no or very limited intertidal habitat (which is expected for the adjacent dock facilities) – images on Google Earth Pro show water alongside the quay whilst elsewhere in the estuary intertidal habitats are shown as being exposed.	Examination of the Government's MAGIC mapping website shows that there are no coastal priority habitats near the modelling point: the nearest coastal priority habitats are small localized areas of intertidal mudflat in the main estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.143 kgN/ha/yr, which is 1.79% of CL (lower) and 1.43% of CL (upper); the PEC is 114% of CL (lower) and 91% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.201 kgN/ha/yr, which is 2.51% of CL (lower) and 2.01% of CL (upper); the PEC is 115% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website. For NOx the PC is predicted to be 0.301 ug/m^3: this is 1.003% of CL and PEC is 120% of CL. The cumulative assessment shows that for NOx the PC is predicted to be 0.433 ug/m^3: this is 1.44% of CL and PEC is 121% of CL. However, the background concentration is 35.78 ug/m^3, which exceeds the CL. The CL for open water and its associated vegetation has been used for this assessment;

[18] The APIS website advises the following for littoral and supralittoral sediments 1. No expected negative impact on species due to impacts on the species' broad habitat. 2. Potential positive impact on species due to impacts on the species' food supply.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
				however, the only intertidal habitat present in this part of the estuary is mudflat.
TCC4		TCC4 is located on a section of the estuary where there is a reinforced bank with adjacent sections with reinforced quay walls. There appears to be minimal if any intertidal habitat at the modelling location – images on Google Earth Pro show water alongside the bank whilst other areas are exposed at low tide (for example TCC7 on the screen capture to the left).	Examination of the Government's MAGIC mapping website shows that no coastal priority habitat is present near the modelling location but intertidal mudflat is present along the northern side of the estuary with small areas of this habitat to the west and east along the southern side of the estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	The cumulative assessment predicts that nitrogen deposition will be 0.0857 kgN/ha/yr, which is 1.07% of CL (lower) and 0.86% of CL (upper); the PEC is 113% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC5		TCC5 is located on a section of the estuary where intertidal mudflats are exposed at low tide. No other coastal priority habitats are thought to be present.	Examination of the Government's MAGIC mapping website shows that the only coastal priority habitat in the area is intertidal mudflat. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.103 kgN/ha/yr, which is 1.29% of CL (lower) and 1.03% of CL (upper); the PEC is 113% of CL (lower) and 91% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.129 kgN/ha/yr, which is 1.61% of CL (lower) and 1.29% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC6 & TCC7		TCC6 and TCC7 are located on a section of the estuary where an area of intertidal mudflats is exposed at low tide. No other coastal priority habitats are thought to be present.	Examination of the Government's MAGIC mapping website shows that the only coastal priority habitat in the area is intertidal mudflat. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone for TCC6 nitrogen deposition is predicted to be 0.110 kgN/ha/yr, which is 1.38% of CL (lower) and 1.10% of CL (upper); the PEC is 113% of CL (lower) and 91% of CL (upper). The cumulative assessment for TCC6 predicts that nitrogen deposition will be 0.132 kgN/ha/yr, which is 1.65% of CL (lower) and 1.32% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC8		TCC8 is located on the northern bank of the main estuary close to the Tees Dock. The bank appears to be a mixture of boulder reinforced slope with adjacent sections with concrete revetment. The location is on the edge of an area of intertidal mudflats (as mapped on the MAGIC website).	Examination of the Government's MAGIC mapping website shows that intertidal mudflat is the only coastal priority habitat in the main estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.098 kgN/ha/yr, which is 1.23% of CL (lower) and 0.98% of CL (upper); the PEC is 113% of CL (lower) and N/A for CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.183 kgN/ha/yr, which is 2.29% of CL (lower) and 1.83% of CL (upper); the PEC is 114% of CL (lower). However, the background concentration is 8.96 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website. The cumulative assessment shows that for NOx the PC is predicted to be 0.396 ug/m^3: this is 1.32% of CL and PEC is 165% of CL.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
				However, the background concentration is 49.10 ug/m^3, which exceeds the CL. The CL for open water and its associated vegetation has been used for this assessment; however, the only intertidal habitat present in this part of the estuary is mudflat.
TCC9		TCC9 is located in the Dabholm Cut, which is a narrow channel with an outflow structure at the eastern end. The Cut appears to receive effluent from the adjacent sewage treatment works to the north-east. The Cut is characterized by sloping banks on both sides, which are either grass or reinforced.	Examination of the Government's MAGIC mapping website shows that the coastal priority habitat intertidal mudflat is present along the whole of the Cut. Mudflat is not identified as a habitat requiring further assessment on the APIS website (in an estuarine environment mudflats will derive nutrient inputs from both marine and riverine sources).	When the development is considered alone nitrogen deposition is predicted to be 0.174 kgN/ha/yr, which is 2.18% of CL (lower) and 1.74% of CL (upper); the PEC is 107% of CL (lower) and 86% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.314 kgN/ha/yr, which is 3.43% of CL (lower) and 3.14% of CL (upper); the PEC is 109% of CL (lower). However, the background concentration is 8.40 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat is the only coastal priority habitat that is present in this part of the estuary and this habitat is not identified as a habitat requiring further assessment on the APIS website.
TCC10		TCC10 is a saline lagoon located at Saltholme (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saline lagoon habitat to the development site. The only exceedance predicted at this location is hydrogen fluoride (1.30% of the CL).	Modelling does not predict that the long-term PC is greater than 1% for European sites, and/or the PEC is greater than 70% for European sites.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC11 TCC14		TCC11 is saltmarsh located at Seal Sands (as mapped on the MAGIC website) TCC14 is located on the saltmarsh and sand dune habitat to the north of TCC11	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saltmarsh habitat to the development site. No exceedance is predicted at this location.	The cumulative assessment predicts that nitrogen deposition will be 0.118 kgN/ha/yr, which is 1.48% of CL (lower) and 1.18% of CL (upper); the PEC is 136% of CL (lower) and 109% of CL (upper). However, the background concentration is 10.78 kgN/ha/yr, which exceeds the CL (lower and upper). These figures have been calculated for 'Coastal stable dune grasslands - acid type', which is a habitat that is not present at or near this modelling point. Mudflat and saltmarsh are the only coastal priority habitats that are present in this part of the estuary. Mudflat is not identified as a habitat requiring further assessment on the APIS website. For pioneer low-mid mid-upper saltmarsh the nitrogen CL range is 10-20 kg N/ha/yr, i.e., the cumulative impact will be of lower significance.
TCC12		TCC12 is saltmarsh located close to Seal Sands (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of saltmarsh habitat to the development site. The only exceedance predicted at this location is hydrogen fluoride (1.03% of the CL).	Modelling does not predict that the long-term PC is greater than 1% for European sites, and/or the PEC is greater than 70% for European sites.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
TCC13		TCC13 is coastal sand dune located at Coatham Sands (as mapped on the MAGIC website)	Examination of the Government's MAGIC mapping website shows that this is one of the nearest occurrences of coastal sand dune habitat to the development site. The only exceedance predicted at this location is hydrogen fluoride (1.07% of the CL).	When the development is considered alone nitrogen deposition is predicted to be 0.107 kgN/ha/yr, which is 1.34% of CL (lower) and 1.07% of CL (upper); the PEC is 115% of CL (lower) and 92% of CL (upper). The cumulative assessment predicts that nitrogen deposition will be 0.421 kgN/ha/yr, which is 5.26% of CL (lower) and 4.21% of CL (upper); the PEC is 119% of CL (lower). However, the background concentration is 9.10 kgN/ha/yr, which exceeds the CL (lower). These figures have been calculated for 'Coastal stable dune grasslands - acid type'[19], which is a habitat that is present at or near this modelling point. However, this habitat is of importance for supporting nesting terns but none have been recorded near this location (see Section 4.2.4). It is also noted the background concentration is 9.1 kgN/ha/yr, i.e., there is already exceedance of the CL (lower) in the absence of the development. The PEC does not exceed the CL (upper).

