



NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning
(Applications Prescribed
Forms and Procedure)
Regulations 2009

APFP Regulation
5(2)(a), 5(2)(g)

Infrastructure
(Environmental Impact
Assessment)
Regulations 2017

North Lincolnshire Green Energy Park

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5.9 Report to Inform Habitat Regulations
Assessment

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Acronyms and Abbreviations

Name	Description
AA	Appropriate Assessment
APIS	Air Pollution Information System
CHP	Combined Heat and Power
DCO	Development Consent Order
DEFRA	Department for Environment, Food and Rural Affairs
DHPWN	District Heat and Private Wire Network
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
ERF	Energy Recovery Facility
FCS	Favourable Conservation Status
HRA	Habitats Regulations Assessment
IROPI	Imperative Reasons of Overriding Public Interest
LSE	Likely Significant Effect
NLGEP	North Lincolnshire Green Energy Park
NSER	No Significant Effect Report
NSIP	Nationally Significant Infrastructure Project
PC	Process Contribution
PEC	Predicted Environmental Contribution
PEIR	Preliminary Environmental Information Report
SAC	Special Area of Conservation
SoS	Secretary of State
SPA	Special Protection Area

1. INTRODUCTION

1.1 Purpose of this Report

- 1.1.1.1 North Lincolnshire Green Energy Park (NLGEP) (The Project) is classified as a Nationally Significant Infrastructure Project (NSIP) under sections 14 and 15 of The Planning Act 2008, as the generating capacity will be in excess of 50 megawatts electrical power (MW). It will therefore be consented under the Development Consent Order (DCO) regime.
- 1.1.1.2 If an application for an NSIP is likely to affect a European designated site and / or a European marine site of nature conservation importance¹, a report must be provided with the application showing the site(s) that may be affected together with sufficient information to enable the competent authority (the Secretary of State (SoS)) to make an Appropriate Assessment (AA), if required. This process is referred to as a Habitats Regulations Assessment (HRA).
- 1.1.1.3 This report presents the Report to inform Habitats Regulations Assessment (HRA) for the Project (including HRA Stage 1: Screening and HRA Stage 2: AA), which is required as part of the DCO submission as described in the Planning Inspectorate's Advice Note 10². The set of matrices developed by the Planning Inspectorate and required to provide a summary of Stage 1 and 2 of the HRA in a standardised form are presented in Appendix 1 to this chapter.

1.2 The Project

- 1.2.1.1 The North Lincolnshire Green Energy Park (NLGEP) ('the Project'), located at Flixborough, North Lincolnshire, is a Nationally Significant Infrastructure Project (NSIP) with an Energy Recovery Facility (ERF) capable of converting up to 760,000 tonnes of non-recyclable waste into 95 MW of electricity at its heart and a carbon capture, utilisation and storage (CCUS) facility which will treat the excess gasses released from the ERF to remove and store carbon dioxide (CO₂) prior to emission into the atmosphere.
- 1.2.1.2 The NSIP incorporates a switchyard, to ensure that the power created can be exported to the National Grid or to local businesses, and a water treatment facility, to take water from the mains supply or recycled process water to remove impurities and make it suitable for use in the boilers, the CCUS facility, concrete block manufacture, hydrogen production and the maintenance of the water levels in the wetland area.
- 1.2.1.3 The Project will include the following Associated Development to support the operation of the NSIP:

¹ European sites comprise: Sites of Community Importance (SCI), Special Areas of Conservation (SAC), candidate SACs (cSAC), possible SACs (pSAC), Special Protection Areas (SPA), potential SPAs (pSPA) and, under UK law, Ramsar sites.

² Advice Note 10: Habitats Regulations Assessment relevant to nationally significant infrastructure projects. The Planning Inspectorate. Republished November 2017, Version 8.

- a bottom ash and flue gas residue handling and treatment facility (RHTF)
- a concrete block manufacturing facility (CBMF)
- a plastic recycling facility (PRF)
- a hydrogen production and storage facility
- an electric vehicle (EV) and hydrogen (H2) refuelling station
- battery storage
- a hydrogen and natural gas above ground installations (AGI)
- a new access road and parking
- a gatehouse and visitor centre with elevated walkway
- railway reinstatement works including, sidings at Dragonby, reinstatement and safety improvements to the 6km private railway spur, and the construction of a new railhead with sidings south of Flixborough Wharf
- a northern and southern district heating and private wire network (DHPWN)
- habitat creation, landscaping and ecological mitigation, including green infrastructure and 65 acre wetland area
- new public rights of way and cycle ways including footbridges
- Sustainable Drainage Systems (SuDS) and flood defence; and
- utility constructions and diversions.

1.2.1.4 The Project will also include development in connection with the above works such as security gates, fencing, boundary treatment, lighting, hard and soft landscaping, surface and foul water treatment and drainage systems and CCTV.

1.2.1.5 The Project also includes temporary facilities required during the course of construction, including site establishment and preparation works, temporary construction laydown areas, contractor facilities, materials and plant storage, generators, concrete batching facilities, vehicle and cycle parking facilities, offices, staff welfare facilities, security fencing and gates, external lighting, roadways and haul routes, wheel wash facilities, and signage.

1.2.1.6 The overarching aim of the Project is to support the UK's transition to a low carbon economy as outlined in the Sixth Carbon Budget (December 2020), the national Ten Point Plan for a Green Industrial Revolution (November 2020) and the North Lincolnshire prospectus for a Green Future. It will do this by enabling circular resource strategies and low-carbon infrastructure to be deployed as an integral part of the design (for example by reprocessing ash, wastewater and carbon dioxide to manufacture concrete blocks and capturing and utilising waste-heat to supply local homes and businesses with heat via a district heating network).

1.2.1.7 Further details about the Project are provided in Chapter 3 of the ES, The Project Description and Alternatives (**Document Reference 6.2.3**)

2. APPROACH TO THE HRA

2.1 Overview

2.1.1.1 The approach to the HRA follows the guidance set out in the Planning Inspectorate’s Advice Note 10. It has also taken account of a range of other guidance material including that produced by Defra (2021)³, the European Commission (EC) (e.g. 2011⁴, 2018⁵), the DTA Habitats Regulations Handbook⁶ and case law. Other specific guidance in relation to HRA and air quality is considered in Section 3.1.

2.1.1.2 The process comprises four main stages:

- Stage 1 Screening to identify the likely effects of a project on a European site and consider whether the effects are likely to be significant;
- Stage 2 Appropriate Assessment to determine whether the integrity of the European site will be adversely affected by the project;
- Stage 3 Assessment of Alternative Solutions to establish if there are any that will result in a lesser effect on the European site; and
- Stage 4 Imperative Reasons of Overriding Public Interest (IROPI) and Compensatory Measures to establish whether it is necessary for the project to proceed despite the effects on the European site, and to confirm that necessary compensatory measures are in place to maintain the coherence of the national site network.

2.1.1.3 Each of the above stages is discussed in more in the following sections.

2.2 Stage 1 – Screening

2.2.1.1 The screening stage examines the likely effects of a project either alone, or in combination with other projects and plans on a European site, and seeks to answer the question “can it be concluded that no likely significant effect will occur?” To determine if the construction and / or operation of the Project⁷ is likely to have any significant effects on the designated sites, the following issues have been considered:

- could the proposals affect the qualifying interest and are they sensitive / vulnerable to the effect;
- the probability of the effect happening;

³ Habitats Regulations Assessments: Protecting a European Site (2021)

⁴ European Commission (2011) *Guidelines on the Implementation of the Birds and Habitats Directives in Estuaries and Coastal Zones with Particular Attention to Port Development and Dredging*. EC.

⁵ European Commission (2018) *Managing Natura 2000 Sites – The Provisions of Article 6 of the ‘Habitats’ Directive 92/43/CEE*. EC.

⁶ Tyldesley, D. and Chapman, C. (2013) *The Habitats Regulations Assessment Handbook*, July 2021 edition UK: DTA Publications Limited.

⁷ It has been assumed that any effects from decommissioning would be addressed in full by the Competent Authority closer to the time when it may occur, based on more specific information about the activities and processes involved, and also the prevailing environmental conditions.

- the likely consequences for the site’s conservation objectives if the effect occurred; and
- the magnitude, duration and reversibility of the effect, taking into account any mitigation built into the project design.

2.2.1.2 The screening stage has therefore sought to conclude one of the following outcomes:

- no likely significant effect;
- a likely significant effect will occur; or
- it cannot be concluded that there will be no likely significant effect.

2.2.1.3 Where the assessment concludes the second or third outcome, then the need for an AA is triggered⁸.

2.2.1.4 Natural England’s internal guidance⁹ states in paragraphs 4.3 to 4.5 that:

4.3 “In undertaking an assessment of ‘likely significant effects’ under the Habitats Regulations, authoritative case law has established that:

- an effect is likely if it ‘cannot be excluded on the basis of objective information’ (Case C-127-02 Waddenzee – refer para 45)
- an effect is significant if it ‘is likely to undermine the conservation objectives’ (Case C-127-02 Waddenzee – refer para 48)
- in undertaking a screening assessment for likely significant effects ‘it is not that significant effects are probable, a risk is sufficient’... but there must be credible evidence that there is ‘a real, rather than a hypothetical, risk’ (Boggis v Natural England and Waveney DC (2009) EWCA Civ 1061 – refer paras 36-37)

4.4 The Advocate General’s opinion in Sweetman also offers some simple guidance that the screening step ‘operates merely as a trigger’ which asks ‘should we bother to check?’ (Case C-258/11 Sweetman Advocate General Opinion (refer paras 49-50).

4.5 As such, when determining whether air pollution from a plan or project has a ‘likely significant effect’ upon a given qualifying feature under the Habitats Regulations, the extent to which there are risks of air pollution that might undermine the conservation objectives for the site is central.”

2.2.1.5 Recent case law has also confirmed that measures intended to avoid, or reduce, the harmful effects of a project on a European site should not be taken into account at the screening stage (C-323/17 People over Wind). Such matters are to be taken into account as part of an AA. However, from an air quality perspective the assessment does take into account the embedded measures that are required to meet emission limits and air quality standards designed for the protection of human health.

⁸ In the case of the third outcome, European guidance (*Assessment of Plans and Projects Significantly affecting Natura 2000 sites (2001)*) advises that sufficient uncertainty remains to indicate that an appropriate assessment should be carried out.

⁹ Natural England Internal Guidance (2018) Approach to advising competent authorities on Road Traffic Emissions and HRAs V1.4 Final. NE.

- 2.2.1.6 The screening assessment also has to include a consideration of other projects and whether likely significant effects to European sites may result in combination with these other projects.
- 2.2.1.7 Other projects and plans that will be considered as part of the in-combination assessment will be agreed with the Competent Authority (in this case the Planning Inspectorate) and based on advice from Natural England and the Environment Agency. Account will be taken of case law including from *Walton and Fraser v Scottish Ministers (2011)*¹⁰ and the *Application for Judicial review by Newry Chamber of Commerce (2015)*¹¹.
- 2.2.1.8 In drawing up the list of other projects and plans, account will be taken also of the need to avoid “legislative overkill” that could occur through the inclusion of “... all plans and projects capable of having any effect whatsoever...” (*Case C-258/11 Sweetman v An Board Pleanála (2013)*)¹² and that there is credible evidence that the risk from these other projects and plans is real (see reference to Boggis above). This will include consideration of the likely effects of the project / plans on the conservation objectives of the European site(s) affected (Section 3.3).

