BSG ecology

Grangetown Energy Recovery Facility

Assessment of air quality impacts on Teesmouth and Cleveland Coast SSSI

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Client	FCC Environment
Project	Grangetown Energy Recovery Facility
Report title	Assessment of air quality impacts on Teesmouth and Cleveland Coast SSSI
Draft version/final	FINAL
File reference	P20-1004 Grangetown Prairie Air Quality Impacts on SSSI.docx

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Reviewed	Roger Buisson	Associate Director	21 January 2022
Updated			Click here to enter a date.
			Click here to enter a date.
Approved for issue to client	Steven Betts	Associate Director	25 January 2022
Issued to client	Steven Betts	Associate Director	25 January 2022

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Contents

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 Air quality modelling has been completed by Environmental Compliance Limited (ECL) and this has revealed that air quality changes may affect parts of the Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI). This report therefore considers the impact of the proposed ERF on the SSSI.

Site description

1.3 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.

1.4 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

1.5 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).

1.6 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.

1.7 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.

Consultation

1.8 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).

1.9 Natural England provided the following advice in relation to the potential impacts of the ERF on the Teesmouth and Cleveland Coast SSSI:

- Modelling locations TCC10, 11, 12 and 13 (see Figure 2) 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 birds and eutrophication is currently resulting in the formation of algal mats that make feeding difficult for some species.
- Saltmarsh and sand dune are important as qualifying features of the Teesmouth and Cleveland Coast SSSI.

Contributors

1.10 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.

1.11 The report has been reviewed by Roger Buisson, Associate Director at BSG Ecology. Roger has worked for over 30 years assessing the impacts of man's activities on natural habitats and species, including the preparation of, and contributions to, EIAs and HRAs for energy recovery facilities, port and harbour infrastructure, underground cable routes, renewable energy projects (onshore and offshore wind and solar) and housing developments.

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

2 Scope of the Assessment

2.1 The nearest part of the Teesmouth and Cleveland Coast SSSI is approximately 1.4 km to the north-west of the Site. Consequently, no significant impacts on the SSSI are likely to arise during the construction phase of the proposed development due to the separation distance. In particular, degradation of habitats arising from pollution, in particular airborne (e.g., dust) and water-borne (e.g., silt) pollutants, are likely to be limited in their extent to the Site and the adjacent area.

2.2 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 ERF. No further degradation of habitat arising from excavation work, material storage and mobile plant tracking etc is likely during this phase of the development.

2.3 The decommissioning phase of the proposed development is expected to result in similar impacts to those described for the construction phase of the development, i.e., no significant impacts on the SSSI are likely to arise during this phase of the works.

Zone of Influence

2.4 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.

2.5 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. As the nearest part of the SSSI is approximately 1.4 km away from the Site, habitat degradation as a result of the proposed development is highly unlikely.
- 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 assessment). As the nearest part of the SSSI is approximately 1.4 km away from the Site, habitat degradation as a result of the proposed development is highly unlikely.
- Degradation of habitats (waterborne pollution) – Waterborne 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. A watercourse runs alongside the western boundary of the Site and this flows into culverts to the north and south. It is likely that this drains into the Tees Estuary to the north of the Site. At this point any pollutant 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. As the Site has already been subject to remediation, the release of contaminants during the construction phase is unlikely. As contractors will be required to adhere to best practice guidance for mitigating impacts on watercourses, it is considered that there is a low likelihood of pollutants, including silt, reaching the River Tees, which is approximately 1.4 km to the north-west of the Site. A ZoI of 1 km has therefore been adopted for the assessment.

2.6 During the operation phase a ZoI of 10 km has been adopted for the consideration of airborne pollutants emitted by the ERF. 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).

2.7 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 1 km from the Site);
- Degradation of habitats (airborne pollution – gaseous and particulate pollutants) (ZoI is 10 km from the Site.

2.8 Taking into account the evaluation of these impact mechanisms and the associated ZoIs, this assessment only considers air quality impacts on the Teesmouth and Cleveland Coast SSSI during the operational phase of the ERF. Impacts on European sites are considered in a separate report (BSG Ecology, 2022).

3 Information on the Teesmouth and Cleveland Coast SSSI

Qualifying features

3.1 The Teesmouth and Cleveland Coast SSSI is of special interest for the following nationally important features that occur within and are supported by the wider mosaic of coastal and freshwater habitats:

Geology:

- Jurassic geology;
- Quaternary geology;

Habitats:

- sand dunes;
- saltmarshes;

Species:

- breeding harbour seals *Phoca vitulina*;
- breeding avocet *Recurvirostra avosetta*, little tern *Sternula albifrons* and common tern *Sterna hirundo*;
- a diverse assemblage of breeding birds of sand dunes, saltmarsh and lowland open waters and their margins;
- non-breeding shelduck *Tadorna tadorna*, shoveler *Spatula clypeata*, gadwall *Mareca strepera*, ringed plover *Charadrius hiaticula*, knot *Calidris canutus*, ruff *Calidris pugnax*, sanderling *Calidris alba*, purple sandpiper *Calidris maritima*, redshank *Tringa totanus* and Sandwich tern *Thalasseus sandvicensis*;
- an assemblage of more than 20,000 waterbirds during the non-breeding season.

3.2 In Section 2 the scope of the assessment is described as being limited to consideration of air quality impacts during the operational phase of the development. Changes in air quality are not likely to impact on the geological interest of the SSSI and so this has been scoped out of the assessment.

3.3 Similarly, changes in air quality are not likely to result in direct impacts on any of the species that are qualifying features of the SSSI (http://www.apis.ac.uk/, accessed 11 January 2022). For this reason the listed species have been scoped out of the assessment; however, the habitats that support these species have been considered, specifically mudflats, sand dunes and saltmarsh. Should a deterioration in habitat condition be identified by the assessment then consideration would be given to the assessment of potential indirect impacts on species through their dependence on particular habitats and the food sources that those habitats support.

Site condition

3.4 Natural England has published the results of a condition assessment 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).

3.5 Examination of priority habitat mapping on the MAGIC website (www. magic.defra.gov.uk, accessed 11 January 2022) shows that saltmarsh is present in SSSI management units 8 and 9. A condition assessment is only available for management unit 8, which is reported to be 'unfavourable declining' due to coastal squeeze and pollution.