[19] The APIS website advises the following for 'Coastal stable dune grasslands - acid type': 1. Potential negative impact on species due to impacts on the species' broad habitat. 2. Potential positive impact on species due to impacts on the species' food supply.

Nitrogen deposition to the River Tees and Tees Estuary

6.125 During the consultation meeting on 24 November 2021, Natural England advised that the HRA needs to consider nitrogen deposition to the River Tees and Tees Estuary. Their concern was that nitrogen deposition may contribute to nutrient enrichment of the water, which Natural England has advised is resulting in the formation of algal mats on mudflats (which makes it difficult for some birds to feed).

6.126 It is estimated that the area of the river and estuary downstream of the transporter bridge (OSGR NZ 49989 21308 – this is estimated to mark the extent of potentially significant effects) is approximately 880 ha. Extrapolating the data shown on Figure 36 in ECL (2022) a worst-case nitrogen deposition of 0.08 kg/Ha/yr has been assumed for the whole river and estuary area. This equates to total nitrogen deposition of 70.4 kg/yr for the whole river and estuary area. If it is assumed that the average depth of the estuary is 1 m (which is likely to be an under-estimate) this equates to 70.4 kg nitrogen deposition in 8.8 million m3 or 8 mg/m3, which is equivalent to 0.008mg/l.

6.127 Water quality monitoring of the Tees Estuary at Smiths Dock (https://environment.data.gov.uk/water-quality/view/sampling-point/NE-45400834) reported dissolved organic nitrogen levels that ranged from 0.76 mg/l (31 March 2021) to 3.49 mg/l (5 March 2021). The estimated total nitrogen deposition therefore equates to between 0.23% and 1.05% of the baseline dissolved organic nitrogen levels.

6.128 The above calculation is necessarily extremely crude and does not account for factors such as river flow, discharge, tidal mixing etc. Nevertheless, it does demonstrate that deposition arising from the proposed development will make an insignificant contribution to nitrogen levels in the river and estuary based on current baseline levels.

Effect of nitrogen deposition on dune vegetation

6.129 As noted in Section 4, the dune habitats at Seaton Snook, South Gare and Seal Sands Peninsula are considered to be unsuitable for nesting terns. This is primarily due to the absence of suitable substrate with wind-blown sand covering significant areas. Whilst dune vegetation has started to develop on the accumulated sand, there is no evidence that vegetation development is being influenced by existing levels of nitrogen deposition.

6.130 Following a site visit in September 2023 Mike Leakey (INCA) observed that '*the strandline and sand dune habitats at all three monitored locations have developed directly on or immediately adjacent to anthropogenic structures, namely training walls and breakwaters, largely constructed between 1880 and 1970, so space for further dune development is inevitably limited by their position in the tidal frame. All of these locations are to some extent subject to cyclical processes of accretion and erosion around the high water mark, but above this level the dunes are relatively stable. In the case of the sheltered western portions of both Seaton Snook and Seal Sands Peninsula, the recent development of saltmarsh vegetation (principally Salicornia and Sueda) serves to reduce the extent and frequency of wave attack and thereby ameliorates erosion*.'

6.131 It is concluded that the development of suitable nesting habitat by terns is primarily influenced by existing topographical features and constraints. Existing or future nutrient enrichment is considered unlikely to significantly influence dune vegetation development and hence the availability of tern nesting habitat.

Duration of effects

6.132 It is expected that emissions from the ERF facility will be maintained throughout the entire operational period (expected to be c.40 years). As previously noted, the release concentrations of the pollutants will be at the permitted emission limit values ("ELVs") on a 24 hour basis, 365 days of the year. In practice, when the plant is operating, the release concentrations will be below the ELVs, and, for most pollutants, considerably so. Taking shutdowns for planned maintenance into account, the plant will not operate for 365 days.

6.133 Taking this into account the level of nitrogen deposition associated with the operation of the ERF is not expected to vary significantly during the entire operational period. Whilst technological improvements may be developed that will allow nitrogen deposition to be reduced, it is not possible to predict if and when this will happen and what the scale of the reduction might be.

6.134 The pollutant trend data available on the APIS website for nitrogen deposition present a mixed picture. When 'Sources ranked by total Nitrogen deposition from combined UK sources' are considered the net change based on the trend data presented in Table 10 is a net reduction of 2.44 KgN/ha/yr. When 'Local contributions to Nitrogen deposition (KgN/ha/yr) from sources (UK)' are considered the net change based on the trend data presented in Table 11 is a net increase of 1.03 KgN/ha/yr. The net change based on the trend data available for 'long range contribution to Nitrogen deposition from sources (UK)', presented in Table 12, show a net reduction of 2.89 KgN/ha/yr. Overall the data indicate a trend where nitrogen deposition levels are reducing.