2.3 Stage 2 – Appropriate Assessment

- 2.3.1.1 Where an AA is required, its aim is to determine if the effects of a project will have an adverse effect on European sites. It should provide and analyse sufficient information to allow the competent authority to make this determination. AA should exclusively focus on the qualifying features of the European site, and it must consider any effects on the conservation objectives of those qualifying interests. It should also be based on, and supported by, evidence that is capable of standing up to scientific scrutiny. EC guidance states that without proper reasoning the assessment does not fulfil its purpose, and cannot be considered “appropriate” and therefore cannot be consented. In terms of what is reasonable, guidance states “to identify the potential risks, so far as they may be reasonably foreseeable in the light of such information as can be reasonably obtained”¹³.
- 2.3.1.2 In undertaking an AA, there are two stages:
- a scientific evaluation of all the likely significant effects of a project alone, or in-combination with other projects, on the relevant qualifying interests of a European site; and
 - a conclusion based on outcomes of the scientific evaluation as to whether the integrity of a European site will be compromised.
- 2.3.1.3 The emphasis for AA is to prove that no adverse effects due to a project will occur which would undermine a European site’s conservation integrity. Site integrity can be defined as: “the coherence of its structure and function

¹⁰ 2011 SCLR 686, [2011] CSOH 131, [2011] ScotCS CSOH_131, 2011 GWD 34-703

¹¹ Neutral Citation No. [2015] NIQB 65

¹² In Case C-258/11

¹³ Scottish Natural Heritage (SNH) (2001) Natura Casework Guidance: Consideration of Proposals Affecting SPAs and SACs. SNH Guidance Note Series. SNH.

across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified”¹⁴.

2.3.1.4 The assessment also needs to take into account any measures which will be implemented to avoid, or reduce the level of impact from a project. The Competent Authority may also consider the use of conditions or restrictions to help avoid adverse effects on site integrity.

2.3.1.5 If the AA concludes that there will be an adverse effect on the integrity of the European site, or that there is uncertainty and a precautionary approach is taken, then consent can only be granted if there are no alternative solutions, Imperative Reasons of Overriding Public Interest (IROPI) is applicable and compensatory measures have been secured.

2.4 Stage 3 – Assessment of Alternative Solutions

2.4.1.1 All feasible alternatives have to be analysed to ensure that there are none which “better respect the integrity of the site in question” and its contribution to the overall coherence of the Natura 2000¹⁵ network (EC, 2018)¹⁶. Alternatives could include the location of the site, its scale and design, and the way in which it is constructed and operated. The “do nothing” option also has to be considered.

2.4.1.2 The comparison of alternatives should not allow other assessment criteria (e.g. economics) to overrule ecological criteria (EC, 2018). However, the same guidance also refers to the opinion for the case C-239/04¹⁷, where the opinion of the Advocate General was that “the choice does not inevitably have to be determined by which alternative least adversely affects the site concerned. Instead, the choice requires a balance to be struck between the adverse effect on the integrity of the SPA and the relevant reasons of overriding public interest”.

2.5 Stage 4 – Imperative Reasons of Overriding Public Interest (IROPI) and Compensation Measures

2.5.1.1 Where a development has an adverse effect on the integrity of a European site and there are no alternative solutions, consent can only be granted if there are imperative reasons of overriding public interest, including those of social or economic nature which would require the realisation of a project. A definition of “overriding public interest” does not occur in the directive; however examples considered are:

- human health, public safety or beneficial consequences of primary importance to the environment; and

¹⁴ European Communities (2000) Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE. EC

¹⁵ Referred to as a 'national site network' in the UK

¹⁶ European Commission (2018) Commission Notice. “Managing Natura 2000 sites. The Provisions of Article 6 of the 'Habitats' Directive 92/43/EEC” Brussels, 21.11.2018 C(2018) 7621 final.

¹⁷ Commission of the European Communities V Portuguese Republic (2006) Case C-239/04.

- any other reasons which are considered by the Competent Authority to be IROPI; or
- if the site does not host a priority habitat or species then IROPI must be demonstrated, and the reasons can include those of a social, or economic nature.

2.5.1.2 If the importance of a project is deemed to outweigh the effects which will result on the European site, and there are no alternatives, compensatory measures must be secured before consent is granted. Compensatory measures are independent of a project and are intended to offset the adverse effects of a project, corresponding specifically to the negative effects on habitats and species concerned.

2.5.1.3 To be acceptable, compensatory measures should:

- take account of the comparable proportions of habitats and species which are adversely affected;
- be within the same bio-geographical range within which the European site is located;
- provide functions that are comparable to those which justified the selection of the original site; and
- have clearly defined implementation and management objectives so the measures can achieve the aim of maintaining the overall coherence of the network.

2.6 Consultation

2.6.1.1 Table 2: Emissions and Relevant Environmental Standards presents excerpts from consultation responses on the PEIR which are relevant to the HRA.

Table 1: Consultation Responses

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
1. Air Quality			
Chapter 5, paragraph 4.13.1.1 indicates that the effects on habitats within 10 km of the Energy Recovery Facility (ERF) have been assessed. Both Appendix 2 and Chapter 5 indicate that a 10 km radius from the Project was used. 'Project', in this instance, is assumed to refer to the Order Limits. It is therefore unclear what search radius has been used and this should be clarified.	Natural England	In the PEIR, the Ecology and HRA assessments identified all designated sites within 10 km of the point of the main ERF stacks, given that this is the key emission point potentially impacting sensitive ecology. The air quality modelling was undertaken using a similar buffer of 10 km from the ERF stacks. The search area has been extended to 15 km from the ERF stack for the ES (Document Reference 6.0).	Section 3.3
Chapter 5 states that initial modelling indicates a negligible risk of significant effects beyond 10 km, and therefore screening to 15 km has not been undertaken for European sites. It should be noted that Natural England has not yet had sight of the results of the initial modelling, so we have not been able to refer to this in our response. However it is relevant that Thorne Moor SAC is located within 15 km of the Order Limits and is notified for H7120 Degraded raised bogs (still capable of natural regeneration). H7120 Degraded raised bogs are sensitive to nutrient nitrogen and acid deposition. Natural England therefore advises that screening up to a minimum of 15 km of the Order Limits should be undertaken. Due to the nature of the proposed development and habitat sensitivities, it may also be appropriate to consider Hatfield Moor SAC and Thorne and Hatfield Moors SPA.	Natural England	As a result of this advice from Natural England, air quality modelling has been extended to include a buffer of 15 km from the ERF stack. We note the presence of Hatfield Moor SAC just outside this buffer zone and will consider the need to include this site dependent on the modelling results. Thorne Moor SAC and Thorne and Hatfield Moors SPA are included within the 15 km search area and are considered in the assessment.	Section 4.2

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
<p>Chapter 5, paragraph 4.2.2.7 states that “no habitats or species of the European sites were found to be sensitive to acid deposition”. Acid deposition has therefore been scoped out of the assessment. APIS indicates that several interest features of the SPA are sensitive to acid deposition and therefore this should be scoped into the assessment.</p>	<p>Natural England</p>	<p>Where ecological receptors within 15 km of the Project have relevant site specific Critical Loads for Acid Deposition and Nutrient Nitrogen Deposition (as identified from APIS), these have been included in the Air Quality Impact Assessment and fed into the HRA and fed into the Report to inform Habitats Regulations Assessments (HRA) (Document Reference 5.9). The HRA acknowledges that a number of broad habitat types used by the SPA bird interest features are sensitive to acid deposition. However, APIS confirms that, for all relevant species, the bird species are not sensitive to any acidity impacts even if the broad habitat types are sensitive. Therefore, no qualifying interest features of the SPA were found to be sensitive to acid deposition.</p>	<p>Section 3.3</p>
<p>Water-based features at all sites in question have been scoped out as the nutrient nitrogen is thought to be influenced overwhelmingly by waterborne nutrient loadings and agricultural run-off rather than by deposition from the atmosphere. Natural England does not consider this suitable justification to scope out all aquatic features. Where a relevant environmental benchmark has been provided on APIS, these features should be assessed.</p>	<p>Natural England</p>	<p>This is noted. It is confirmed that environmental benchmarks have been used where they are provided by APIS e.g. salt marsh communities. The SAC water-based features that have been scoped out are: mudflats and sandflats not covered by seawater at low tide, river lamprey and sea lamprey. There are no environmental benchmarks provided on APIS for these features. APIS notes that marine and river habitats do not tend to be sensitive to air pollution impacts, or are dominated by other sources of inputs.</p>	<p>Section 4.2.2</p>
<p>Sand dune habitats have also been scoped out of the assessment for all sites in question. Dune systems are one of the most sensitive habitats to air pollution and, within the Humber Estuary SAC and SSSI, are already exceeding critical loads. Chapter 5, Section 8.3 summarises the findings of the Air Quality Impact Assessment (AQIA) and concludes that there are likely to be exceedances in nitrogen and acid deposition at Humber Estuary SSSI, SAC and SPA. Section</p>	<p>Natural England</p>	<p>The potential significant contributions for dune habitats identified in the Air Quality Impact Assessment in the PEIR were based on modelling that assumed all habitat types were located within 10 km of the ERF. In reality, this is not the case and the HRA takes the further step of looking at the specific habitat locations within each designated site. All of the sand dune habitats are located at least 45 km from the Project</p>	<p>Section 4.2.2</p>

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
<p>8.3 clearly identifies potentially significant contributions for dune habitats and concludes that detailed assessment is therefore required. Natural England are concerned then that dune habitats have not been included in the detailed assessments summarised in Appendix 2 and Chapter 5. Air quality impacts on sand dunes should be considered in further detail in the Appropriate Assessment.</p>		<p>and at this distance, effects on sand dunes as a result of air emissions will be negligible. Therefore effects on sand dunes have been scoped out of the Environmental Statement (Document Reference 6.0).</p>	
<p>7. Cumulative Impacts</p>			
<p>Finally, in-combination effects have not been considered at this stage and we would welcome this information when it becomes available.</p>	<p>Natural England</p>	<p>In-combination effects are now addressed in this report. We have assessed cumulative impacts in Chapter 18 of the ES (Document Reference 6.2.18).</p>	<p>Sections 4.6 and 5.5</p>
<p>The ‘in-combination’ requirement makes sure that the effects of numerous small proposals, which alone would not result in a significant effect, are assessed to determine whether their combined effect would be significant enough to require more detailed assessment. Natural England notes that the application site is in close proximity to a number of SSSIs. Based on the plans submitted, Natural England considers that the proposed development could have potential significant effects on the interest features for which the sites have been notified. Chapter 10 correctly identifies SSSIs for assessment.</p>	<p>Natural England</p>	<p>In-combination effects are now addressed in this report. We have assessed cumulative impacts in Chapter 18 of the ES (Document Reference 6.2.18). This includes assessing cumulative impacts on SSSIs in close proximity to the project.</p>	<p>Sections 4.6 and 5.5</p>
<p>Plans or projects that should be considered in the in-combination assessment include the following:</p> <ul style="list-style-type: none"> ■ the incomplete or non-implemented parts of plans or projects that have already commenced; ■ plans or projects given consent or given effect but not yet started; ■ plans or projects currently subject to an application for consent or proposed to be given effect; ■ projects that are the subject of an outstanding appeal; ■ ongoing plans or projects that are the subject of regular review; 	<p>Natural England</p>	<p>In-combination effects are now addressed in this report. We have assessed cumulative impacts in Chapter 18 of the ES (Document Reference 6.2.18). This considers plans or projects as per the criteria outlined.</p>	<p>Sections 4.6 and 5.5</p>