3.6 Habitat mapping on the MAGIC website (www. magic.defra.gov.uk, accessed 11 January 2022) shows that sand dune is present in SSSI management units 28 and 29. A condition assessment is not available for either management unit.

Habitat sensitivity

3.7 Habitats may be 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):

3.8 "*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)*."

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

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

3.11 The critical loads used in this assessment are presented in Tables 1 and 2. These include a range for each site. The lower end of the range has been used for a conservative assessment.

3.12 Natural England has advised (letter received from Nick Lightfoot dated 13 January 2022, reference: DAS A002818 / 371306) that 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).

Table 1*: Nitrogen Nutrient Critical Loads (source: Air Pollution Information Service (APIS)) *denotes priority habitats*

Habitat / Ecosystem	N Critical Load (CL) range (kg N/ha/yr)
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

***Table 2**: Acid Deposition Critical Loads for habitats that support qualifying features (birds)*

Habitat	Acidity CLminN-CLmaxN (keq /ha/yr)	Acidity CLmaxS (keq /ha/yr)
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

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.

No Critical Load/Level data are available for saltmarsh, APIS advising that 'The likely contribution of acidification to this breakdown is not understood but the risks from acid deposition compared with eutrophication are probably small, based on available evidence.'

No Critical Load/Level data data are available for sand dunes, APIS advising that 'The majority of dune systems in the UK are calcareous, well buffered and low in heavy metals so should be tolerant of acid deposition.'

4 Impact Assessment

Summary of the air quality modelling approach

4.1 An air quality assessment has been carried out by ECL (ECL, 2022) using the latest version of the ADMS modelling package to determine the impact of emissions to air on local European sites and their underpinning SSSIs, 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 (see Figure 2).

4.2 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.

4.3 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[1].

4.4 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).

4.5 Modelling points (specific locations shown on Figure 2) were selected to include key sensitive ecological receptors (see Table 3 and associated table notes). Modelling points TCC10 to TCC13 have been included specifically to assess air quality impacts on coastal priority habitats: TCC10 is a saline lagoon located at Saltholme; TCC11 is saltmarsh and sand dune; TCC12 is saltmarsh; and TCC13 is sand dune. All of these modelling points are located within the boundary of the SSSI.

Air quality modelling data

Overview

4.6 The air quality modelling undertaken by ECL considered a number of different ecological receptors, which are listed in Table 3. As previously noted, modelling points TCC10 to TCC13 are the focus of this assessment as they relate to priority habitats that form part of the qualifying interest of the Teesmouth and Cleveland Coast SSSI.

4.7 The Critical Loads for deposition that have been used in the assessment are presented in Tables 1 and 2 for the habitat that have been considered.

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

***Table 3**: Ecological Receptors Considered for the Assessment (see Figure 2)*

ECL Receptor	Easting (X) [(a)]	Northing (Y) [(a)]	Distance from Source [(b)] (m)	Heading (degrees)
TCC10	450882	522960	3825	294
TCC11	453572	525627	4294	349
TCC12	451681	525099	4570	324
TCC13	456614	525978	5085	26

Notes to Table 3
(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).

Airborne NO_X, SO_2 and NH_3 concentrations

4.8 A summary of site-specific baseline concentrations of NO_X, SO_2 and NH_3, as provided by APIS, is presented in Table 4. Background concentrations for each ecological receptor have been obtained at the same point as listed in Table 3, i.e., the closest grid square to the point of the site used in the assessment. Comparison of the baseline data presented in Tables 4 and 5 with the Critical Load ranges presented in Tables 1 and 2 reveals that there is already exceedance of the Critical Load for most pollutants when considered in the absence of the proposed development.

***Table 4**: Baseline Concentrations of NO_X, SO_2 and NH_3*

ECL Receptor Reference	Background Concentration [(a)]			
	NO_X (µg/m^3)		SO_2 (µg/m^3)	NH_3 (µg/m^3)
	Annual Mean	24 Hour Mean [(b)]	Annual Mean	Annual Mean
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 [(c)]	0.89

Notes to Table 4
(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) 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.

Table 5: Background Nutrient Nitrogen and Acid Deposition

ECL Receptor Reference	Nutrient Nitrogen Background (kgN/ha/yr) [(a)]	Acid Deposition Background - (keq/ha/yr) [(b)]		
		Total	Nitrogen	Sulphur
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

Notes to Table 5
(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).

Deposition parameters - sensitive habitats

4.9 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.

4.10 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 6: 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 6
(a) Concentrations are at reference conditions i.e., 273K, 1 atmosphere, 11% oxygen, dry.
(b) Unless stated otherwise, the BAT-AEL[2]s have been used (new plant, high end).

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

4.11 EA Operational Instruction 67_12[3] 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. This guidance has been adopted for the assessment in relation to the SSSI.

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

4.13 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 the receiving site.

4.14 Information presented on the APIS website for the Teesmouth and Cleveland Coast SSSI indicates that sand dunes and saltmarsh, which are habitats that may be used by some of the birds associated with the SSSI, are sensitive to nutrient nitrogen effects.

4.15 For northern shoveler and gadwall APIS reports that there is no comparable habitat with an established critical load estimate available. Furthermore the habitat that supports these species is typically P limited. The potential effects on northern shoveler and gadwall 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.

4.16 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 22 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.

[2] Best Available Technique – Associated Emission Level
[3] 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.

4.17 Information presented on the APIS website for the SSSI indicates that Sandwich tern, common tern and little tern are associated with dune habitat; however, there are no known dune nest sites located within the area that might be impacted by the operation of the ERF. Consequently, impacts on tern species are not considered further in this report.

4.18 Information presented on the APIS website for the SSSI indicates that sanderling, knot, ringed plover, avocet, redshank and shelduck are all associated with saltmarsh habitat. Modelling point TCC11 covers this habitat, which is present in SSSI management units 8 and 9. Breeding ruff is associated with hay meadows, which does not appear to be present within the study area (https://magic.defra.gov.uk/, accessed 11 January 2022). Wintering ruff is likely to be associated with saltmarsh habitat.