6.135 If planning permission is granted for the ERF, the facility is unlikely to be operational before 2028. If nitrogen deposition continues to decline in line with the trends shown by data available on the APIS website, it might reasonably be expected that background levels of nitrogen deposition will also fall.

Reversibility of effects

6.136 The Climate Change Act 2008 commits the UK government by law to reducing greenhouse gas emissions by at least 100% of 1990 levels (net zero) by 2050. Various initiatives are being brought forward in order to meet this target.

6.137 The Government's Environmental Improvement Plan 2023 notes that '*To restore nature, we will need to improve the quality of our environment*.' '*Firstly, we will aim to achieve clean air*.' The Plan recognises that, despite improvements in recent decades, air quality continues to be the biggest source of harm to the natural environment. To address this the Government will:

- cut overall air pollution by tackling the key sources of emissions, including reducing the maximum limits for domestic burning appliances in Smoke Control Areas;
- tackle specific hotspots by challenging councils to improve air quality more quickly, while supporting them with clear guidance, funding, and tools;
- reduce ammonia emissions (crucial for sensitive natural habitats) by using incentives in our new farming schemes, investing £13 million in slurry storage infrastructure in 2023 and considering expanding environmental permitting conditions to dairy and intensive beef farms.

6.138 The Government's proposed ban on the sale of new petrol and diesel cars has now been pushed back to 2035 from the original deadline of 2030. Under the ban, from 2035 only electric battery-powered cars and zero-emission vehicles will be able to be bought new. Whilst this may be interpreted by some as being a relaxation of a key environmental target, it remains the case that the sale of new petrol and diesel cars will be phased out within the next twelve years. Taking this into account, it is considered likely that current rates of nitrogen deposition associated with traffic can be expected to continue to reduce in the future.

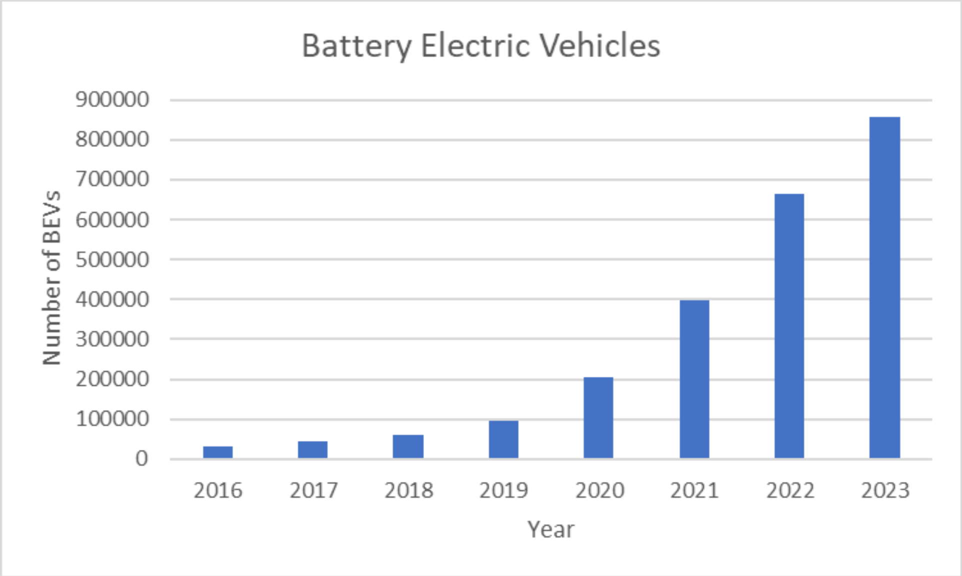
6.139 Published data indicate that sales of electric and hybrid cars are increasing – see Graph 3 below (source: https://www.nextgreencar.com/electric-cars/statistics/). Nevertheless, these types of vehicle still represent a relatively small proportion of the total vehicles on UK roads, although this is expected to change in response to the Government's proposed ban on the sale of new petrol and diesel cars.

6.140 Trend data proved by APIS show that nitrogen deposition associated with 'road transport' is decreasing:

- Source attribution for nitrogen deposition (sources ranked by total Nitrogen deposition (KgN/ha/yr) from combined UK sources): nitrogen deposition decreased from 1.55 to 1.18 kgN//ha/yr (2012 to 2018).
- Source attribution for nitrogen deposition (Local contributions to Nitrogen deposition (KgN/ha/yr) from sources UK): nitrogen deposition decreased from 0.75 to 0.58 kgN//ha/yr (2012 to 2018).

- Source attribution for nitrogen deposition (long range contribution to Nitrogen deposition (KgN/ha/yr) from sources UK): nitrogen deposition decreased from 0.8 to 0.6 kgN//ha/yr (2012 to 2018).

6.141 If the trend data for local contributions is used, this represents a reduction of c.2.8 KgN/ha/yr. If this trend continues by the time the ERF is operational, which is assumed to be in 2028 or later, the continued reduction in emissions from road traffic would exceed the modelled deposition from the operational ERF.



***Graph 3**: Number of Battery Electric Vehicles in the UK (Source: (https://www.nextgreencar.com/electric-cars/statistics/).*

6.142 In January 2021 the North Sea became a NOx Emissions Control Area (ECA) for shipping (under Annex VI of the 1997 MARPOL Protocol). This requires ships constructed and commissioned after that date to operate within IMO Tier III NOx control standards. This is expected to result in a drop in NOx emissions.

6.143 Trend data proved by APIS present a mixed picture for nitrogen deposition associated with 'international shipping':

- Source attribution for nitrogen deposition (sources ranked by total Nitrogen deposition (KgN/ha/yr) from combined UK sources): nitrogen deposition decreased from 1.72 to 1.34 kgN//ha/yr (2012 to 2018).
- Source attribution for nitrogen deposition (Local contributions to Nitrogen deposition (KgN/ha/yr) from sources UK): nitrogen deposition increased from 0.29 to 0.32 kgN//ha/yr (2012 to 2018).
- Source attribution for nitrogen deposition (long range contribution to Nitrogen deposition (KgN/ha/yr) from sources UK): nitrogen deposition increased from 1.43 to 1.02 kgN//ha/yr (2012 to 2018).

6.144 Whilst an increase is reported for local contributions to Nitrogen deposition, the increase was very small – 0.005 kgN//ha/yr. By comparison a decrease is reported for long range contributions to Nitrogen deposition of 0.068 kgN//ha/yr.

6.145 It is concluded that nitrogen deposition arising from emissions from international shipping is likely to remain stable as a worst case, but will probably reduce driven by the designation of the North Sea as a NOx Emissions Control Area.