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
<ul style="list-style-type: none"> ■ any draft plans being prepared by any public body; and ■ any proposed plans or projects published for consultation prior to application. 			
<p>When assessing the effects on designated sites, Natural England recommends that the search radius for be measured from the nearest point on the designated site to the proposal being assessed, or the nearest area of sensitive habitat, if known. This would likely identify those proposals which are likely to affect overlapping geographic extents within the designated site in question.</p>	Natural England	<p>In-combination effects are now addressed in this report and considered this search area.</p> <p>We have assessed cumulative impacts in Chapter 18 of the ES (Document Reference 6.2.18). This considers the cumulative impact on ecological sites.</p>	Sections 4.6 and 5.5
<p>Chapter 18 of the PIER provides a list of projects to be included in an assessment of the potential in-combination effects. Keadby II Power Station has been identified for consideration within the baseline and is scoped out of the in-combination assessment. Natural England notes that the air quality screening assessment uses DEFRA Background Mapping dated 2018 and APIS background data dated 2017 - 2019. It is not clear whether emissions to air from Keadby II Power Station are included within these background data. The Applicant should make a thorough check that all relevant emissions are included in the baseline assessment.</p>	Natural England	<p>We have assessed cumulative impacts in Chapter 18: of the Environmental Statement (Document Reference 6.2.18). This considers emissions from Keadby 2 and Keadby 3. The assessment also considers the trends in the long term baseline on a regional, national and international basis, and assesses the overall likelihood of significant adverse impacts on sensitive ecological receptors due to in-combination effects</p>	<p>Sections 4.6, and 5.5</p> <p>Section 4.6.1</p>
10. Ecology			
<p>Consideration of the Habitats Regulations is presented in Chapter 5 of the PEIR. Chapter 5 focusses solely on the potential effects of operational air quality. Paragraph 1.1.1.6 indicates that the screening matrices will include other potential effects arising from construction. Presumably this will be included with the Development Consent Order (DCO) submission. This should also consider other potential effects arising from operation. Natural England advises that the screening test should be carried out before the detailed assessment. Stage 1 of the Habitats Regulations</p>	Natural England	<p>This is noted and other effects (alone and in-combination) are now considered in this report.</p>	Sections 4.5, 4.6.4 and 5.3

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
<p>Assessment (HRA), the Likely Significant Effect (LSE) test, should identify the potential for all construction and operational impacts of the proposed development on each interest feature of the European sites in question, both alone and in-combination with other plans and projects. We will provide our advice on the HRA when the relevant information for this stage in the application has been provided.</p>			
<p>SACs are designated for rare and vulnerable habitats and species, whilst SPAs are classified for rare and vulnerable birds. Many of these sites are designated for mobile species that may also rely on areas outside of the site boundary. These supporting habitats may be used by SPA/SAC populations or some individuals of the population for some or all of the time. These supporting habitats can play an essential role in maintaining SPA/SAC species populations, and proposals affecting them may therefore have the potential to affect the European site.</p> <p>It should be noted that some of the potential impacts that may arise from the proposal relate to the presence of SPA interest features that are located outside the site boundary. Natural England advises that the potential for offsite impacts should be considered in assessing what, if any, potential impacts the proposal may have on European sites.</p>	<p>Natural England</p>	<p>This is noted. The potential for disturbance to qualifying interest bird species on functionally linked land is now considered in the HRA, as set out in Report to inform Habitats Regulations Assessment (Document Reference 5.9).</p>	<p>Sections 4.5, 4.6.4 and 5.3</p>
<p>Chapter 10, Appendix E Ornithology Surveys recorded a peak count of 42 mallard roosting and feeding along the banks of the River Trent. Mallard are an assemblage species of the Humber Estuary SPA / Ramsar and this represents 4% of the Humber Estuary population (based on a five year average from 2015/16 – 2019/20). The River Trent therefore is considered functionally linked land and the potential for bird disturbance should be a key consideration within the HRA.</p>	<p>Natural England</p>	<p>This is noted. The potential for disturbance to qualifying interest bird species on functionally linked land is considered in the HRA, as set out in the Report to inform Habitats Regulations Assessment (Document Reference 5.9).</p>	<p>Sections 4.5, 4.6.4 and 5.3</p>

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
<p>When identifying the potential for significant effects, we recommend that the seasonality of species designations be considered; for instance, whether there are records of a species during the season when it is identified as a designated site feature (e.g. during the breeding season). Although it is also worth considering impacts to those species at any time of year.</p>	<p>Natural England</p>	<p>This is agreed and is considered as part of the HRA as set out in the Report to inform Habitats Regulations Assessment (Document Reference 5.9).</p>	<p>Sections 4.5, 4.6.4 and 5.3</p>
<p>We welcome mitigation measures proposed in Chapter 10, Section 7. The specifics of these measures should be detailed in the Code of Construction Practice (CoCP) and Ecological Management Plan (EMP) which will need to be agreed with Natural England.</p> <p>Potential for noise, vibration and visual disturbance as a result of the construction and operation of the development should be a key consideration of the HRA process. Chapter 13 (Traffic and Transport), paragraph 8.2.5.3 indicates that there will be an additional 580 vessel movements per annum at Flixborough Wharf as a result of the proposed development. This represents a significant increase of 200% (when compared to 305 vessel movements in 2019) and should be considered within the HRA. As the development includes new access routes close to the designated site boundary, the HRA and SSSI assessment should also consider the potential for recreational disturbance impacts.</p>	<p>Natural England</p>	<p>The potential for disturbance (noise/vibration/visual) to qualifying interest bird features during construction and operation of the scheme is considered in the HRA. It is noted that the potential for recreational disturbance should also be included.</p> <p>The potential for disturbance (noise/vibration/visual) to qualifying interest bird features of the Humber Estuary SPA and Ramsar during construction and operation has been considered in the HRA – including the potential effect of vessel movement on birds using the River Trent. The potential for recreational disturbance has also been considered.</p>	<p>Sections 4.5, 4.6.4 and 5.3</p>
<p>21. Water Resources and Flood Risk</p>			
<p>It is understood that all water for use within the proposed development will be sourced from the Anglian Water mains supply, and all elements will be connected into a surface water drainage system and a sewerage system.</p> <p>Natural England welcomes mitigation measures proposed in Chapter 9, Section 7, as well as mitigation to prevent</p>	<p>Natural England</p>	<p>This is noted. The HRA considers the potential for impacts on water quality.</p>	<p>Section 4.5</p>

Consultation Response	Prescribed Consultee(s)	Response / Action	Reference within this document
leaching of construction pollutants into surface waters, as outlined in Chapter 9, paragraph 8.2.1.9. Potential for water quality impacts should be considered in the HRA.			

- 2.6.1.2 The consultation highlighted that the HRA should include an assessment of potential effects on European sites including the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site.
- 2.6.1.3 The Scoping Opinion also required that the spatial scope of the HRA should include a 30 km radius for SACs where bats are a qualifying feature, due to bat foraging distances. However, no SACs designated for their importance for bats were identified within 30 km of the Order Limits and this matter was not assessed further.

3. APPROACH TO ASSESSING THE EFFECTS ON HABITATS AND SPECIES FROM EMISSIONS TO AIR

3.1 Guidance

3.1.1.1 The approach to the assessment has taken account of the following guidance:

- DEFRA / EA guidance on Air Emissions Risk Assessment for Your Environmental Permit (as updated on 7 October 2020).
- DEFRA/ EA guidance on Environmental Permitting: Air Dispersion Modelling Reports (as updated on 19 January 2021).
- A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.0, June 2019). Institute of Air Quality Management (IAQM).
- CIEEM (2021) *Advice on Ecological Assessment of Air Quality Impacts*. Chartered Institute of Ecology and Environmental Management. Winchester, UK.
- Natural England Internal Guidance (2018) Approach to advising competent authorities on Road Traffic Emissions and HRAs V1.4 Final. NE.

3.1.1.2 Information about the relative sensitivity of qualifying interest habitats and plant species, and habitats supporting qualifying interest fauna species, was obtained from the Air Pollution Information System (APIS).

3.2 Critical Loads and Levels

3.2.1.1 The critical loads¹⁸ and critical levels¹⁹ for each habitat type were obtained from APIS and used as tools to assess the potential for effects of air pollutants on habitats. The critical load refers to the quantity of pollutant deposited from air to the ground, while the critical level is the gaseous concentration of a pollutant in the air.

3.2.1.2 Effects resulting from nitrogen and acid deposition have been assessed on a habitat and species-specific approach against critical loads listed in APIS. These specific loads are provided in the relevant tables in the Screening of Likely Significant Effects (see Section 4.3.1.3).

3.2.1.3 Critical levels (for the effects of NO_x, SO₂, NH₃ and HF) have been assessed against environmental standards that apply either across all habitat types (for NO_x and HF), or across lichens/bryophytes and vascular plants (for SO₂ and NH₃) as set out in Table 2.

¹⁸ Critical Loads are defined as: "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge"

¹⁹ Critical levels are defined as "concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge".

Table 2: Emissions and Relevant Environmental Standards

Substance	Emission period	Target (mean)
NOx	Annual	30 micrograms per cubic metre ($\mu\text{g m}^{-3}$)
	Daily (24hr mean)	75 $\mu\text{g m}^{-3}$
SO ₂	Annual	10 $\mu\text{g m}^{-3}$ – where lichens / bryophytes are present
	Annual	20 $\mu\text{g m}^{-3}$ – for all other vegetation
NH ₃	Annual	1 $\mu\text{g m}^{-3}$ – where lichens / bryophytes are present
	Annual	3 $\mu\text{g m}^{-3}$ – for all other vegetation
HF	Weekly	0.5 $\mu\text{g m}^{-3}$
	Daily	5 $\mu\text{g m}^{-3}$

3.3 European Sites Search Area

3.3.1.1 Potential effects on habitats within 15 km of the main emission source at the ERF have been assessed, as recommended by Natural England (see Table 1). This is in line with current Defra / Environment Agency (EA) guidance²⁰ for some larger emitters.

3.3.1.2 European designated sites included in the search area were:

- SAC and candidate SACs;
- SPAs and potential SPAs; and
- Ramsar sites.

3.4 Screening Methodology

3.4.1.1 The Process Contribution (PC) is the environmental concentration at a receptor location of each substance emitted to air as a result of the Project.

3.4.1.2 Atmospheric dispersion modelling was undertaken to predict the short and long-term PC against the respective environmental standards. The screening approach to determine whether the PCs for the Project were insignificant, or required further assessment, was undertaken by comparing the PCs, and where necessary Predicted Environmental Contributions (PECs), against the percentages of the critical levels / loads for each habitat as set out in the Defra / EA guidance (Table 3).

3.4.1.3 The approach also takes account of the contribution of the Project along with other projects and plans as part of the in-combination assessment (Section 4.6).

²⁰Air emissions risk assessment for your environmental permit (2016).

Table 3: Assessment Criteria for Habitats and Species

Criterion	Assessment
Long Term / Short Term	
<ul style="list-style-type: none"> ■ PC < 1% of CL (long) and / or PC <10% of CL (short) ■ Or PC > 1% of CL (long) and / or >10% of CL (short) but PEC < 70% of CL 	<ul style="list-style-type: none"> ■ Insignificant contribution²¹ and no further assessment required. Considered in the assessment to have no likely significant effect.
<ul style="list-style-type: none"> ■ PC > 1% of CL (long) and / or >10% of CL (short) and PEC > 70% of CL 	<ul style="list-style-type: none"> ■ Cannot be considered as an insignificant contribution. Further assessment is required to determine the effects on habitats and species and whether, or not, they are likely to have an adverse effect on the integrity of a European site.

3.4.1.4 The levels and loads of air pollutants at habitats in the European sites within a 15 km radius from the main emission source at the ERF were predicted by the atmospheric dispersion modelling. Details about the model and its input data can be found in ES Chapter 5 Air Quality (**Document Reference 6.2.5**).