4.19 Information presented on the APIS website for the SSSI indicates that purple sandpiper is associated with littoral rock habitat, which is not sensitive to nitrogen deposition. Similarly APIS reports that grey seal is associated with inshore sublittoral rock, which is not sensitive to nitrogen deposition.

4.20 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 most of the air quality modelling points): this habitat is not considered to be sensitive to nitrogen inputs.

4.21 Table 7 shows that no NOx exceedance of the long-term PC is predicted at modelling points TCC10, TCC11, TCC12 and TCC13. The data show that the background levels already exceed the long-term Critical Level in the absence of development.

4.22 Table 9 similarly shows no exceedance of the long-term PC for NH3 at modelling points TCC10, TCC11, TCC12 and TCC13.

4.23 Table 10 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.

4.24 Table 11 shows predicted exceedance for nitrogen deposition at modelling point TCC13. Predicted exceedance of the lower CL is 1.07%. Predicted exceedance of the upper CL is 1.34%. The data show that the background levels already exceed the lower CL, i.e., there is exceedance in the absence of development.

4.25 Table 8 below shows that there is no predicted exceedance for SO2 at any modelling points. Similarly Table 12 below shows that there is no predicted exceedance for acid deposition at any modelling points.

***Table 7**: Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	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)
TCC10	0.119	30	0.40%	n/a	n/a	n/a	1.64	75	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%

4.26 A summary of maximum predicted GLCs of oxides of nitrogen at the modelling points is presented in Table 7. 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, Ramsar sites and SSSIs. Any significant impacts are highlighted in bold.

4.27 It can be seen from the data in Table 7 that the daily mean oxides of nitrogen PCs are all less 10% of the respective critical level and therefore, are not significant at all receptor locations. For the annual mean oxides of nitrogen PCs, the impact is also not significant (i.e., greater than 1% of the long-term critical level).

***Table 8**: Comparison of Maximum Predicted SO_2 PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	Long Term PC (µg/m³)	Long Term Critical Level (CL) (µg/m³)	Long Term PC as a % of the CL (µg/m³)
TCC10	0.0262	20	0.13%
TCC11	0.0226		0.11%
TCC12	0.0153		0.08%
TCC13	0.0518		0.26%

4.28 A summary of maximum predicted GLCs of sulphur dioxide at the modelling points are presented in Table 8. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsar sites and SSSIs. In Table 8, any significant impacts are highlighted in bold.

4.29 It can be seen from the data in Table 8 that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all modelling points.

***Table 9**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	**NH_3 (annual mean) - When Lichens and Bryophytes are not present**					
	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**
TCC10	0.00812	3	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

4.30 A summary of maximum predicted GLCs of ammonia at the modelling points are presented in Table in 9. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for SPAs, SACs, Ramsar sites and SSSIs. Any significant impacts are highlighted in bold.

4.31 It can be seen from the data in Table 9 that the annual mean ammonia PCs are all less than 1% of the critical level at the modelling locations. The impact is not significant (i.e., greater than 1% of the long-term critical level) at any modelling point.

***Table 10**: Comparison of Maximum Predicted HF PCs with Critical Levels at receptor locations TCC10-13*

ECL Receptor Ref.	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)
TCC10	**0.00651**	0.5	**1.30%**	0.003*	0.01	2%	0.0140	5	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 10

*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 [(4)].

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

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

4.33 It can be seen from the data in Table 10 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all modelling points.

4.34 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 TCC10, TCC12 and TCC13 - and are therefore potentially significant. TCC11 is less than 1% of the critical level therefore no further assessment is required.

4.35 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 (5). 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.

4.36 The maximum weekly HF PC are all less than 1% 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).

***Table 11**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at receptor locations TCC10-13*

ECL Receptor Ref.	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
TCC10	0.0542	8	10	0.68%	0.54%	n/a	n/a	n/a	n/a
TCC11	0.0470			0.59%	0.47%	n/a	n/a	n/a	n/a
TCC12	0.0318			0.40%	0.32%	n/a	n/a	n/a	n/a
TCC13	**0.107**			**1.34%**	**1.07%**	9.1	9.21	**115%**	92%

4.37 A summary of maximum predicted nutrient nitrogen deposition rates at the receptor locations related to the SSSI are presented in Table 11. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 3.12, 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).

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

4.38 In Table 11, 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.

4.39 It can be seen from the data in Table 11 that there are predicted exceedances for nitrogen deposition at modelling point TCC13, with the remaining sites screening out as insignificant. 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 (1.07%). Using the more conservative Critical Load range there are no PECs greater than 100%.

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

Table 12*: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at receptor locations TCC10-13*

ADMS Ref.	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
TCC 10	0.00386	1.03	0.00411	0.20	0.223	1.998	1.56	1.03	0.204	0.40%	n/a	n/a
TCC 11	0.00335	1.07	0.00354	0.28	0.223	1.998	1.56	1.07	0.284	0.34%	n/a	n/a
TCC 12	0.00226	1.07	0.00239	0.28	0.223	1.998	1.56	1.07	0.282	0.23%	n/a	n/a
TCC 13	0.00763	0.75	0.00808	0.25	0.223	1.998	1.56	0.758	0.258	0.79%	n/a	n/a

Notes to Table 12

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

4.41 A summary of maximum predicted acid deposition rates at the modelling points are presented in Table 12, with the deposition velocities for grassland utilised for all modelling points assessed.

4.42 In Table 12, 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.

4.43 It can be seen from the data in Table 12 that the maximum acid deposition rates due to process contributions are less than 1% of the critical load at all the modelled points.

Revised Modelling

4.44 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 6).

4.45 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.

4.46 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.

4.47 The revised modelling data (Table 24 in ECL, 2022) show that the annual mean sulphur dioxide PCs are all less than 1% of the critical level and therefore are not significant at all monitoring points considered.

4.48 The revised modelling data (Table 25 in ECL, 2022) show that the annual mean ammonia PCs are all less than 1% of the critical level at modelling points TCC10-TCC14. The PECs as a percentage of the annual critical level are all less than 100% of the critical level. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

4.49 The revised modelling data show negligible change for hydrogen fluoride compared to the data presented in Table 10. It can therefore be assumed that there will be no adverse effect on the ecological sites assessed.