7 Conclusion

7.1 Air quality modelling has predicted small exceedances for nitrogen deposition at eight modelling points for Sandwich tern and little tern. The birds themselves are not vulnerable to elevated levels of nitrogen deposition; however, some of the habitats upon which they depend may be sensitive to increased nitrogen deposition. The exceedance has been predicted based on information available on the APIS website, which indicates that effects need to be considered for 'Coastal stable dune grasslands (acid type)' where the Critical Load of 8-10 kgN/Ha/yr is exceeded.

7.2 This is a highly precautionary approach as the most sensitive habitat type, Coastal stable dune grasslands (acid type), is not present at any of the ecological receptors. As there are areas of Coastal stable dune grasslands (calcareous type) at receptors TCC11 and TCC14 (Seal Sands Peninsula) and TCC13 (Coatham Dunes), a Critical Load range of 10-15 kgN/ha/yr has also been considered (instead of 8-10 kgN/ha/yr for acid type dunes).

7.3 Based on this higher Critical Load range for nitrogen deposition there would only be an exceedance of the Lower Critical Load for one receptor (TCC11) and only when it is considered in combination with the anticipated emissions from the Redcar Energy Centre. It is noted that the lower CL is already exceeded in the absence of development.

7.4 An increase in nitrogen deposition on the shifting sand dune communities has the potential to increase plant growth resulting in the loss of open habitat for nesting little terns. The results of a study carried out by Jones *et al*. (2004) found that an increase in the growth of marram (and possibly sand couch and lyme grass) may only occur where nitrogen deposition rates >15kg/N/ha/yr occur. The proposed ERF is not expected to increase background nitrogen deposition to a level that would result in a significant change in the characteristics of the vegetation.

7.5 Survey in September 2023 (INCA, 2023) concluded that the dune habitat at Seaton Snook, South Gare and Seal Sands Peninsula is unsuitable for nesting terns. This is primarily due to the absence of suitable substrate with wind-blown sand dominating. Whilst dune vegetation has started to develop on the accumulated sand, there is no evidence that vegetation development is being influenced by existing levels of nitrogen deposition. It is therefore concluded that the presence/absence of suitable nesting habitat by terns is primarily influenced by existing topographical features and constraints. Existing or future nutrient enrichment is considered unlikely to significantly influence dune vegetation development and hence the availability of tern nesting habitat.

7.6 Saltmarsh is present at modelling point TCC11, which is not an important habitat for breeding terns. There is currently no evidence that terns are nesting in any of the dune habitat that has been considered in the air quality modelling for this assessment. Furthermore, future nesting activity is considered unlikely (INCA, 2023). It is therefore concluded that no adverse effects are likely in relation to the conservation status of any tern species that is a qualifying feature of the SPA and Ramsar site.

7.7 Small exceedances are also predicted for NOx (two modelling points) and NH_3 (two modelling points). In all cases the exceedances of the 1% threshold are small: none of the PECs are greater than 100% (i.e., the level beyond which it cannot be assumed that there will be no adverse effect on European Sites and SSSI's).

7.8 Whilst exceedances of the 1% threshold are predicted for hydrogen fluoride (twelve modelling points), the predicted levels still fall well below the weekly critical level even when current baseline levels are factored in. No exceedance is predicted for SO_2 or acid deposition.

7.9 Evaluation of the modelling locations in the estuary (TCC1 to TCC9) has concluded that they are typically characterised by hard-engineered banks or quay walls with minimal or no intertidal habitat present (many areas remain flooded at low tide). Where intertidal habitat is present this is limited to mudflats, which is not considered to be vulnerable to the effects of elevated nitrogen deposition. There are no saltmarsh or sand dune or other sensitive coastal priority habitats in the vicinity of the proposed development site: the nearest sand dunes are at Coatham Sands, approximately 4.8 km to the north-east, and the nearest saltmarsh is at Seal Sands, approximately 4.2 km to the north of the proposed development (modelling points TCC10 to TCC13 have been included specifically to assess air quality impacts on coastal priority habitats).

7.10 Air quality modelling has also predicted exceedances for NOx at modelling points TCC2, TCC3 and TCC9 for Sandwich tern and little tern (for supralittoral sediment). There are predicted exceedances of the long-term (30 ug/m^2) and short-term (75 ug/m^2) Critical Level for supralittoral sediment. At modelling points TCC2 and TCC3 the long-term CL is exceeded in the absence of development.

7.11 As noted above, the habitats at many of the modelling points are either intertidal mudflat or are permanently inundated with sea water. Mudflat is not considered to be sensitive to elevated NOx levels of the magnitude predicted for the proposed development due to the effects of inundation, dilution, tidal mixing and dispersal. It is also understood that parts of the estuary are subject to dredging in order to maintain a navigable channel. The removal of sediment will inevitably result in the removal of nutrients contained within those sediments.

7.12 Examination of the evidence base for the Teesmouth and Cleveland Coast SPA / Ramsar extension (Natural England, 2015; Natural England, 2018; Natural England, 2019) indicates that, whilst some tern species may feed within the estuary (and potentially in the vicinity of the areas where small-scale exceedance of nitrogen deposition and NOx are predicted), most of the qualifying species are associated with more distant areas. Terns are mainly piscivorous and it is concluded that the predicted air quality changes are not likely to affect prey availability and hence the conservation status of tern species as a result of changes in prey availability.

7.13 Baseline data for nutrient nitrogen and acidity have been obtained from the APIS website for the period 2005 to 2020. Plots of these data reveal a gradual downward trend, although an increase followed by a decline is noted for the period 2016 – 2020. It is not known what caused the increase during this period, and it is not known if the trajectory is for levels to reduce to those recorded pre-2016. The data available for 2020 appear to show that the overall downward trend is continuing.

7.14 Source attribution trend data indicate that nitrogen deposition is decreasing for the majority of sources (for ranked sources, local sources and long-range sources). Consideration of the available evidence leads to the conclusion that nitrogen deposition associated with road traffic emissions can reasonably be expected to continue to decline as a result of Government policy. Contributions from international shipping are likely to remain stable as a worst case, but may decline as a result of the North Sea NOx ECA.

7.15 Overall, it is concluded that the small increases in nitrogen deposition, NOx and NH_3 at some modelling points are not likely to have an adverse effect on the conservation status of any qualifying species and hence the integrity of the Teesmouth and Cleveland Coast SPA / Ramsar site. This conclusion has been reached through consideration of changes against a baseline where there is exceedance of the lower Critical Load / Level for these pollutants.