3.4.1.5 To assess the likely effects on European designated sites, the following methods were followed:

- Habitats that were not sensitive to specific air pollutants were screened out.
- Account was taken at this stage of the sensitivity of faunal species to potential effects on their supporting habitat. For example, APIS confirms that the qualifying interest bird species of the Humber Estuary SPA are not sensitive to the effects of acid deposition on their broad habitat types, so effects on these species were not considered further.
- Where qualifying interest features were present only in locations where they would clearly not be affected, they were excluded from consideration.
- In terms of nitrogen and acid deposition, the most sensitive habitat type amongst the qualifying interest features was selected. If the effects on this habitat type were found to be insignificant, it was assumed that effects on other qualifying features (with less stringent critical loads) would be similarly insignificant.
- Where the most sensitive qualifying interest feature of a designated site could not be screened out, the PCs were then predicted at other less sensitive habitats to assess the potential effect on all relevant habitats associated with the site.
- Where there were no identified critical loads on APIS, a view was taken on how likely the feature was to be affected and the likelihood of a real risk occurring as a result of the effects of air pollutants. For example, in the case of water-based features, the nutrient nitrogen will be

²¹ The term 'significant' is used here in the context of its meaning within the Environment Agency guidance (ie making a 'significant contribution') and not within the context of the EIA Regulations 2017 (ie not necessarily leading to a 'likely significant effect').

influenced overwhelmingly by waterborne nutrient loadings and agricultural run-off rather than by deposition from the atmosphere, so these features were screened out.

- The APIS tool does not cover Ramsar sites. As the Humber Estuary Ramsar site protects the same habitats and species as the SAC and SPA designations, it was assumed that the modelling results for the SAC and SPA could be similarly applied to the Ramsar designation too.

3.5 Appropriate Assessment Methodology

3.5.1.1 Where European sites could not be screened out (including taking account of the in-combination assessment), further consideration was given to whether adverse effects on the integrity of the site were likely.

3.5.1.2 The analysis of the effects on site integrity was based on the effects of air emissions on particular habitats and the conservation objectives of each site. This analysis relied on professional judgement as there are no published criteria to determine whether a PC > 1% / PEC > 70% will result in an adverse effect on the integrity of a European site. The assessment took account of the factors listed below.

- The extent to which the PC was greater than 1% of the critical level / load.
- The background level of each pollutant and the PEC (i.e. PC + background) and whether the background levels / loads were sufficiently low to accommodate the predicted PC loads. As with the PC, there are no published criteria to determine whether a PEC of any level will be insignificant, or result in an adverse effect.
- The location of the relevant qualifying interest feature within the designated site, the extent of this feature affected by PCs > 1% and the variability in the occurrence of PCs > 1% over that area.
- The sensitivity within a habitat type. For example, saltmarsh that is exposed for longer periods (e.g. mature upper saltmarsh) is likely to be more sensitive to effects from pollutant concentrations in the air than those parts of the saltmarsh that are subject to regular inundation by water (e.g. lower to middle saltmarsh).
- The effects of Keadby 2 and Keadby 3 were considered in-combination.

4. SCREENING FOR SIGNIFICANT EFFECTS ON EUROPEAN SITES

4.1 Overview

4.1.1.1 This section sets out the European sites included in the assessment, the habitats and species that have been screened out, potential effects and the screening for any likely significant effects on the European sites.

4.2 European Sites

4.2.1.1 No European sites will be directly affected by the Project. Five European sites were identified within 15 km of the main emission source at the ERF, namely:

- Humber Estuary Special Area of Conservation (SAC);
- Humber Estuary Special Protection Area (SPA);
- Humber Estuary Ramsar site;
- Thorne Moor SAC; and
- Thorne & Hatfield Moors SPA.

4.2.1.2 Further details about these European sites are provided in Table 4 and their locations are shown in Figure 4. The qualifying features for each site are summarised in Table 5.

4.2.1.3 The Humber Estuary SAC and Ramsar boundaries along the River Trent lie adjacent to the Order Limits of the Project around the Flixborough Industrial Estate. The elements of the Project that abut the boundary in this area are the existing port (Flixborough Wharf) and land to be used as a wetland/SUDs area, or other planted landscape screening mitigation, if required.

4.2.1.4 The presence of Hatfield Moor SAC just outside of the 15 km radius from the main emission source search area was noted during consultation. However, the air quality modelling showed that there was no potential for a significant effect on a site over 15 km from the ERF, so Hatfield Moor SAC was screened out and not considered further.

Table 4: European Sites

European Site Name, Site Code and Area	Distance from ERF stack (km)	Qualifying Features of Interest (Species and Annex I Habitats)
<p>Humber Estuary SAC (UK0030170) 36657.15 ha</p>	<p>0.1 km west</p>	<p>Annex I habitats that are a primary reason for selection of the site: H1130: Estuaries H1140: Mudflats and sandflats not covered by seawater at low tide</p> <p>Annex I habitats and Annex II species present as a qualifying feature, but not a primary reason for site selection: H1110: Sandbanks which are slightly covered by sea water all the time H1150: Coastal lagoons H1310: <i>Salicornia</i> and other annuals colonising mud and sand H1330: Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) H2110: Embryonic shifting dunes H2120: Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (marram grass) (“white dunes”) H2130: Fixed coastal dunes with herbaceous vegetation (“grey dunes”) H2160: Dunes with <i>Hippophae rhamnoides</i> (sea buckthorn) S1095: Sea lamprey (<i>Petromyzon marinus</i>) S1099: River lamprey (<i>Lampetra fluviatilis</i>) S1364: Grey seal (<i>Halichoerus grypus</i>)</p>
<p>Humber Estuary Ramsar (UK11031) 37987.8 ha</p>	<p>0.1 km west</p>	<p>Near natural estuary, supporting dune systems, estuarine waters, intertidal mud and sand flats, saltmarshes and saline lagoons. The Humber Estuary supports a breeding colony of grey seals at Donna Nook and a breeding site for natterjack toad in the dune slacks at Saltfleetby-Theddlethorpe. It is an important migration route for river and sea lamprey and supports an assemblage of waterfowl of international importance.</p> <p>Individual water bird qualifying species are: common shelduck (<i>Tadorna tadorna</i>), golden plover (<i>Pluvialis apricaria</i>), red knot (<i>Caladris canutus</i>), dunlin (<i>Caladris alpina</i>), black tailed godwit (<i>Limosa limosa</i>), bar-tailed godwit (<i>Limosa lapponica</i>) and common redshank (<i>Tringa totanus</i>).</p>
<p>Humber Estuary SPA (UK9006111)</p>	<p>6.5 km north</p>	<p>Annex I Species: avocet (<i>Recurvirostra avosetta</i>), great bittern (<i>Botaurus stellaris</i>), hen harrier (<i>Circus cyaneus</i>), golden plover, bar-tailed godwit, ruff (<i>Philomachus pugnax</i>), Eurasian marsh harrier (<i>Circus aeruginosus</i>) and little tern (<i>Sterna albifrons</i>).</p>

European Site Name, Site Code and Area	Distance from ERF stack (km)	Qualifying Features of Interest (Species and Annex I Habitats)
37630.24 ha		<p>Regularly Occurring Migratory Species: common shelduck, knot, dunlin, black tailed godwit and redshank.</p> <p>Waterbird Assemblage: 153,934 individual waterbirds (non-breeding) including dark-bellied brent goose (<i>Branta bernicla bernicla</i>), shelduck, wigeon (<i>Anas penelope</i>), teal (<i>Anas crecca</i>), mallard (<i>Anas platyrhynchos</i>), pochard (<i>Aythya ferina</i>), scaup (<i>Aythya marila</i>), goldeneye (<i>Bucephala clangula</i>), great bittern, oystercatcher (<i>Haematopus ostralegus</i>), avocet, ringed plover (<i>Charadrius hiaticula</i>), golden plover, grey plover (<i>Pluvialis squatarola</i>), lapwing (<i>Vanellus vanellus</i>), knot, sanderling (<i>Calidris alba</i>), dunlin, ruff, black-tailed godwit, bar-tailed godwit, whimbrel (<i>Numerius phaeopus</i>), curlew (<i>Numenius arquata</i>), redshank, greenshank (<i>Tringa nebularia</i>) and turnstone (<i>Arenaria interpres</i>).</p>
Thorne Moor SAC (UK0012915) 1911.02 ha	10.1 km west	<p>Annex I habitats that are a primary reason for selection of the site: 7120: Degraded raised bogs still capable of natural regeneration</p>
Thorne & Hatfield Moors SPA (UK9005171) 2449.2 ha	10.1 km west	<p>Annex I Species: European nightjar (<i>Caprimulgus europaeus</i>) - breeding</p>

- 4.2.1.5 In general, the conservation objectives seek to 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 (FCS) 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.

4.2.2 Review of Qualifying Interest Location and Sensitivity to Air Emissions

- 4.2.2.1 The air quality modelling approach for nitrogen and acid deposition is habitat-specific. The locations of qualifying interest habitats and species were reviewed for the larger designated sites. Where features were only present at considerable distances from the Project they were screened out of the assessment.
- 4.2.2.2 For the Humber Estuary SAC / Ramsar site, many of the qualifying habitats and species are coastal or marine features, which do not occur within 15 km of the Project (where the potential for adverse effects has been identified). All the SAC / Ramsar dune habitats, coastal lagoons, *Salicornia* and other annuals colonising mud and sand, and grey seal (*Halichoerus grypus*) habitats all occur in the outer estuary at least 45 km from the Project and were therefore screened out. The Ramsar designation included a breeding site for natterjack toads on dune slacks which was also excluded due to distance.
- 4.2.2.3 Review of the Humber Estuary SAC citation and the distribution of priority habitats shown on the MAGIC website²² established that the qualifying habitats and species that occur within 15 km of the Project are:
- estuaries and their component Atlantic salt meadows (saltmarsh);
 - mudflats and sandflats not covered by seawater at low tide;
 - sandbanks which are slightly covered by seawater all the time;
 - river lamprey (*Lampetra fluviatilis*); and
 - sea lamprey (*Petromyzon marinus*).

²² Based on citation information and spatial data showing the distribution of designated habitats on the MAGIC website.

- 4.2.2.4 The qualifying interest habitats and species were then reviewed using information from APIS to establish their sensitivity to atmospheric pollutants. Estuaries and Atlantic salt meadows (saltmarsh) were identified as sensitive to nitrogen deposition, but were not sensitive to acid deposition.
- 4.2.2.5 For flowing water habitats, or habitats that are regularly inundated with water in the Humber Estuary SAC and Ramsar site, the nutrient nitrogen and acidity inputs will be predominantly from waterborne sources and agricultural run-off rather than air pollutants²³. APIS confirms that ‘sandbanks which are slightly covered by seawater all the time’ are not considered to be sensitive to any of the pollutants in the assessment, therefore effects on this habitat type were screened out. ‘Mudflats and sandflats not covered by seawater at low tide’, and river / sea lamprey do not have sensitivity information or CLs on APIS. However, as mudflats are regularly inundated with water and lamprey use freshwater and marine habitats, ‘mudflats and sandflats not covered by seawater at low tide’ and river / sea lamprey are not considered sensitive to airborne air pollutants and have been screened out. This approach has previously been agreed with the EA and Natural Resources Wales (NRW) on submissions for other developments which have subsequently been approved.
- 4.2.2.6 Key impacts on river and sea lamprey include river pollution, engineering works that can create obstacles to upstream migration (e.g. dams, weirs) and destruction of their spawning gravels and other habitat²⁴. As the River Trent will not be affected by the Project except for a slight increase in boat traffic movement, no potential effects on river or sea lamprey are predicted and disturbance to lamprey species was screened out of the assessment.
- 4.2.2.7 For the Humber Estuary SPA / Ramsar site and Thorne & Hatfield Moors SPA, acid deposition is not expected to have a negative effect on any of the qualifying bird species. In all cases, APIS confirmed that the birds’ broad habitat types were not sensitive to acid deposition, or there were no expected negative effects on the species as a result of effects on the species’ broad habitat type. However, a number of the qualifying bird species of the SPAs were sensitive to the potential effects of nitrogen deposition on their broad habitat types so the effects of nitrogen deposition were assessed further.
- 4.2.2.8 The degraded raised bog habitat at Thorne Moor SAC is sensitive to both nitrogen and acid deposition so the effects of these emissions were assessed further.
- 4.2.2.9 In summary, the sensitive qualifying interest habitats and species for each designated site that were taken forward for assessment of the effect of emissions to air are listed in Table 5.