4.50 The revised modelling data (Table 27 in ECL, 2022) show that there are predicted exceedances for Nitrogen deposition at modelling points 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 not exceeded at any monitoring points. 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.

4.51 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. 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. It can therefore be assumed that there will be no adverse effects on these sites.

In-combination assessment

4.52 ECL has carried out a cumulative assessment, the methods and detailed results being presented in a separate report (ECL, 2021).

4.53 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.

4.54 The developments that ECL were aware of (at the time of writing), but which have been excluded from the assessment for the reasons given 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.

4.55 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[6].

[6] 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 13: *Comparison of Maximum Predicted Oxides of Nitrogen PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	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)
TCC10	0.159	30	0.53%	n/a	n/a	n/a	1.69	75	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%

4.56 A summary of maximum predicted GLCs of oxides of nitrogen at the modelling points is presented in Table 13. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively. Any significant impacts are highlighted in bold.

4.57 It can be seen from the data in Table 13 that the daily mean oxides of nitrogen PCs are all less than 10% of the respective critical level and therefore, are not significant at the four receptor locations identified in relation to the SSSI.

4.58 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 TCC13. Consequently, the PECs have been calculated for these receptors. Using the background NO_X concentrations the PEC assessment for TCC13 is shown in Table 13.

4.59 It can be seen from the results in Table 13, that for TCC13 there will be no adverse effect (i.e., the PECs are less than 100% of the critical level).

4.60 The results of revised modelling carried out by ECL in 2022 (Table 43 in ECL, 2022) show similar results, i.e., that no adverse effect can be assumed for the modelling points (i.e., the PECs are less than 100% of the critical level).

Table 14: *Comparison of Maximum Predicted SO_2 PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	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
TCC10	0.0399	20	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%

4.61 A summary of maximum predicted GLCs of sulphur dioxide at the modelling points are presented in Table 14. The significance of the impacts has been determined using the 1% criteria for long-term predictions, for four receptor locations identified in relation to the SSSI. Any significant impacts are highlighted in bold.

4.62 It can be seen from the data in Table 14 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 modelling points TCC10, TCC11 and TCC12.

4.63 For the annual mean sulphur dioxide PC, 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/m^3. 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/m^3 has been used for calculating the SO_2 PEC for TCC13.

4.64 Consequently, with a PEC of 2.60 µg/m^3 (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).

4.65 The revised modelling data from 2022 show a similar result (ECL, 2022).

***Table 15**: Comparison of Maximum Predicted NH_3 PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	NH_3 (annual mean) - When Lichens and Bryophytes are NOT present					
	Long Term PC (µg/m^3)	**Long Term Critical Level (CL) (µg/m^3)**	**Long Term PC as a % of the CL (µg/m^3)**	**Background (µg/m^3)**	**PEC (µg/m^3)**	**PEC as %age of CL**
TCC10	0.0133	3	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%

4.66 A summary of maximum predicted GLCs of ammonia at the four receptor locations identified in relation to the SSSI are presented in Table 15. The significance of the impacts has been determined using the 1% criteria for long-term predictions. Any significant impacts are highlighted in bold.

4.67 It can be seen from the data in Table 15 that, with the exception of TCC13) the annual mean ammonia PCs are all less than 1% of the critical level at the majority of the modelling points assessed. The impact is potentially significant (i.e., greater than 1% of the long-term critical level) at TCC13. Consequently, PECs will need to be calculated for this receptor.

4.68 Using the relevant background NH_3 concentrations, the PEC assessment for TCC13 is shown in Table 15. As displayed by the results in Table 15 it can be assumed that there will be no adverse effect on the SSSI (i.e., the PEC is less than 100% of the critical level).

4.69 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 16: *Comparison of Maximum Predicted HF PCs with Critical Levels at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	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)
TCC10	**0.00656**	0.5	**1.31%**	0.003*	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 16

*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 [(7)].

4.70 A summary of maximum predicted GLCs of hydrogen fluoride at the four receptor locations identified in relation to the SSSI are presented in Table 16. The significance of the impacts has been determined using the 1% and 10% criteria for long and short-term predictions, respectively, for the SSSI. Any significant impacts are highlighted in bold.

4.71 It can be seen from the data in Table 16 that the daily mean HF PCs are all less than 10% of the critical levels and therefore are not significant at all modelling points.

4.72 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 TCC10 - TCC13, inclusive, and are therefore potentially significant.

4.73 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/m³ with an elevated background of 0.003 µg/m³ where there are local anthropogenic emission sources [(8)]. In the interest of being conservative, the higher background concentration (i.e., 0.003 µg/m³) will be used for the purposes of calculating the PECs.

4.74 The maximum weekly HF PC for the four modelling points listed in Table 16 occurs at TCC13 and therefore the worst-case PEC would be 0.0177 µg/m³ (or 3.55% 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).

4.75 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).

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

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

***Table 17**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at receptor locations TCC10-13 – In-combination*

ECL Receptor Ref.	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
TCC10	0.0688	8	10	0.86%	0.69%	n/a	n/a	n/a	n/a
TCC11	**0.118**			**1.48%**	**1.18%**	10.78	10.90	**136%**	**109%**
TCC12	0.0630			0.79%	0.63%	n/a	n/a	n/a	n/a
TCC13	**0.421**			**5.26%**	**4.21%**	9.1	9.52	**119%**	95%

4.76 A summary of maximum predicted nutrient nitrogen deposition rates at the receptor locations TCC10-13 are presented in Table 17. It should be noted that the habitat with the lowest lower and upper critical load has been selected. As noted in section 3.12, 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).

4.77 In Table 17, 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 the SSSI) of the critical load are highlighted in bold.

4.78 It can be seen from the data in Table 17 that there are predicted exceedances for nitrogen deposition at modelling point TCC11 and TCC13, with the remaining sites screening out as insignificant. 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 (1.18% at TCC11 and 4.21% at TCC13).

4.79 If the Critical Load range is considered for Coastal stable dune grasslands (calcareous type), the PEC is only greater than 100% for the lower Critical Load (10 kgN/Ha/yr) at TCC11. It is worth noting that the background levels are already elevated and exceed the lower critical load in the absence of the development.