7.16 The suitability of the habitats for nesting terns is also linked to a range of factors other than air quality. Factors such as coastal squeeze, predation risk and human disturbance may all influence the suitability of the habitats for nesting little tern.

7.17 The Habitats Regulations Assessment screening process has concluded that the proposed development is not directly connected with or necessary to the management of any European Site. The HRA screening identified that a likely significant effect may arise as a result of changes in air quality during the operation of the ERF when considered alone. No other likely significant effects have been identified for the Teesmouth and Cleveland Coast SPA / Ramsar site or for any other European site.

7.18 The initial screening assessment of likely significant effects has been carried out in the absence of mitigation measures and is therefore compliant with the judgment People Over Wind - *Sweetman vs Coillte* (European Court, 12 April 2018).

7.19 An appropriate assessment has been completed, which includes further air quality studies, and this has concluded that the proposed development, based on the scientific evidence that is available, will not have an adverse effect on the integrity of the Teesmouth and Cleveland Coast SPA / Ramsar site alone and in combination with other plans and projects. It is also concluded that the proposed development would not prevent the SPA's restore conservation objective being met.

8 References

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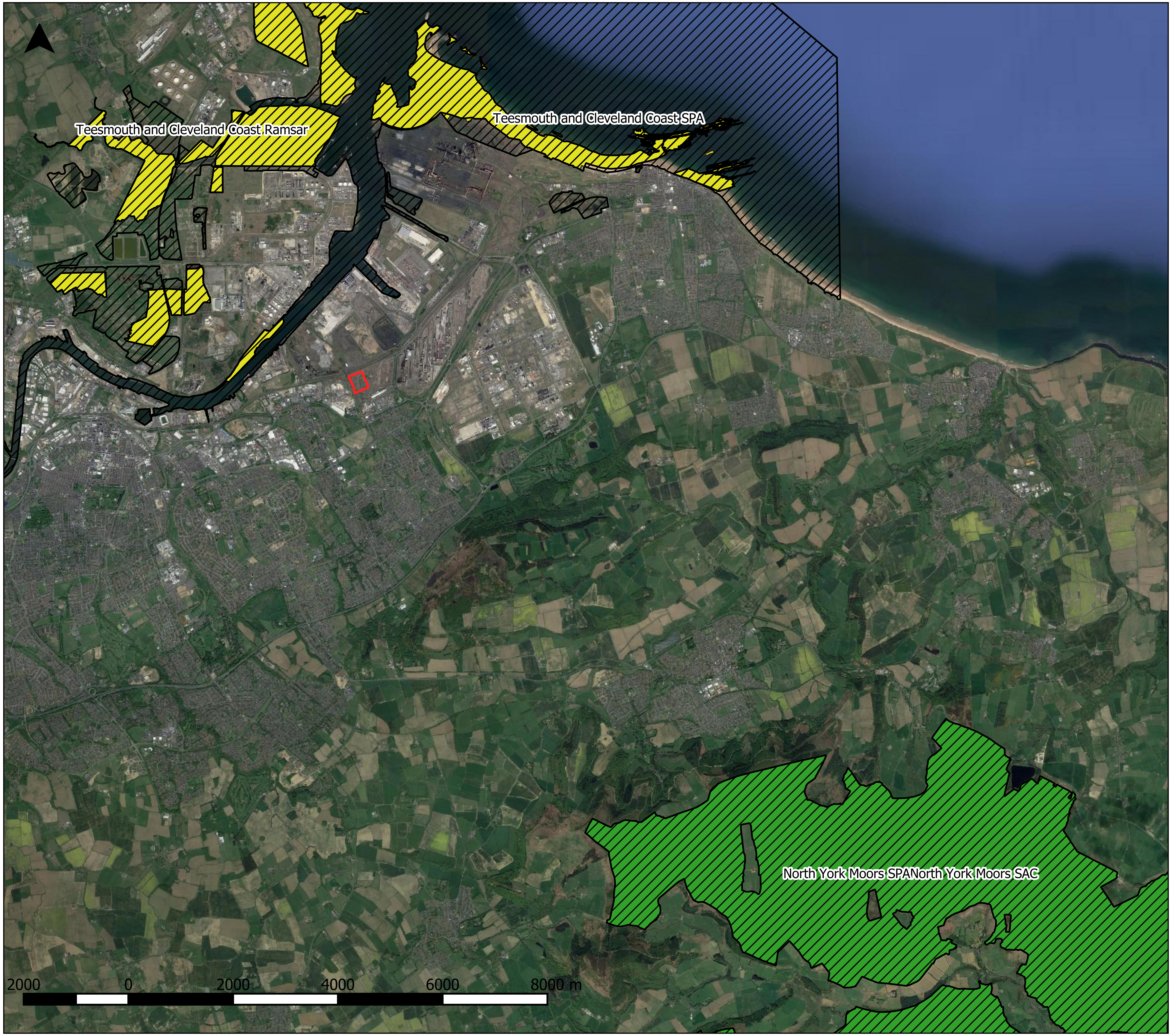
9 Figures

Figure 1: Location plan showing European designated sites



Document path

Legend

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar
- Site boundary

BSG | ecology

OFFICE: Newcastle
T: 0191 303 8964
JOB REF: P20-1004

PROJECT TITLE
Grangetown Prairie Energy Recovery Facility

DRAWING TITLE
Figure 1: Site Location

DATE: 19.8.2021
SCALE: 1:7,000
DRAWN: HB
STATUS: Final

Sources: BSG Ecology survey data

Figure 2: Air quality modelling locations

(Source: ECL, 2022)

10 Appendix 1

INCA (2023). Assessment of the impacts of nitrogen deposition on tern nesting sites. September 2023, Report ID: INCA 2023-38.

Report ID: INCA 2023-38

Assessment of the impacts of nitrogen deposition on tern nesting sites

Mike Leakey / Ian Bond

September 2023

Industry Nature Conservation Association

1. Introduction

INCA has been commissioned to undertake an appraisal of the suitability of specific sites within the Teesmouth and Cleveland Coast SPA/SSSI to support nesting terns. In particular, the assessment is to consider whether that suitability is being affected by increased nitrogen deposition.

The appraisal is to consist of two parts:

i) a habitat condition assessment of each site to determine its current suitability for nesting terns and whether there are any indications of impacts occurring as a result of nutrient enrichment and,

ii) a desk-based appraisal of each site's suitability based on other factors and the history and ecology of nesting terns in those areas.