²³ APIS notes that ‘In most lowland rivers and burns, nitrogen inputs from catchment land-use, not deposition from the atmosphere, are likely to be much more significant’.

²⁴ Maitland, P.S. (2003) *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

Table 5: Sensitive Qualifying Interest Features

Designated Site	Qualifying Annex I Habitats and Annex II Species	Sensitive to nitrogen (APIS)?	Sensitive to acidity (APIS)?
Humber Estuary SAC / Ramsar	Estuaries	✓	×
	Atlantic salt meadows	✓	×
Humber Estuary Ramsar	Birds species including black tailed godwit & golden plover	✓	×
Humber Estuary SPA	Bird species including avocet, black tailed godwit, curlew, dark-bellied brent goose, golden plover, great bittern, little tern, marsh harrier & wigeon	✓	×
Thorne Moor SAC	Degraded raised bogs still capable of natural regeneration	✓	✓
Thorne & Hatfield Moors SPA	European nightjar	✓	×

4.3 Effects Considered in the Assessment

4.3.1.1 The potential effects on European sites due to the construction and / or operation of the Project considered in the assessment include:

- the effect of operational emissions to air;
- disturbance or displacement of qualifying interest bird species from the Humber Estuary Ramsar site;
- disturbance or displacement of qualifying interest bird species from the Humber Estuary SPA using functionally linked land;
- recreational disturbance;
- changes to water quality; and
- changes to air quality during construction.

4.3.1.2 Decommissioning activities will be similar in approach and scale to construction activities. Therefore the assessment of construction effects in this report will also be applicable to the decommissioning phase.

4.3.1.3 These potential effects are considered in more detail in the following sections.

4.4 Screening of Emissions to Air – Project Alone

4.4.1 Overview

4.4.1.1 This section summarises the predicted effects of the air pollutants from the Project alone on the European designated sites and whether “no likely

significant effect” can be concluded, or whether further assessment (i.e. AA) is required.

- 4.4.1.2 A summary of the PCs, and where necessary PECs, as a percentage of the critical levels / loads for each designated site is presented. For nutrient nitrogen and acid deposition, only the qualifying interest habitats and species that are sensitive to the effects of these emissions are listed Section 4.2.2). The air dispersion modelling results are described further in ES Chapter 5 Air Quality (**Document Reference 6.2.5**).

4.4.2 Effects of NO_x on European Sites

- 4.4.2.1 The predicted PCs for long-term (annual mean) and short-term (24 hour) NO_x are listed in Table 6.
- 4.4.2.2 At the Humber Estuary SAC / Ramsar and SPA, the long-term environmental standard was exceeded (annual PC was > 1% of the critical level), but the PEC, taking account of background levels, was well below 70% of the critical level. Therefore, the emissions from the Project alone were still considered to be insignificant according to the assessment criteria. Consequently, no likely significant effects on the Humber Estuary SAC, Ramsar site or the Humber Estuary SPA are expected as a result of annual NO_x emissions.
- 4.4.2.3 The PC was < 1% of the critical level (for annual mean) at Thorne Moor SAC and Thorne & Hatfield Moors SPA indicating that emissions of NO_x are insignificant at these sites.
- 4.4.2.4 For 24 hr NO_x, the data shows that the PC is > 10% of the critical level at the Humber Estuary SAC and Ramsar site, therefore effects cannot be screened out as insignificant and further assessment is required. Levels are insignificant (PC < 10% of the critical level) at the other European sites.

Table 6: Predicted PCs for NO_x and Percentages of Critical Levels

European Site	Baseline NO _x (µg m ⁻³)	Critical Level (µg m ⁻³)	PC (µg m ⁻³)	PC as % of Critical Level	PEC as % of Critical Level
NO_x Annual Mean					
Humber Estuary SAC, Ramsar	13.5	30	2.0	6.8%	51.7%
Humber Estuary SPA	13.5	30	0.3	1.0%	45.9
Thorne Moor SAC	13.2	30	0.03	0.1%	-
Thorne & Hatfield Moors SPA	12.9	30	0.03	0.1%	-
NO_x 24hr					
Humber Estuary SAC, Ramsar	27.0	75	36.5	48.7%	N/A

European Site	Baseline NO _x (µg m ⁻³)	Critical Level (µg m ⁻³)	PC (µg m ⁻³)	PC as % of Critical Level	PEC as % of Critical Level
Humber Estuary SPA	27.0	75	3.0	4.0%	N/A
Thorne Moor SAC	26.4	75	1.1	1.5%	N/A
Thorne & Hatfield Moors SPA	25.8	75	1.1	1.5%	N/A

The PC is considered to be an insignificant contribution where:

- For NO_x Annual Mean: PC < 1% of CL and / or PC > 1% but PEC < 70% of CL
- For NO_x 24hr: PC < 10% of CL (short term)

4.4.3 Effects of Ammonia on European Sites

4.4.3.1 The predicted PCs for ammonia (NH₃) are listed Table 7.

4.4.3.2 The critical levels used are those for vascular plants (3 µg m⁻³) for all the European sites except for Thorne Moor SAC, where lichens are present and the more stringent critical level for lichen and bryophyte presence was used (1 µg m⁻³).

4.4.3.3 Ammonia levels exceeded the percentage PC threshold of 1% and the PEC threshold of 70% of the critical level at the Humber Estuary SAC and Ramsar site so further assessment is required. Levels are insignificant (PC < 1% of the critical level) at the other European sites and no likely significant effects are expected as a result of emissions of ammonia.

Table 7: Predicted PCs for NH₃ and Percentages of Critical Levels

European Site	Baseline NH ₃ (µg m ⁻³)	Critical Level (µg m ⁻³)	PC (µg m ⁻³)	PC as % of Critical Level	PEC as % of Critical Level
Humber Estuary SAC, Ramsar	3.6	3	0.05	1.6%	120.9%
Humber Estuary SPA	3.6	3	0.02	0.7%	-
Thorne Moor SAC	2.6	1	0.002	0.2%	-
Thorne & Hatfield Moors SPA	3.5	3	0.002	0.1%	-

The PC is considered to be an insignificant contribution where:

- PC < 1% of CL and / or PC > 1% but PEC < 70% of CL

4.4.4 Effects of SO₂ on European Sites

4.4.4.1 The predicted PCs for SO₂ (annual) are listed in Table 8. As for ammonia, the more stringent critical level for lichen or bryophyte presence (10 µg m⁻³ for SO₂) was used at Thorne Moor SAC only, with a critical load of 20 µg m⁻³

³ applied to all other sites. The PC did not exceed 1% of the critical level at any of the European sites and therefore emissions of SO₂ were considered insignificant. No likely significant effect on the European sites are predicted.

Table 8: Predicted PCs for SO₂ and Percentages of Critical Levels

European Site	Baseline SO ₂ (µg m ⁻³)	Critical Level (µg m ⁻³)	PC (µg m ⁻³)	PC as % of Critical Level
Humber Estuary SAC, Ramsar	7.5	20	0.1	0.7%
Humber Estuary SPA	7.5	20	0.1	0.3%
Thorne Moor SAC	1.3	10	0.01	0.1%
Thorne & Hatfield Moors SPA	1.6	20	0.01	0.03%

The PC is considered to be an insignificant contribution where:

- PC < 1% of CL and / or PC > 1% but PEC < 70% of CL

4.4.5 Effects of HF on European Sites

4.4.5.1 The predicted PCs for short-term hydrogen fluoride (HF) at the European sites are listed in Table 9. The PC was < 10% of the critical level for both weekly and 24 hr emissions (both considered to be short term). Therefore emissions of HF are considered to be insignificant and no likely significant effects on the European sites are expected.

Table 9: Predicted PCs for HF and Percentages of Critical Levels

European Site	Baseline HF (µg m ⁻³)	Critical Level (µg m ⁻³)	PC (µg m ⁻³)	PC as % of Critical Level
HF Weekly				
Humber Estuary SAC, Ramsar	3.6	0.5	0.04	7.7%
Humber Estuary SPA	3.6	0.5	0.01	1.3%
Thorne Moor SAC	3.2	0.5	0.002	0.3%
Thorne & Hatfield Moors SPA	3.2	0.5	0.002	0.3%
HF 24hr				
Humber Estuary SAC, Ramsar	3.6	5	0.1	1.9%
Humber Estuary SPA	3.6	5	0.02	0.4%
Thorne Moor SAC	3.2	5	0.01	0.1%
Thorne & Hatfield Moors SPA	3.2	5	0.01	0.1%

The PC is considered to be an insignificant contribution where:

European Site	Baseline HF ($\mu\text{g m}^{-3}$)	Critical Level ($\mu\text{g m}^{-3}$)	PC ($\mu\text{g m}^{-3}$)	PC as % of Critical Level
■ PC < 10% of CL (short term)				

4.4.6 *Effects of Deposited Nitrogen on European Sites*

- 4.4.6.1 The predicted PCs for deposited nitrogen are listed in Table 7. The PC exceeded 1% of the critical load and the PEC exceeded the 70% threshold for Atlantic saltmeadow (saltmarsh) and estuary habitat types at the Humber Estuary SAC / Ramsar site, therefore further assessment is required.
- 4.4.6.2 Contributions of nutrient nitrogen are insignificant (PC < 1% of the critical load) at all other European sites and no likely significant effects are expected.

4.4.7 *Effects of Acid Deposition on European Sites*

- 4.4.7.1 Thorne Moor SAC was the only European site with qualifying interest features located within 15 km of the Project that was identified as sensitive to acid deposition.
- 4.4.7.2 The predicted PCs for acid deposition at Thorne Moor SAC are listed in Table 11. The PC did not exceed 1% of the critical load and therefore the effects of acid deposition on the SAC were considered insignificant. No likely significant effects on Thorne Moor SAC are predicted.