4.80 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 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 TCC13 and TCC14.

4.81 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 18*: Comparison of Maximum Predicted Acid Deposition Rates with the Maximum Critical Load at receptor locations TCC10-13 – In-combination*

ADMS Ref.	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
TCC 10	0.00490	1.03	0.00520	0.20	0.223	1.998	1.56	1.03	0.205	0.51%	n/a	n/a
TCC 11	0.00842	1.07	0.00894	0.28	0.223	1.998	1.56	1.08	0.289	0.87%	n/a	n/a
TCC 12	0.00448	1.07	0.00475	0.28	0.223	1.998	1.56	1.07	0.285	0.46%	n/a	n/a
TCC 13	0.0299	0.75	0.0318	0.25	0.223	1.998	1.56	0.78	0.282	**3.09%**	1.06	53%

Notes to Table 18

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

4.82 A summary of maximum predicted acid deposition rates at the identified modelling points are presented in Table 18, with the deposition velocities for grassland utilised for all four receptor locations identified in relation to the SSSI assessed.

4.83 In Table 18, 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 the SSSI) of the critical load are highlighted in bold.

4.84 It can be seen from the data in Table 18 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 TCC13.

4.85 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 18 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 receptors at these locations.

4.86 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).

Revised air quality modelling data

4.87 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, 2021).

4.88 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 19). In accordance with published guidance[9], the impacts can therefore be considered insignificant.

***Table 19**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC10 – TCC13 (Installation Only)*

<table>
<tr><th>ADMS Ref.</th><th>Lower Critical Load (kgN/ha/yr)</th><th>Upper Critical Load (kgN/ha/yr)</th><th>Nutrient Nitrogen Deposition Rate [(a)] (kgN/ha/yr)</th><th>PC as a % of Lower Critical Load</th><th>PC as a % of Upper Critical Load</th><th>Background Concentration (kgN/ha/yr)</th><th>PEC (kgN/ha/yr)</th></tr>
<tr><td>TCC10</td><td rowspan="4">8</td><td rowspan="4">10</td><td>0.0239</td><td>0.298%</td><td>0.239%</td><td>n/a</td><td>n/a</td></tr>
<tr><td>TCC11</td><td>0.0216</td><td>0.270%</td><td>0.216%</td><td>n/a</td><td>n/a</td></tr>
<tr><td>TCC12</td><td>0.0164</td><td>0.205%</td><td>0.164%</td><td>n/a</td><td>n/a</td></tr>
<tr><td>TCC13</td><td>0.0492</td><td>0.615%</td><td>0.492%</td><td>n/a</td><td>n/a</td></tr>
<tr><td>TCC14</td><td></td><td></td><td>0.0204</td><td>0.254%</td><td>0.204%</td><td>n/a</td><td>n/a</td></tr>
</table>

Notes to Table 19

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

4.89 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.

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9 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.

4.90 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.

4.91 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.

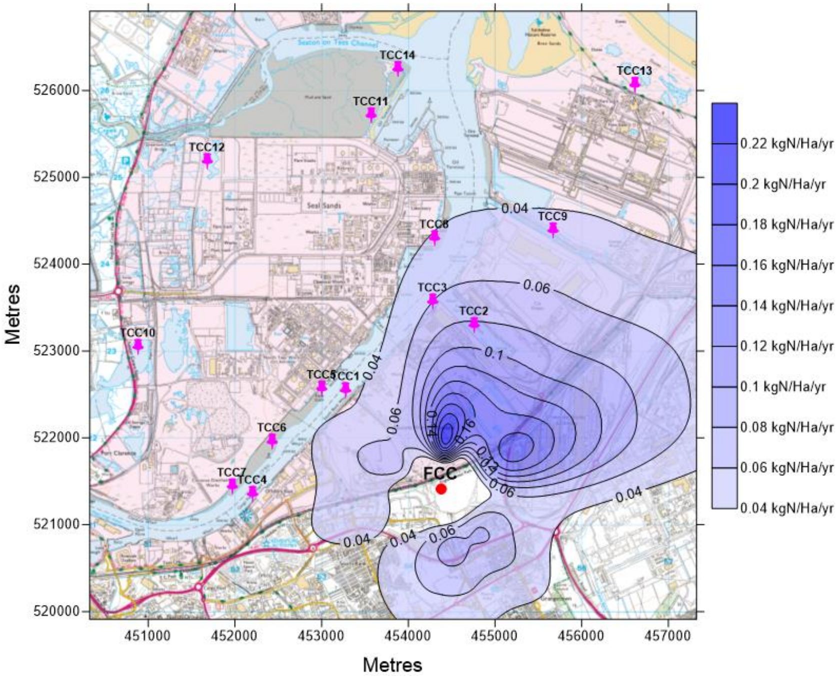


***Figure 3**: Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (Revised NH_3 Emission Rate) – Met Year 2020 (Source: ECL, 2021)*

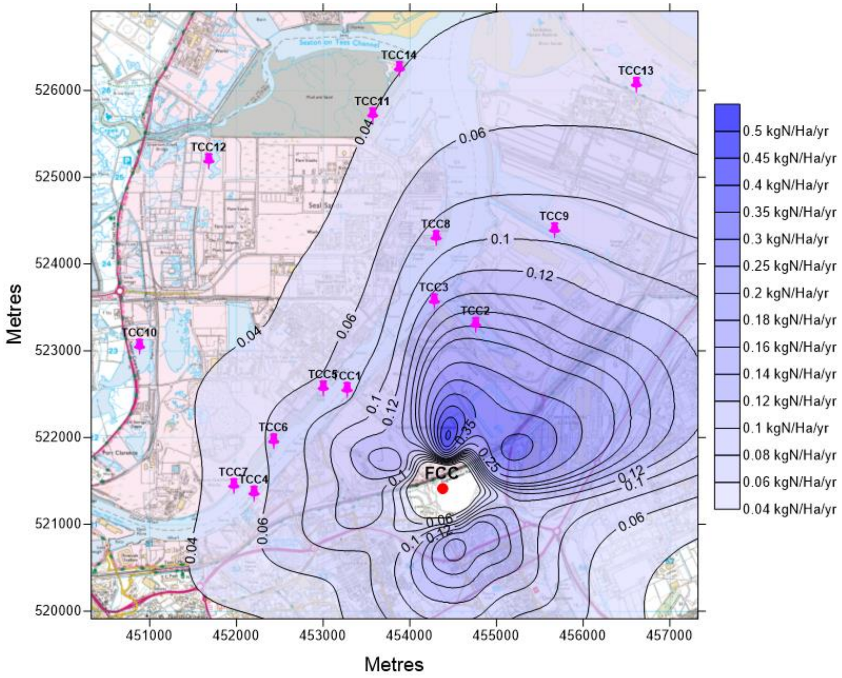


Figure 4: *Nutrient Nitrogen Deposition (N + NH_3 (dry)) – Installation Only (NO_X & NH_3 at BAT-AELs) – Met Year 2020 (Source: ECL, 2021)*