2. Habitat assessment of potential tern nest sites

2.1 Seaton Snook

Seaton Snook was assessed on 5th September 2023 by Mike Leakey, Associate Ecologist with INCA.

An area of shoreline above the high-water mark at Seaton Snook (Teesmouth National Nature Reserve) has been roped off annually for several years in an attempt to reduce disturbance should Little Terns and other shorebirds such as Ringed Plover nest there. This area is centred on NGR NZ537263 and covers around 0.15ha. Considerable accretion of sand has clearly occurred here, evinced by numerous buried and half-buried fence posts. The substrate is predominantly sandy, with a minimal shingle component and virtually no cobbles, and the distance between the strandline (high water mark) and established dune vegetation is less than 10m; in both cases suboptimal for breeding Little Terns, which prefer a more heterogenous substrate covering a much larger area above the high-water mark.

Strandline vegetation occupies a narrow band, of which 90% is bare sand, with a 50:50 grass to forb ratio on the vegetated 10%. The dominant grass is Sand Couch *Elytrigia juncea* with occasional Lyme Grass *Leymus arenarius*, accompanied by Frosted Orache *Atriplex laciniata*, Prickly Saltwort *Salsola kali* and Sea Beet *Beta vulgaris ssp. maritima*. Immediately to landward lies a zone of foredune, comprising 40% bare sand with a 60:40 grass to forb ration on the vegetated 60%. The grass component is still dominated by Sand Couch but with some Marram *Ammophila arenaria* and Red Fescue *Festuca rubra* colonisation. The forb element is rather more diverse, and includes Restharrow *Ononis repens*, Narrow-leaved Ragwort *Senecio inaequidens*, Common Cat's-ear *Hypochaeris radicata*, Bird's-foot-trefoil *Lotus corniculatus* and Wild Carrot *Daucus carota*. Above this zone established Marram-dominated dunes predominate, with no more than 5% bare sand and an 80:20 grass to forb ratio. The latter are represented by Narrow-leaved Ragwort, Wild Carrot, Restharrow and Common Toadflax *Linaria vulgaris*.

Taxa indicative of high nutrient environments such as docks, thistles and nettles appear to be absent from all these habitats, hence nutrient enrichment from whatever source does not seem to an issue. To conclude, Seaton Snook does not support substrates of sufficient quality and extent to support breeding Little Terns, irrespective of the degree of predation and human disturbance to which it is doubtless subject.

Photograph 1. View from the south, illustrating the restricted bare substrate habitat above the high-water mark.

Photograph 2. View of the strandline habitat.

Photograph 3. View of the establishing dune habitat.

2.2 South Gare

South Gare was assessed on 1st September 2023 by Ian Bond, Ecologist with INCA.

An area of land at South Gare has been fenced off annually for several years in an attempt to reduce disturbance should Little Terns nest there. In previous years this has encompassed a sparsely vegetated area of sand and shingle, which appeared suitable for nesting Little Terns. For some years this was the only area at South Gare which appeared to have the potential to support nesting Little Tern. Sand has now accumulated in the fenced area such that the shingle has almost entirely been buried and the topography is no longer flat. Vegetation has established on the accumulated sand, leaving no more than 10% bare sand. A view across this area is shown in Photograph 1. The vegetation is principally Sand Couch *Elymus farctus*, with lesser amounts of Lyme Grass *Leymus arenarius*. Marram *Ammophila arenaria*, is establishing in places but with weak growth, as would be expected given that sand accumulation is limited in this zone. Forbs are frequent and make up around 10% of the flora. Of these, Narrow-leaved Ragwort *Senecio inaequidens*, and Canadian Fleabane *Erigeron canadensis,* are frequent throughout, with Sea Sandwort *Honckenya peploides*, frequent along the seaward margin. Smooth Sow Thistle *Sonchus oleraceus*, Dandelion *Taraxacum officinale agg*., and Sea Beet *Beta vulgaris maritima*, are occasional and more rarely Catsear, *Hypochaeris radicata,* Curled Dock *Rumex crispus*, and various Oraches, *Atriplex spp.,* are present. The change in the habitat appears to have been driven by the accumulation of sediment with the vegetation being typical of establishing dune. Species indicative of nutrient enrichment were limited to Curled Dock and a few individual specimens of Thistle *Cirsium spp*., though in this instance Curled Dock is likely to be more indicative of the remains of the shingle plant community. Therefore nutrient enrichment does not appear currently be having any significant effect on the type of vegetation.

A little further south and to the seaward of the fenced area there is suitable substrate in the form an area of mixed shingle and sand. However, this is a small area (a few tens of square metres) and being slightly lower in the tidal frame is subject to inundation, at least on higher spring tides.

In the light of the above it is considered that there are currently no suitable areas for a colony of Little Terns to nest at South Gare. It is possible that one or two pairs might attempt to nest but even this seems unlikely.

Photograph 4. Part of the area at South Gare previously fenced for Little Tern

2.3 Seal Sands Peninsula

It was not possible to gain permission to access Seal Sands Peninsula in the time-frame required for this report therefore the description is based on existing knowledge of the site.

Seal Sands Peninsula is an artificially created spit which separates Seal Sands and Seaton Channel from the River Tees. It is steep-sided throughout and for approximately half of its length it is little more than the width of the access road. At the northern end it broadens out, but there is a breach in the western side and consequently most of this wider part is much lower than the sides and consists of intertidal saltmarsh. All other areas around the base of the Peninsula are intertidal, leaving no suitable habitat for nesting terns. The sides of the Peninsula then rise steeply and have in many places been covered by blown sand which has been colonised by Marram grass, the topography on its own precluding nesting by terns. On the top of the Peninsula there is approximately 0.5ha of relatively flat ground but again this is fixed-dune habitat and does not contain any areas of the shingle/cobble habitat that would be required by nesting Little Terns.

3. Evaluation of air quality impacts

This section considers the impacts on dune vegetation from nitrogen. These are set out in the Air Pollution Information system (APIS) as follows:

- These systems are adapted to low levels of mineral N availability: increasing the availability of N will threaten the competitive balance between species leading to changes in composition and loss of habitat species constants.
- Speeds up succession through the chronosequence, movement between the dune stages.
- Lichens and mosses are particularly sensitive both from direct effects associated with N accumulation and from shading as a consequence of increase growth of overstorey vegetation in response to N deposition.
- Species sensitivity to other stresses e.g. grazing pressure, desiccation and pathogens may be enhanced.