Table 10: Predicted PCs for Deposited Nitrogen and Percentages of Critical Loads

European Site	Qualifying Interest Feature	Background Nitrogen Deposition (kg N /ha /yr)	Critical Load (CL) (kg N/ha /yr) (min)	PC (kg N /ha /yr)	PC as % of CL (min)	PEC as % of CL
Humber Estuary SAC, Ramsar	Atlantic salt meadows Estuaries	28.9	20	0.5	2.3%	146.8%
Humber Estuary SPA	Pioneer, low-mid and mid-upper saltmarshes supporting a wide range of wetland bird species.	28.9	20	0.1	0.7%	-
	Low and medium altitude hay meadows – golden plover, curlew, ruff, wigeon, lapwing, teal, oystercatcher & redshank.					
	Rich fens supporting hen harrier, great bittern, marsh harrier	28.9	15	0.1	0.9%	-
Thorne Moor SAC	Degraded raised bogs still capable of natural regeneration	21.3	5	0.01	0.3%	-
Thorne & Hatfield Moors SPA	Coniferous woodland and dwarf shrub heath supporting European nightjar	46.2	5	0.01	0.3%	-

The PC is considered to be an insignificant contribution where:

- PC < 1% of CL and / or PC > 1% but PEC < 70% of CL

Table 11: Predicted PCs for Acid Deposition and Percentages of Critical Loads

European Site	Qualifying Interest Feature	Background Acid Deposition (keq ha ⁻¹ yr ⁻¹)		Critical Load (CL) (keq ha ⁻¹ yr ⁻¹)			PC (keq ha ⁻¹ yr ⁻¹)		PC as % of CL (min)
		S baseline	N baseline	CL max S	CL min N	CL max N	Total S	Total N	
Thorne Moor SAC	Degraded raised bogs still capable of natural regeneration	0.2	1.5	0.1	0.3	0.5	0.001	0.001	0.4%

The PC is considered to be an insignificant contribution where:

- PC < 1% of CL and / or PC > 1% but PEC < 70% of CL

4.5 Screening of Other Effects – Project Alone

4.5.1 *Disturbance or Displacement of Qualifying Interest Birds from the Humber Estuary Ramsar site*

- 4.5.1.1 The construction and operation of the Project will result in increased noise, artificial lighting and human disturbance. There will also be an increase in road and rail traffic, and increased vessel movement along the River Trent. This has the potential to lead to disturbance to, or displacement of, bird species from foraging or roosting habitats.
- 4.5.1.2 The Extended Phase 1 Habitat surveys established that there is little suitable habitat for qualifying interest bird species within the Order Limits. Habitats include intensively managed arable farmland with associated field drains and hedgerows which provide limited refuge or foraging habitat for the waterbirds listed under the Humber Estuary Ramsar or SPA designation (ES Chapter 10 Ecology and Nature Conservation) (**Document Reference 6.2.10**). The River Trent provides more suitable habitat adjacent to the Project, with the riverside vegetation dominated by reedbeds in this area.
- 4.5.1.3 The breeding, wintering and migratory bird survey results confirmed that the arable farmland habitat is not an important area for most waterbirds. During the breeding bird survey, no bird species from the Ramsar site were recorded. Only small numbers of waterbirds from the Humber Estuary Ramsar were recorded in the arable fields around the Project during the wintering and migratory bird surveys (such as teal, oystercatcher, lapwing, curlew and a single sighting of marsh harrier flying over arable fields). Slightly higher numbers of roosting golden plover were recorded on occasion (with a peak count of 82) within the Order Limits but the majority of observations were of low numbers of birds.
- 4.5.1.4 The wintering and migratory bird survey also found that the area of the River Trent adjacent to the Project did not support significant populations of most waterbirds, with only small numbers of birds recorded. A larger sized flock was recorded on only a few occasions. A flock of approximately 50 lapwing were recorded in fields to the west of the River Trent (which will not be affected by the Project) on one survey visit. Golden plover were recorded in larger numbers in flight on one survey (a peak count of 290 birds were observed in flight over the River Trent) but all other observations of golden plover in flight or on land were in much lower numbers.
- 4.5.1.5 Only small numbers of waterbirds that are qualifying interest features of the Humber Estuary Ramsar designation were recorded. There is potential for disturbance to these birds during construction and operation of the Project, for example as a result of increased noise, lighting, traffic movements and human presence. However, birds using the local area are showing signs already of tolerance to some sources of disturbance, given the existing industrial estate present and regular agricultural activity. If small numbers

of birds are disturbed, there are large areas of estuarine and arable farmland habitats available in the local area to move to. Given this and the low numbers of qualifying feature bird species recorded, the effects of disturbance or displacement on birds from the Ramsar designation are not predicted to be significant.

4.5.2 Disturbance or Displacement of Qualifying Interest Birds from the Humber Estuary SPA on Functionally Linked Land

- 4.5.2.1 The Humber Estuary SPA lies 6.5 km to the north of the Project. However, there is the potential that mobile qualifying interest bird species from the SPA rely on land outwith the SPA boundary for foraging or roosting. Important areas for qualifying birds outside of the SPA designation which support the species in question are referred to as ‘functionally linked land’.
- 4.5.2.2 As detailed in the previous section, the breeding and wintering bird surveys highlighted that the arable farmland habitat surrounding the Project is not an important area for waterbirds, with very low numbers of waterbirds recorded. During the wintering and migratory surveys, waterbird species were recorded in low numbers (such as teal, oystercatcher, lapwing, curlew, golden plover and a single sighting of marsh harrier). The only exception to this were occasional sightings of larger flocks of lapwing and golden plover (as detailed previously) and regular records of mallard, which were recorded in larger numbers (with a peak of 41 birds during the wintering survey and a peak of 45 birds during the migratory bird survey). Wintering mallard are a qualifying interest species of the Humber Estuary SPA but are not protected under the Ramsar designation. The mallards were mainly recorded in the water of the River Trent, on its banks or flying over the river, with small number of birds recorded in the adjacent fields. Mallard was the only qualifying interest species recorded on the majority of wintering and migratory bird survey visits rather than occasionally, and in significantly sized numbers throughout the survey visits to suggest that the location may be important for the species.
- 4.5.2.3 A recent NE commissioned report defines functionally linked land as ‘areas of land occurring within 20 km of an SPA, that are regularly used by significant numbers of qualifying bird species’²⁵. A ‘significant number of birds’ can be defined as 1% of the qualifying population of the SPA. The latest British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) report lists the mallard population of the SPA as 1046 individuals (based on a five year average from 2015/16 to 2019/20)²⁶. The wintering and migratory survey peak counts of 42 and 45 birds respectively would account for 4% of the SPA population. In total, peak counts of over 10 birds (i.e. over 1% of the SPA population) were recorded on approximately half of all wintering and migratory bird survey visits. Therefore, it has been assumed that the area of the River Trent and its immediate banks adjacent to the Project is functionally linked land for the Humber Estuary SPA and

²⁵ Bowland Ecology 2021. Identification of Functionally Linked Land supporting SPA waterbirds in the North West of England. NERC361. Natural England

²⁶ WeBS Report Online.

the potential effect on mallard from this area was assessed further in the AA.

4.5.3 *Recreational Disturbance*

- 4.5.3.1 The Project is committed to enabling public access and new cycleways and footpaths will be provided as part of the Project. The Project also includes the creation of a new wetland area adjacent to the River Trent, which will create new ecologically diverse wetland habitats (ES Chapter 3 The Project Description and Reasonable Alternatives) (**Document Reference 6.2.3**). The wetland will have informal paths and an associated Visitor Centre to encourage public access. The new wetlands area and its use by visitors and operational personnel has been considered as a potential source of impact in the assessment of recreational disturbance.
- 4.5.3.2 There is the potential for the increase in recreational use of the site to cause disturbance to qualifying interest bird species of the Humber Estuary Ramsar, or those using functionally linked land associated with the Humber Estuary SPA. However, bird species associated with the designated site have only been recorded in small numbers around the NLGEP site and River Trent, as detailed previously. The raised earth embankments around the River Trent provide some screening of activity to birds on the river. Given the small numbers of Humber Estuary SPA and Ramsar qualifying interest species present in the local area and their likely sensitivity to disturbance, any effects are likely to be temporary and localised. No likely significant effects on the functionally linked land associated with the Humber Estuary SPA, or the Humber Estuary Ramsar site are predicted.

4.5.4 *Water Quality Impacts*

- 4.5.4.1 The water quality of the River Trent (part of the Humber Estuary SAC / Ramsar site) will not be directly affected by the Project. The whole of the River Trent along the length of the Order Limits is lined with raised earth embankments which provide flood defence. There will be no abstractions to or discharges from the river. There will be no construction, operational or decommissioning interactions with the River Trent (as detailed in ES Chapter 9 Water Resources and Flood Risk, **Document Reference 6.2.9**).
- 4.5.4.2 The only potential pathway for impact on the Humber Estuary SAC / Ramsar is from surface water as the River Trent is downstream of the Project. In the absence of mitigation, the potential for contaminated surface water entering the watercourse and resulting in significant effects on the qualifying interest habitats or species supported by the River Trent cannot be excluded. Therefore, the potential effect on the Humber Estuary SAC / Ramsar was assessed further in the AA.

4.5.5 *Air Quality during Construction*

- 4.5.5.1 The potential effects on air quality during construction were also considered for the Humber Estuary SAC / Ramsar site. The Air Quality assessment concluded that the likely impacts of increased traffic emissions

during construction are negligible and were therefore not considered further (ES Chapter 5 Air Quality, **Document Reference 6.2.5**).

- 4.5.5.2 The River Trent section of the Humber Estuary SAC / Ramsar site is adjacent to the Project and within the zone where construction dust impacts may occur (ES Chapter 5 Air Quality, **Document Reference 6.2.5**). In the absence of mitigation, the potential for construction dust resulting in significant effects on the qualifying interest habitats or species of the European site cannot be excluded. Therefore the potential effect of construction dust on the Humber Estuary SAC / Ramsar was assessed in the AA.

4.5.6 Screening Assessment Summary

- 4.5.6.1 The PCs for all of the pollutant types at Thorne Moor SAC and Thorne & Hatfield Moors SPA are predicted to be insignificant. Therefore, no likely significant effects on these European sites are predicted and no further assessment is required.
- 4.5.6.2 The screening assessment could not rule out the potential for significant effects at the Humber Estuary SAC / Ramsar site for the effects of operational emissions to air (NO_x (24 hr), ammonia and nitrogen deposition (for Atlantic salt meadows and estuary habitat types)), surface water quality and construction dust. In addition, potential disturbance to mallard using functionally linked land associated with the Humber Estuary SPA could not be screened out.
- 4.5.6.3 Therefore further assessment was required for the Humber Estuary SAC / Ramsar and the Humber Estuary SPA as part of the AA.

4.6 In-combination Effects – Screening

4.6.1 Approach to Screening

- 4.6.1.1 The ES sets out the approach to assessing the cumulative effects of the Project in Chapter 18 Cumulative Assessment (**Document Reference 6.2.18**). The same approach has been used to identify plans and projects which may have an in-combination effect on European sites for this HRA. Other developments considered in the assessment included those which are under construction, permitted applications not yet implemented and submitted applications not yet determined.
- 4.6.1.2 The assessment applied a proportionate approach in identifying other proposed developments that could contribute to impacts on the same receptors as the Project. The spatial scope of each planning category considered is summarised in Table 12 below. The search area was determined by the largest distance at which the Project could potentially have in-combination effects. The key search areas for the HRA in-combination assessment were:

- In terms of emissions to air, it was considered that only developments with significant combustion emissions had the potential to have an effect in-combination with this Project. For air quality impacts on SAC, SPA and Ramsar sites the search area for other developments was a 15 km radius around the main emission source at the ERF, and then a further 15 km radius around European sites that fell within the initial 15 km radius, as requested by Natural England during consultation (see Section 2.6). For the extensive Humber Estuary SAC / Ramsar site, the search area extended 15 km only from the areas of the designated site that fell within the original 15 km search area; and
- A conservative 2 km search area around the Project Order Limits was applied for construction and operational disturbance or other indirect local effects, plus a further 2 km buffer around those parts of the Humber Estuary SAC / Ramsar falling within the initial 2 km search area.