4.92 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 TCC11, TCC13 and TCC14 (Table 20). 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 20**: Comparison of Maximum Predicted Nutrient Nitrogen Deposition Rates with Critical Loads at Sensitive Habitat Sites – TCC10 – TCC13 (Installation + REC)*

<table>
<tr><th>ADMS Ref.</th><th>Lower Critical Load (kgN/ha/yr)</th><th>Upper Critical Load (kgN/ha/yr)</th><th>Nutrient Nitrogen Deposition Rate (a) (kgN/ha/yr)</th><th>PC as a % of Lower Critical Load</th><th>PC as a % of Upper Critical Load</th><th>Background Concentration (kgN/ha/yr)</th><th>PEC (kgN/ha/yr)</th><th>PEC as % of Lower Critical Load</th><th>PEC as a% of Upper Critical Load</th></tr>
<tr><td>TCC10</td><td rowspan="4">8</td><td rowspan="4">10</td><td>0.0397</td><td>0.496%</td><td>0.397%</td><td>n/a</td><td>n/a</td><td>n/a</td><td>n/a</td></tr>
<tr><td>TCC11</td><td>0.0919</td><td>1.15%</td><td>0.919%</td><td>10.78</td><td>10.87</td><td>136%</td><td>109%</td></tr>
<tr><td>TCC12</td><td>0.0475</td><td>0.593%</td><td>0.475%</td><td>n/a</td><td>n/a</td><td>n/a</td><td>n/a</td></tr>
<tr><td>TCC13</td><td>0.382</td><td>4.77%</td><td>3.82%</td><td>9.1</td><td>9.48</td><td>119%</td><td>95%</td></tr>
<tr><td>TCC14</td><td></td><td></td><td>0.125</td><td>1.56%</td><td>1.25%</td><td>10.78</td><td>10.91</td><td>136%</td><td>109%</td></tr>
</table>

Notes to Table 27

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

4.93 In Table 20, 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 the SSSI) of the critical load are highlighted in bold.

4.94 The data presented in Table 20 show that there are predicted exceedances for Nitrogen deposition at modelling points TCC11, TCC13 and TCC14, with the remaining sites screening out as insignificant. Where there are predicted exceedances of the critical load, these are 1.15%, 4.77% and 1.56% of the lower critical load and 3.82% (TCC13) and 1.56% (TCC14) of the upper critical load.

4.95 As noted in section 3.12, 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 also been considered (instead of 8-10 kgN/ha/yr for acid type dunes). If the more conservative Critical Load range is applied, there is only exceedance of the lower Critical Load at TCC13 (3.82%) and TCC14 (1.25%). The upper Critical Load is only exceeded at TCC13. When the PEC is considered the only PECS that exceed 100% are for the lower Critical Load at TCC11 and TCC14.

4.96 It is important to note that the background levels are already elevated and exceed the lower critical load in the absence of the development (at TCC11 and TCC14).

4.97 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 20.

4.98 Table 21 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 21**: Predicted Nutrient Nitrogen Deposition Rates at Sensitive Habitat Sites (TCC10 – TCC13) For Three Scenarios*

ADMS Ref.	Nutrient Nitrogen Deposition Rate [(a)] [(b)] (kgN/ha/yr)		
	Installation Only	**REC Only**	**Installation + REC**
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 21
(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 10.4.1 of ECL (2021).

4.99 The results presented in Table 21 show that, overall, the predicted nutrient nitrogen deposition rates for the REC are greater than those for the Installation.

4.100 ECL (2021) 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 (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*'.

4.101 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.