The impacts described above are mainly on the intrinsic nature of the dune as habitat, whereas what is assessed in this report is how those impacts might affect the potential for Little Terns to nest. The specific impact to be considered is therefore any increase in vegetation growth as a result of additional nitrogen deposition, which would cover the more open mixtures of sand, shingle and cobbles which Little Terns require for nesting.

A more detailed description of the impacts of nitrogen deposition on dune in APIS states; "In UK dunes, effects of N occur through eutrophication and impacts on soils (Phoenix et al. 2012). In semi-fixed (open) dune habitats, N deposition increased cover of marram grass (*Ammophila arenaria*) and increased total biomass (Jones et al 2004), while in fixed dune grasslands, plant species diversity decreased and biomass increased. Acid dune systems appear to be more sensitive to N inputs than calcareous dunes." and "Dominant dune building species i.e. *Ammophila arenaria, Elytrigia juncea* and *Leymus arenaruis* (Harkel et al 1998; Veer & Kooijman 1997) are likely to respond positively to N deposition by increasing their cover."

The principal sand dune communities where these impacts have been identified, semi-fixed dune and fixed dune, are not habitats in which Little Terns nest, therefore impacts on those habitats can be ruled out. Little Tern nesting habitat is focused on fore-dune communities and to some extent incipient mobile-dune communities. These communities can include *Elytrigia juncea* (syn. *Elymus farctus*), *Leymus arenarius* and *Ammophila arenaria*, which could in theory increase their cover in these locations due to increased nitrogen deposition. This is therefore considered with respect to each of the three locations.

At Seal Sands Peninsula fore-dune habitats are effectively absent, being prevent from forming by the steep, made-ground which impedes zonation and gives a sharp transition from intertidal to semi-fixed and fixed dunes.

At Seaton Snook, the area of fore-dune, ie between the high water mark and fixed dunes is very narrow, as described in section 2 and shown in Photograph 2. While there may be the potential for the Sand Couch in that location to increase in coverage, the small amount of shingle/cobble present and the confined area make it unsuitable for a Little Tern colony in any case.

At South Gare, the amount of vegetation in the area that was previously potentially suitable for Little Tern nesting has increased noticeably within the past year. This has coincided with an increase in sand deposition creating some more elevated areas. As this marked increase in vegetation is recent and has happened rapidly, it seems unlikely to have been a result of a significant increase in nitrogen over that period but rather seems likely to have been in response to the changing substrate. In addition, the species present are typical of this vegetation community and do not include any significant elements of nitrophilous species. Regardless of the cause, the current levels of sand and associated vegetation cover have rendered this area unsuitable for nesting Little Terns therefore any increase in nitrogen deposition would make no difference to its potential to support that species.

4. Desk-based appraisal of selected sites for breeding Little Tern *Sternula albifrons* and Common Tern *Sterna hirundo*, Teesmouth and Cleveland Coast SSSI

Teesmouth and Cleveland Coast SSSI was notified on 31 July 2018, replacing and consolidating seven previously notified SSSI. The supporting information document accompanying the notification stated the following:

> "Little Tern was a feature of the previously notified South Gare and Coatham Sands SSSI, but they have not bred in significant numbers there since 2005. A number of other locations within the Teesmouth and Cleveland Coast SSSI have been used for breeding in the recent past (Seaton Sands, Seaton Snook, RSPB Saltholme, Saline Lagoon on Number 4 Brinefield) but not in significant numbers since 2007. A single pair fledged two chicks at South Gare in 2015 and two pairs nested there unsuccessfully in 2017. There is a large Little Tern colony at Crimdon Dene, just north of Teesmouth and Cleveland Coast SSSI, but within Teesmouth and Cleveland Coast pSPA and Durham Coast SSSI. This colony became established in the mid- to late-1990s and has grown into a significant colony, with a recent peak of 114 pairs in 2012. It is considered that Little Terns choose colony locations around the Tees Estuary each year depending on the local conditions (such as fish stocks, disturbance and vegetation growth at nest sites. The Little Terns nesting at Crimdon use the Teesmouth and Cleveland Coast SSSI for feeding. In addition they form pre- and post-breeding gatherings within the SSSI (in particular at North and South Gare). Little tern is a feature of the Teesmouth and Cleveland Coast pSPA (between 2010 and 2014 supporting an average of 81 breeding pairs, representing 4.3% of the GB population). The Teesmouth and Cleveland Coast SSSI therefore supports essential activities (foraging and roosting/loafing) of more than 1% of the total British breeding population of Little Tern. In addition Little Tern qualify for SSSI selection due to being an international feature.
>
> The Teesmouth and Cleveland Coast SSSI supports over 1% of the total British breeding population of Common Tern (between 2010 and 2014 the SSSI supported an average of 399 breeding pairs which represents 4.0% of the GB breeding population). Common Tern is a feature of the Teesmouth and Cleveland Coast pSPA and therefore also qualifies for SSSI selection as a result of being an international feature. The majority of Common Terns breed on islands and artificial rafts within the RSPB Saltholme reserve, with small numbers scattered at a number of other locations around the estuary. They feed out at sea as well as along the tidal Tees and its main tributaries."

The three sites relevant to the current appraisal are as follows:

Seaton Snook (NZ537268) shown as Point A in Figure 1.

Seal Sands Peninsula (NZ537262) shown as Point B in Figure 1.

South Gare (NZ558278) shown as Point C in Figure 1.

The strandline and sand dune habitats at all three of these locations have developed directly on or immediately adjacent to anthropogenic structures, namely training walls and breakwaters, largely constructed between 1880 and 1970, so space for further dune development is inevitably limited by their position in the tidal frame. All of these locations are to some extent subject to cyclical processes of accretion and erosion around the high water mark, but above this level the dunes are relatively stable. In the case of the sheltered western portions of both Seaton Snook and Seal Sands Peninsula, the recent development of saltmarsh vegetation (principally *Salicornia* and *Sueda*) serves to reduce the extent and frequency of wave attack and thereby ameliorates erosion.

At this stage Common Tern can be scoped out of the appraisal process, since the species has never been known to nest at any of these three sites, nor does any suitable habitat (islands and artificial rafts within lagoons) exist at these locations.

Henceforth, the appraisal will focus on Little Tern.

Figure 1. Location of relevant tern breeding and potential breeding sites.