Table 12: Planning Categories Scale and Spatial Scopes

Category	Spatial Scope
Power generation projects or projects with significant combustion emissions a. NSIP b. Section 36 (including variations) of the Electricity Act c. Town and Country Planning Act (combustion projects only that constituted EIA development under the Town and Country Planning (EIA) Regulations 2017 and required HRA to screening stage at least	15 km from main emission source at the ERF, plus a further 15 km from each European site (SAC / SPA / Ramsar) falling within the initial 15 km
NSIP, Section 36 (including variations), Section 37 of the Electricity Act and Town and Country Planning Act: for projects which, by virtue of their potential to affect (e.g. through disturbance) a European protected site, were screened in to undertake an EIA under the Town and Country Planning (EIA) Regulations 2017	0 to 2 km from the Order Limits, plus a further 2 km from the parts of European sites falling within the initial 2 km zone

4.6.1.3 The cumulative assessment established a long list of 232 developments to be considered, which was then screened to identify a shortlist of developments relevant for the HRA. The full process is detailed in Chapter 18 Cumulative Assessment (**Document Reference 6.2.18**). The screening considered temporal considerations (e.g. whether the construction of other development could overlap in time with the Project construction phase). As a worst-case approach, it was assumed that there will be overlapping operational phases for all the other developments with the operational phase of the Project. Very small scale developments such as household extensions were screened out. It also considered technical considerations, such as the likely zone of influence (ZoI) for each impact type. In terms of

HRA, the main impacts (and their zones of influence) considered are listed in Table 13.

Table 13: Project Impacts (and their Zones of Influence) with Potential to Contribute to Cumulative Effects on European Sites

Topic	Potential Impacts	Zone of Influence
HRA: construction	During construction, potential cumulative disturbance effects could occur with other developments being constructed in close proximity.	A conservative Zol was applied for European sites, comprising up to 2 km from the Order Limits, plus 2 km from the parts of European sites falling within the initial 2 km zone. This zone was considered for impacts such as construction dust and disturbance to qualifying interest species.
HRA: operation	<p>During operation, the key consideration will be the potential combined effect of emissions to atmosphere (from the Project and other combustion processes) and subsequent pollutant deposition on designated sites.</p> <p>Some activities associated with operation could contribute to cumulative effects with other developments in close proximity.</p>	<p>15 km, plus a further 15 km from each European site falling within the initial 15 km zone. Other developments considered are those that are likely to include a significant combustion process. 2 km for local wildlife sites.</p> <p>Up to 2 km from the Order Limits, plus 2 km from the parts of European sites falling within the initial 2 km zone.</p>

4.6.1.4 The extents of these Zol are shown on Figure 5 and Figure 6 along with the developments identified within them. Any developments shown on the Figures but not short-listed in Table 14 were not considered to have effects that should be considered for the HRA in-combination screening.

4.6.1.5 Consideration of developments with significant operational emissions, a review of other developments with large combustion sources not yet operating, but likely to operate concurrently with the Project, identified the following:

- Keadby 2 (within 15 km);
- Keadby 3 (within 15 km);
- An Energy Recovery Facility at Doncaster (within 15 km of European sites that are within 15 km of the Project); and
- An Energy Centre in Hull (within 15 km of European sites that are within 15 km of the Project).

4.6.1.6 The locations of these other developments are shown in Figure 5. Several other developments recently approved were also identified but were screened out of the in-combination effects assessment for the following reasons:

- Eggborough (within 15 km of European sites that are within 15 km of the Project) is a CCGT to replace a former coal fired generation station

of similar size operating until 2018 and assumed to have been contributing to the baseline measurements made in recent years. This development has been screened out as effectively displacing the emissions of a previous similar-sized emitter.

- West Burton (within 15 km of European sites that are within 15 km of the Project) is a 299 MW gas-fired plant which will replace a much larger coal-fired plant scheduled to operate until September 2022. This development has been screened out as effectively displacing the emissions of a larger-sized emitter.
- Drax Repower (within 15 km of European sites that are within 15 km of the Project) is replacing the remaining two coal-fired units with gas turbines²⁷. This development has been screened out as effectively displacing the emissions of a previous similar-sized emitter.

4.6.1.7 On further assessment and review of the planning applications for the Energy Recovery Facility at Doncaster (see BH EnergyGap LLP, 2020)²⁸ and the Energy Centre in Hull (Energy Works (Hull) Ltd, 2011)²⁹ it was apparent that each development had assessed its air quality effects to a distance of 10 km from their respective locations. It is reasonable to assume that no air quality impacts were predicted beyond these distances. The Energy Recovery Facility at Doncaster and the Energy Centre in Hull are approximately 13.3 km and 13.9 km away respectively from any parts of European sites that are within 15 km of the Project. On this basis these other developments were screened out of the in-combination effects assessment.

4.6.1.8 The above screening process left the Keadby 2 and Keadby 3 developments for consideration in the in-combination effects assessment. It should further be noted that Keadby 1 gas-fired power station will cease operating before Keadby 3 is commissioned.

²⁷ Currently it appears that the Drax Repower project in the form of gas turbines will not proceed and a likely scenario is the existing coal-fired generation will be replaced by biomass. Whatever the outcome, in emission terms it will still be a case of effectively displacing the emissions of a previous similar-sized emitter.

²⁸ BH EnergyGap LLP (2020) Sandall Stones Road, Doncaster – Environmental Statement Volume 1 Chapter 5 Air Quality

²⁹ Energy Works (Hull) Ltd (2011) Environmental Statement - Air Quality and Odour and Environmental Statement Addendum for an Energy Works on three adjacent parcels of land in Hull (Application 11/00615/CM)

Table 14: Short List of Other Developments for Consideration in the HRA

ID	Application Reference	Description of Other Development	Location in relation to Order Limits	Overlap in temporal scope
84	PA/2015/0628	Hybrid application for full planning permission for new road and footpaths, informal areas of open space, parklands, play areas and new wildlife habitats, attenuation ponds, recreational lakes, and wetlands community; and outline planning permission with all matters reserved for non-residential institutions (Use Classes D1 and D2), leisure facilities (Use Classes A1 and A3) and storage (Use Class B8).	Within 100 m	Construction
85	PA/2015/0396	Outline planning permission for the development of up to 2500 new homes including a village centre (Use Classes A1, A2, A3, A4, A5, B1 and D1), a health care facility (Use Class D1), community facilities (Use Class D1), a 3 form of entry primary school (Use Class D1), new roads and footpaths, informal areas of open space, play spaces and new wildlife habitats, water bodies and wetlands with all matters reserved for subsequent approval.	Within 100 m	Construction
86	PA/2015/0627	Planning permission for highway works to deliver the new terminating junction to the M181 motorway (due to the de-trunked section of the highway to the north and south of the terminating junction) and the development of the eastern and western sections of the east west link road connecting to the B1450 Burringham Road.	Within 100 m	Construction
21(2)	PA/2019/1461	Planning permission to site an array of ground mounted photovoltaic solar collectors including associated infrastructure.	Within 100 m	Construction
83	PA/2020/2049	Planning permission for the construction of 163 two, three and four bedroomed, 2 storey traditional residential homes with associated garages and access infrastructure.	Within 100 m	Construction
10(2)	PA/2018/1388	Planning permission to re-develop existing football stadium to deliver 11,000 capacity football stadium (Use Class D2); cafe/bar (Use Class A3/4); commercial space (mixed use); club shop (Use Class A1); site access, car parking and associated infrastructure.	Within 100 m	Construction
11(2)	PA/2018/1389	Outline application for the erection of one hundred and sixty apartments with associated works and some matters reserved.	Within 2 km	Construction
16(4)	PA/2018/2140	Planning permission for the installation of a renewable led energy scheme comprising ground mounted photovoltaic solar arrays and battery-based electricity storage containers together with substations; transformer stations; access; internal access track.	Within 1 km	Construction

ID	Application Reference	Description of Other Development	Location in relation to Order Limits	Overlap in temporal scope
17(2)	PA/2018/2186	Outline planning permission for 36 dwellings including new access road and adoptable sewage pumping station (appearance, landscaping, layout and scale reserved for subsequent approval).	Within 1 km	Construction
180	PA/2021/1069	Planning permission to carry out a flood mitigation scheme including the creation of five surface water storage areas and associated works.	Within 2 km	Construction
193	PA/2021/672	Outline planning permission to erect 302 dwellings, to include remediation of the site and means of access as a matter not reserved for subsequent consideration.	Within 1 km	Construction
200	PA/2021/1069	Planning permission to carry out a flood mitigation scheme including the creation of five surface water storage areas and associated works.	Within 2 km	Construction
4(1)	PA/2017/1386	Planning permission for highway works to deliver a new terminating junction to the M181 motorway comprising a new at-grade roundabout to access the B1450 Burringham Road from the M181, new B1450 side roads and realignment of the existing B1450, two new.	Within 100 m	Construction
49(1)	PA/2017/1977	Planning permission for the construction of a Flood Defence Scheme comprising of sheet piling along the right bank of the River Trent; the placing of scour protection along the right bank of the River Trent; localised property protection.	Within 2 km	Construction
8(4)	PA/2018/1060	Planning permission to erect a precast concrete manufacturing facility along with external storage areas and associated infrastructure.	Within 1 km	Construction
N1	Section 36 Variation Consent	Keadby 2 Power Station Project. 910 MW Combined gas fired generating station (CCGT).	Within 7.5 km	Operation
N2	Planning Inspectorate Ref: EN010114	Keadby 3 Low Carbon Gas Power Station Project. A combined cycle gas turbine (CCGT) power station, comprising a CCGT unit with a capacity of up to 910 megawatts (MW) electrical output (gross), carbon capture and compression plant, a CO2 export pipeline connection, and associated development.	Within 7.5 km	Operation

4.6.2 Potential for In-combination Effects

- 4.6.2.1 No direct impacts from the Project on European sites have been identified as part of the HRA and therefore the in-combination assessment focussed on potential indirect impacts identified during the screening stage of the Project.
- 4.6.2.2 The air quality assessment concluded that there will be no significant cumulative effects from construction dust. Additionally, surface water interactions for each development will be fully managed under the relevant permitting process and no significant cumulative effects are expected as set out in ES Chapter 18 Cumulative Assessment (**Document Reference 6.2.18**). Consequently the potential for in-combination effects as a result of construction dust or surface water interactions were screened out of the assessment.
- 4.6.2.3 Therefore the potential for in-combination effects with other developments was considered for:
- the effect of operational emissions to air;
 - disturbance or displacement of qualifying interest bird species from the Humber Estuary Ramsar site; and
 - disturbance or displacement of qualifying interest bird species from the Humber Estuary SPA using functionally linked land.

4.6.3 Potential for In-combination Effects - Operational Emissions to Air

- 4.6.3.1 For operational emissions to air, two projects were identified that had the potential for in-combination effects: Keadby 2 Power Station Project and Keadby 3 Low Carbon Gas Power Station Project (see Figure 5). The potential in-combination effects of these developments are considered in the following sections.

Project Overview: Keadby 2 and Keadby 3

- 4.6.3.2 The Keadby 2 Project is a combined cycle gas turbine (CCGT) nearing completion of construction. It received its Environmental Permit to operate in November 2020. Information to support the assessment of in-combination effects is drawn from Keadby Power Station - Environmental Permit Variation Application, Air Quality Impact Assessment and Habitat Regulations Assessment, 29 November 2019 (SSE, 2019)³⁰.
- 4.6.3.3 The Keadby 3 Low Carbon Gas Power Station Project is an NSIP for which the DCO application was accepted in June 2021. In its ES, Keadby 3

³⁰ SSE (2019) Keadby Power Station - Environmental Permit Variation Application, Air Quality Impact Assessment and Habitat Regulations Assessment, 29 November 2019

assessed air quality effects on protected sites (SSE, 2021a)³¹ for the proposed development alone and in-combination with other developments (SSE, 2021b)³². In doing so it considered Keadby 2 as part of the baseline and did this by modelling Keadby 2 emissions and adding them to the current baseline. The assessment of Keadby 3 concluded that the Project could potentially have in-combination effects with Keadby 3 but since the Project was at an early stage in the application process insufficient data were available to make an assessment and that the onus would therefore fall on the Project to assess in-combination effects with Keadby 3.