4.102 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)*

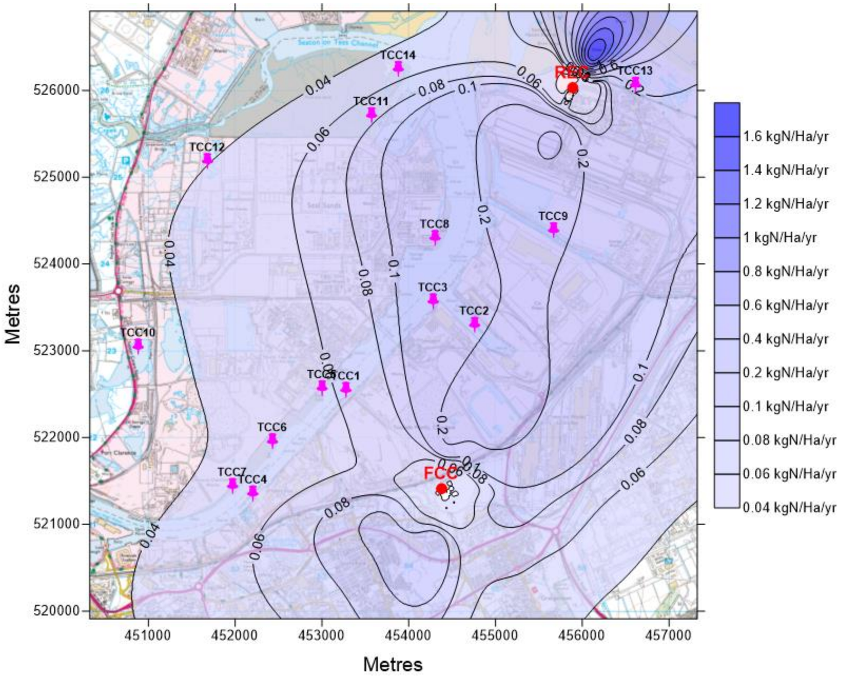
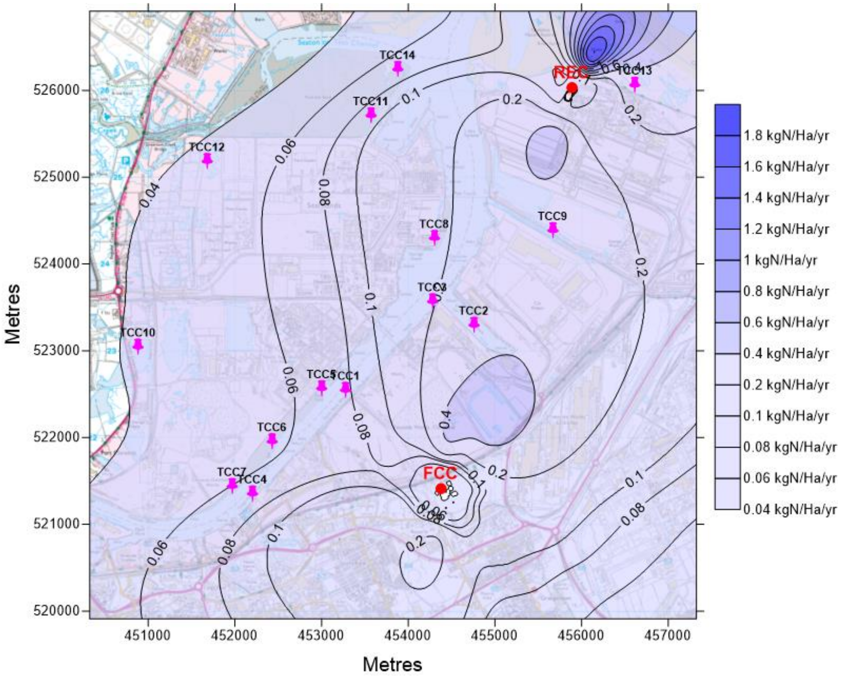


***Figure 6**: Nutrient Nitrogen Deposition (N + NH3 (dry)) – Installation + REC (BAT-AELs) – NWP 2020 (Source: ECL, 2021)*



Habitat sensitivity at modelling point

4.103 Table 22 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 SSSI. The locations of all air quality modelling points are shown on Figure 2.

4.104 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.

4.105 As previously noted, TCC10 is a saline lagoon located at Saltholme; TCC11 is saltmarsh and sand dune; TCC12 is saltmarsh; and TCC13 is sand dune. TCC10 to TCC13 are all located within the boundary of the Teesmouth and Cleveland Coast SSSI. TCC14, which is located close to TCC11, is saltmarsh and sand dune.

***Table 22**: Evaluation of modelling points TCC10 to TCC13*

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
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 modelling point is approximately 3.6 km to the west-north-west of the Site.	The only exceedance predicted at this location is hydrogen fluoride (1.30% of the CL). It can be seen from the data in Table 16 that the daily mean HF PC is less than 10% of the critical level and therefore is not significant at this modelling point.
TCC11 TCC14		TCC11 is saltmarsh located at Seal Sands (as mapped on the MAGIC website). Natural England has also advised that sand dune is present and Ian Bond (INCA – email dated 12 January 2022) has advised that there is a narrow fringe of dune present. 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. The modelling point is approximately 4.3 km to the north-west of the Site.	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'. 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.

Rec. Ref.	Location	Habitat Description	Evaluation	Assessment
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 modelling point is approximately 4.7 km to the north of the Site.	The only exceedance predicted at this location is hydrogen fluoride (1.03% of the CL). It can be seen from the data in Table 16 that the daily mean HF PC is less than 10% of the critical level and therefore is not significant at this modelling point
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 modelling point is approximately 4.8 km to the north-east of the Site.	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'[10], which is a habitat that is present at or near this modelling point. It is also noted the background concentration already exceeds the CL (lower) in the absence of the development. The PEC does not exceed the CL (upper). Exceedance is predicted at this location for hydrogen fluoride (1.07% of the CL). It can be seen from the data in Table 16 that the daily mean HF PC is less than 10% of the critical level and therefore is not significant at this modelling point.

[10] 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

4.106 During the consultation meeting on 24 November 2021, Natural England advised that the assessment 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).

4.107 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 (2021) 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.

4.108 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.

4.109 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.

5 Conclusion

5.1 Air quality modelling has been carried out by ECL for the proposed ERF using a total of fourteen modelling points. The choice of air quality modelling points includes sensitive habitats within the boundary of the Teesmouth and Cleveland Coast SSSI. TCC10 is a saline lagoon located at Saltholme; TCC11 is saltmarsh and sand dune; TCC12 is saltmarsh; TCC13 is sand dune; and TCC14 is saltmarsh and sand dune.

5.2 Air quality modelling has predicted small exceedances for nitrogen deposition at modelling points TCC11, TCC13 and TCC14. The exceedance has been predicted based on information available on the APIS website, i.e., effects have been considered for 'Coastal stable dune grasslands (acid type)' where the Critical Load of 8-10 kgN/Ha/yr is exceeded.

5.3 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).

5.4 Based on this higher Critical Load range 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.

5.5 Small exceedances are also predicted for NOx (modelling point TCC13), SO_2 (modelling point TCC13) and NH_3 (modelling point TCC13). In all cases the exceedances of the 1% threshold are small; however, the PEC is less than 100% of the critical level and so it can be assumed that there will be no adverse effect.

5.6 Whilst exceedances of the 1% threshold are predicted for hydrogen fluoride (at modelling points TCC10, TCC12 and TCC13), 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.

5.7 Overall, it is concluded that the small increase in nitrogen deposition are not likely to have an adverse effect on the conservation status of any qualifying habitat and hence the integrity of the Teesmouth and Cleveland Coast SSSI. 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.

6 References

BSG Ecology (2022). Grangetown Energy Recovery Facility: Report to Inform a Habitats Regulations Assessment.