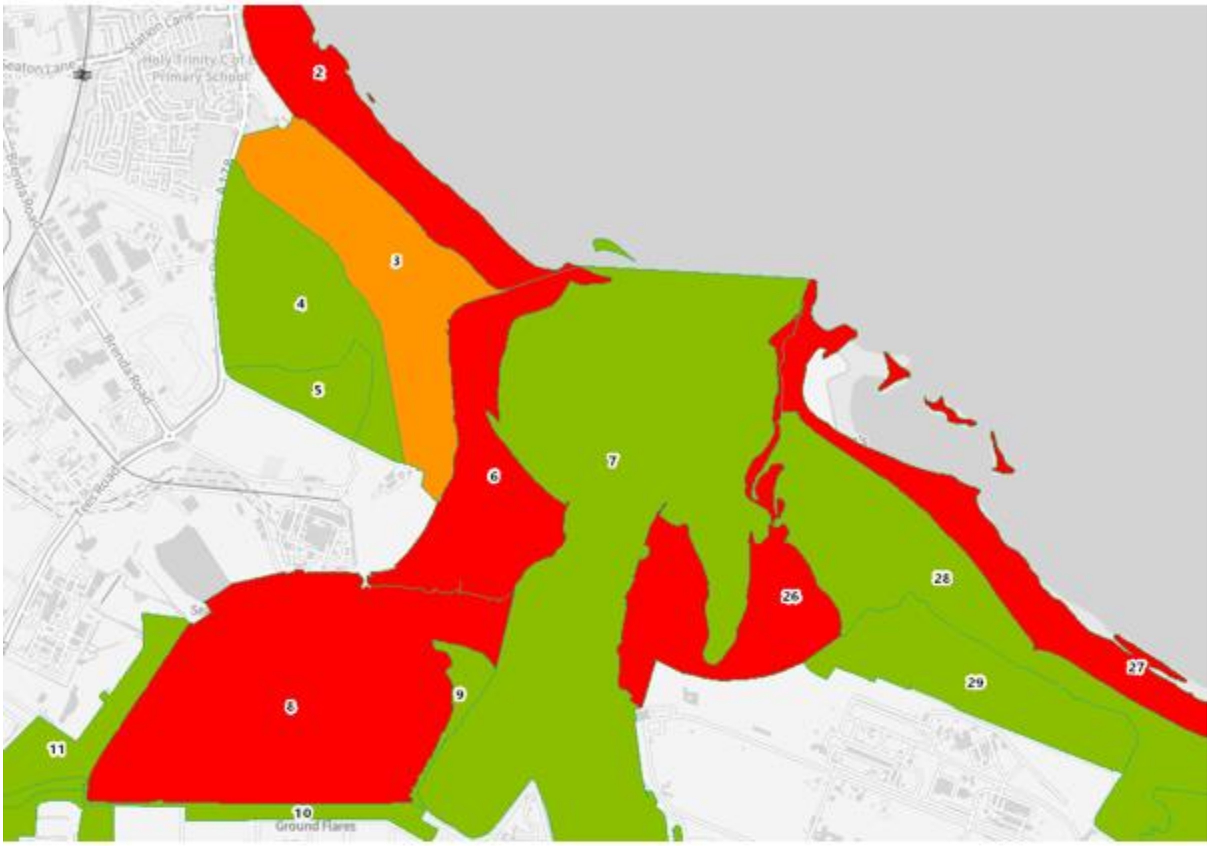
The most recent condition assessments for the SSSI units in which the three sites are located are summarised in Table 1.

Table 1. Summary of current SSSI unit condition.

Site	SSSI Unit	Date	Condition Assessment	Reason for Unfavourable Condition
Seaton Snook	6	March 2018	Unfavourable declining	Recreational disturbance
Seal Sands Peninsula	9	March 2018	Favourable	N/a
South Gare	27	March 2018	Unfavourable declining	Recreational disturbance

Natural England has not undertaken, or at least published, any further condition assessments in the intervening five years. It should be borne in mind that the above condition assessments relate to a range of notified features including breeding terns and refer to the whole units depicted in Figure 2.

Figure 2. SSSI Unit Condition.



Since 2018 no Little Terns have bred at any of the three sites, although in 2021 one pair did manage to fledge a single juvenile from a nest on the developing cobble berm immediately south of the North Gare breakwater, at NZ540282, which lies within Unit 6 of the SSSI. During the five-year period since 2018, the species has abandoned Crimdon Denemouth in favour of the foreshore at Seaton Carew, where in 2021 an impressive 89 chicks fledged from 91 hatched (Cleveland Bird Report 2021).

5. Conclusions

It is clear that, for the most part, conditions are currently unsuitable for breeding Little Tern at the three selected sites. Habitat extent is extremely limited in extent at all of these sites, and – as is clear from Natural England's own condition assessments of SSSI Units 6 and 27 – the intensity of recreational disturbance renders successful breeding all but impossible at two of them, the single juvenile fledged at North Gare constituting an exception that proves the rule (the Cleveland Bird Report 2021 stated that "Rather surprisingly a colour-ringed chick fledged at North Gare, where it managed to hide in the rocks for long enough to become fully-winged. This was despite the close proximity to large numbers of beach visitors with their barbeques, children and dogs").

A further factor that militates against Little Tern breeding success is predation by both mammals (in particular fox and hedgehog) and birds (especially corvids, raptors and gulls). Effective fencing and 24-hour wardening are among widely adopted measures to deter such predation of eggs and chicks, as is demonstrated by the impressive recent productivity at the Seaton Carew colony.

There is no evidence that air quality impacts are implicated in the development of dune vegetation, to the detriment of the open shingle and cobble habitats used by breeding Little Terns. Such habitats are in any case by definition ephemeral, being created and eroded by dynamic coastal processes, and colonised by strandline and sand dune National Vegetation Classification types, as indeed is shown by the recent history of the Crimdon Denemouth colony. Neither the SSSI notification documents nor the condition assessments make any reference to threats posed by air quality / nutrient deposition.

There is, however, evidence that Little Terns are capable of colonising new sites as suitable habitat becomes available, and abandoning old sites with suboptimal habitat, increased recreational pressure and / or more intense predation. In 2018 60+ pairs fledged no young at Crimdon Denemouth, largely because of egg predation by Carrion Crows *Corvus corone*. The following year the Seaton Carew site was utilised for the first time, and 36 pairs fledged 38 juveniles.

The recent natural development of a substantial cobble berm in the lee of the North Gare breakwater is an example of how dynamic coastal processes can create new habitat and potential breeding opportunities for Little Tern.