Chapman, C. & Tyldesley, D. (2016). *Functional linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects - a review of authoritative decisions*. Natural England Commissioned Reports, Number 207.

Council Directive on the conservation of natural habitats and of wild fauna and flora of 21st May 1992 (92/43/EEC).

Council Directive on the conservation of wild birds of 2nd April 1979 (70/409/EEC) consolidated by the Birds Directive 2009 (2009/147/EC).

DEFRA (2016). Air emissions risk assessment for your environmental permit. [Online] Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit [Accessed: 14 July 2021].

Defra (2021) Guidance - Habitats regulations assessments: protecting a European site. https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site.

ECL (2022). Air dispersion modelling assessment of releases from the proposed Energy Recovery Facility at Tees Valley. Ref: ECL.007.04.01_ADM - Final Draft (3).

Holman *et al* (2019). A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0, Institute of Air Quality Management, London. www.iaqm.co.uk/text/guidance/airquality-impacts-on-nature-sites-2019.pdf.

INCA (2019). Ecology report: Storage of soils and its final use in the regeneration of land. Report prepared for South Tees Development Corporation. Report ID: INCA 201920

JBA Consulting (2019). Energy Recovery Plant: Habitat Regulations Assessment (HRA) Screening Report. Final Report. December 2019.

JBA Consulting (2020). Energy Recovery Facility: Habitats Regulations Assessment / Appropriate Assessment. March 2020.

Natural England (2014a). Site Improvement Plan: Teesmouth & Cleveland Coast. Version 1.0.

Natural England (2014b). Site Improvement Plan: North York Moors. Version 1.0.

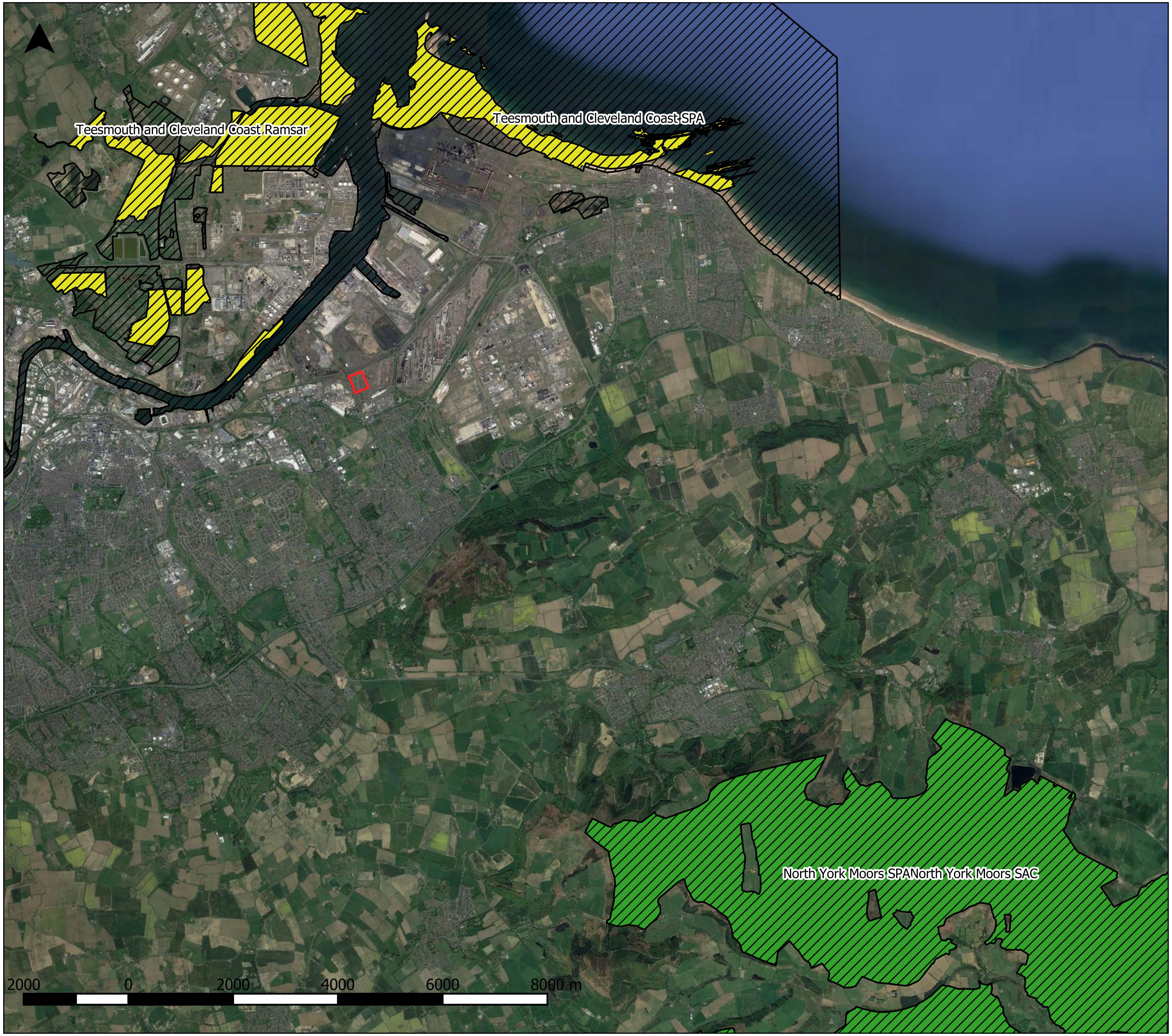
Natural England (2015). Natural England Technical Information Note TIN172. A possible extension to the Teesmouth and Cleveland Coast Special Protection Area.

Natural England (2018). Departmental Brief: Teesmouth and Cleveland Coast potential Special Protection Area (pSPA) and Ramsar.

Natural England (2019). Teesmouth and Cleveland Coast potential Special Protection Area (pSPA) and proposed Ramsar Site (pRamsar). Report of Consultation by Natural England, 2019.

7 Figures

Figure 1: Location plan showing European designated sites (the Teesmouth and Cleveland Coast SSSI covers the same area as the SPA and Ramsar site combined)



Legend

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

BSG | ecology

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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

Document path

Figure 2: Air quality modelling locations

(Source: ECL, 2022)