- 4.6.3.4 Based on a review of the information provided in the Keadby 2 Environmental Permit application (SSE, 2019) and the Keadby 3 ES (SSE, 2021a) the following conclusions on in-combination effects can be made for the pollutants of interest, namely NO_x, ammonia (NH₃), nutrient nitrogen deposition and acid deposition. It should be noted that the assessments of all three sets of emissions must be considered worst case for several reasons, including: (a) the values referred to are generally the highest that occur anywhere within a protected site and will not be coincident for all three projects; (b) predictions are usually from the worst-case year for meteorological data input to the dispersion model; and (c) predictions are based on a worst-case operating hours scenario.

Emissions of NO_x (annual average and 24 hours)

- 4.6.3.5 For annual average NO_x, the Keadby 2 and 3 assessments predict contributions at the Humber Estuary SAC and Ramsar site of 2.9% and 1.6% of the critical level respectively. The Project also makes a contribution of 6.8% of the critical level at these sites. For the Humber Estuary SPA, the Keadby 2 and 3 assessments predict contributions of 0.6% and 0.4% respectively, and the Project makes a contribution of 1.0% of the critical level. Contributions of annual NO_x were substantially lower at Thorne Moor SAC / Thorne & Hatfield Moors SPA (with contributions of 0.1%, 0.2% and 0.2% of the critical level predicted for the Project, Keadby 2 and Keadby 3³³ respectively).
- 4.6.3.6 It should be noted that these contributions will not coincide at the same locations within these European sites. More importantly, there is substantial headroom before the in-combination predicted environmental concentration (i.e. baseline, plus Keadby 2, Keadby 3 and the Project) meets and / or exceeds 70% the critical level (i.e. the threshold guideline used to indicate a need for further assessment, if it is exceeded). Therefore no in-combination effects are predicted from Annual Average NO_x concentrations. Regarding short-term NO_x concentrations these cannot, for reasons of meteorological conditions, simultaneously affect the same protected site (or part thereof) and so are not considered further.

³¹ SSE (2021a) The Keadby 3 Low Carbon Gas Power Station Project, Document Ref: 6.3, Environmental Statement Volume II - Appendix 8B: Air Quality - Operational Phase

³² SSE (2021b) The Keadby 3 Low Carbon Gas Power Station Project, Document Ref: 5.12, Habitats Regulations Assessment Screening Report

³³ The NO_x contribution for Keadby 3 refers to Thorne Moor SAC only as contributions for Thorne & Hatfield Moors SPA were not presented.

Ammonia

- 4.6.3.7 Keadby 2 and 3 assessments predict process contributions of ammonia of 3.2% and 0.5% respectively of the critical level at Humber Estuary SAC and Ramsar site. The Project is predicted to make a process contribution of 1.6% of the critical level at Humber Estuary SAC and Ramsar site. For the Humber Estuary SPA, the Keadby 2 and 3 assessments predict contributions of 0.6% and 0.1% respectively, and the Project makes a process contribution of 0.7% of the critical level.
- 4.6.3.8 At Thorne Moor SAC, ammonia contributions from the Project, Keadby 2 and Keadby 3 are predicted as 0.2%, 0.7% and 0.2% of the critical level respectively. Thorne & Hatfield Moors SPA has similar contributions at 0.1% of the critical level for the Project and 0.6% of the critical level for Keadby 2 (no data for Keadby 3).
- 4.6.3.9 In-combination with those from Keadby 2 and 3, there is a need for further assessment of the effects of ammonia on the Humber Estuary SAC, SPA and Ramsar site, Thorne Moor SAC and Thorne & Hatfield Moors SPA.

Nitrogen Deposition

- 4.6.3.10 The Keadby 2 assessment predicts a contribution of nutrient nitrogen of 2.0 to 2.9% of the critical load at Humber Estuary SAC and Ramsar site, and Keadby 3 assessment predicts a contribution of 0.7%. The Project is predicted to make a contribution of 2.3% of the critical load at Humber Estuary SAC and Ramsar site. For the Humber Estuary SPA, Keadby 2 predicts contributions of 0.4 – 0.8% of the critical load, Keadby 3 predicts a contribution of 0.2%, and the Project predicts contributions of 0.7 – 0.9% of the critical load.
- 4.6.3.11 At Thorne Moor SAC, nitrogen deposition from the Project, Keadby 2 and Keadby 3 are predicted as 0.3%, 0.8% and 0.2% of the critical load respectively. At Thorne & Hatfield Moors SPA, contributions are 0.3% of the critical load for the Project and 0.4% of the critical load for Keadby 2 (no data for Keadby 3).
- 4.6.3.12 In-combination with those of Keadby 2 and 3, there is a need for further assessment of the effects of nitrogen deposition on the Humber Estuary SAC, SPA and Ramsar site, Thorne Moor SAC and Thorne & Hatfield Moors SPA.

Acid Deposition

- 4.6.3.13 Individually the Project, Keadby 2 and Keadby 3 predict that the effects on acid deposition were insignificant at Thorne Moor SAC (the only European site which is sensitive to the effects of acid deposition in this assessment). Keadby 3 predicted no appreciable contribution of acid deposition on Thorne Moor SAC (0.0% of the critical load). However, in-combination the combined emissions from the Project and Keadby 2 may equal or exceed the 1% of the critical load threshold, with contributions of 0.4% and

0.6% of the critical load respectively. Further consideration has been given to acid deposition based on the above and the already high background levels of acid deposition at Thorne Moor SAC.

Conclusion

4.6.3.14 As there is potential for the operational phases of these projects to coincide with that of the Project, the potential for likely significant effects on European sites could not be excluded and further assessment was required as part of the AA (see Section 5.5).

4.6.4 Potential for In-combination Effects - Disturbance or Displacement of Qualifying Interest Bird Species

4.6.4.1 The location of other projects in the vicinity of the Project was considered in relation to potential in-combination effects of disturbance or displacement of birds from the Humber Estuary Ramsar site and Humber Estuary SPA (through disturbance to mallard on the River Trent and its immediately adjacent banks, which is considered functionally linked land for mallard protected under the SPA designation).

4.6.4.2 Fifteen developments were identified within 2 km of the Project, which are mostly associated with the existing industrial estate and nearby residential areas (see Figure 6). While there will be some localised disturbance to local bird populations, all but one of the developments are over 1 km from the Humber Estuary Ramsar designation and the potential for in-combination disturbance effects is low. No likely significant in-combination disturbance effects on the Humber Estuary Ramsar bird populations are expected.

4.6.4.3 As illustrated on Figure 6, no new developments with the potential for disturbance effects on birds were identified within the extended 2 km zone up the River Trent. Only one development was identified close to the River Trent, which was a flood defence scheme which could cause disturbance during construction. However, this development is situated over 4 km south of the stretch of the River Trent which will be affected by disturbance from the Project, and also almost 1 km outside of the Ramsar boundary. At this distance, in-combination effects are considered unlikely.

5. APPROPRIATE ASSESSMENT

5.1 Introduction

5.1.1.1 The HRA screening identified that an Appropriate Assessment (AA) was required for the effects of:

- NO_x (24 hour), ammonia and deposited nitrogen on the Humber Estuary SAC / Ramsar site;
- surface water quality on the Humber Estuary SAC / Ramsar site;
- construction dust on the Humber Estuary SAC / Ramsar site; and
- potential disturbance to mallard using functionally linked land associated with the Humber Estuary SPA.

5.1.1.2 This section assesses the impacts of the Project on the relevant qualifying interest features of each site. Contour plots have been produced to assist with the assessment of the potential effects of emissions to air, which illustrate the dispersion extent and concentrations of the pollutants as a percentage of the PC. The aim of the AA was to identify whether no adverse effect on the integrity of the European sites can be concluded, or whether adverse effects on the integrity of the European sites will result.

5.1.2 Drone Survey

5.1.2.1 As saltmarsh habitat was a key consideration in the AA, a drone survey was undertaken in June 2020 to remotely map the habitats along the length of the River Trent up and downstream from the Project site. Ground truthing of the data has not yet been undertaken so the results should be viewed as indicative rather than definite.

5.1.2.2 Figure 7 provides a comparison of the drone survey results and the Natural England Priority Habitat Inventory Dataset from Defra's MAGIC map website. The drone survey results indicated that the majority of the habitat lining the River Trent was reedbed with intermingled small areas of upper saltmarsh (represented as 'reedbed' on the map). While the NE dataset categorises it as saltmarsh, NEs supplementary advice on the Humber Estuary SAC saltmarsh habitat also suggests that reedbed is widespread. The advice notes that the tidal marsh community is dominated by *Phragmites australis* (common reed) and *Bulboschoenus maritimus* swamp (sea club-rush), along with *Elymus repens* (couch grass) saltmarsh community. These reedbed-dominated habitats account for more than 50% of the total tidal vegetation in the inner estuary down to the King George V Bridge at Gunness (which lies south of the Project site). The Environment Agency (EA) dataset on saltmarsh extent & zonation also shows that reedbed is the dominant habitat type along the River Trent, with small areas of fringing upper saltmarsh³⁴.

³⁴ Environment Agency Dataset: Saltmarsh Extent & Zonation.

5.1.2.3 Therefore, it is concluded that reedbed is more common along the River Trent than the MAGIC dataset shows and it will be assumed for the assessment that a mosaic of reedbed and upper saltmarsh habitat exists in these areas. The EA dataset of saltmarsh extent was used for the contour maps as the most up to date official information source.

5.2 Humber Estuary SAC / Ramsar

5.2.1 Effects of NO_x

5.2.1.1 The PC for daily (24 hour) NO_x at the Humber Estuary SAC / Ramsar site exceeded the 10% threshold at 48.7% of the critical level. Daily (24 hour) NO_x is a measure of short-term peaks in emissions over the course of a day. These short-term emissions are less likely to have a significant impact on vegetation.

5.2.1.2 The Institute of Air Quality Management (IAQM) guide to the assessment of air quality impacts on designated nature conservation sites³⁵ notes that long term (annual mean) concentration of NO_x is the most relevant for its impacts on vegetation as the effects are additive in nature over months and years. The effects of long term NO_x was assessed as insignificant for the Humber Estuary SAC / Ramsar site in the HRA screening.

5.2.1.3 A contour plot (Figure 8) was produced to illustrate the main areas where 24hr NO_x was predicted to exceed the 10% threshold of the critical level. The contour plot shows that 9.4 ha of reedbed and 2.8 ha of upper saltmarsh habitat is affected along the Humber Estuary SAC / Ramsar site, extending up and downstream of the stack locations. Emission levels are only slightly over the 10% threshold over approximately half of this area, with a peak rising up to 48.7% of the critical level on the section of the River Trent adjacent to Flixborough Industrial Estate (where reedbed is dominant). Qualifying interest habitats in this area are limited to the small scattered areas of upper saltmarsh. The dominant habitat present is reedbed which is not a qualifying interest feature for either designated site.

5.2.1.4 The exceedance of the 10% threshold of the critical level will be of a short term nature which is less damaging to habitats, and will occur in an area with very little qualifying interest habitat. 9.4 ha of reedbed (which equates to 1% of reedbed extent within the SAC / Ramsar) and 2.8 ha of upper saltmarsh (0.3% of saltmarsh extent within the designated site) are within the exceedance zone but a much smaller part of this area (adjacent to Flixborough Industrial Estate) will actually experience the peak levels of emissions. Background levels of NO_x are low (well below the critical level for NO_x) which suggests that the saltmarsh could accommodate small increases in NO_x without adverse effects. Given the very small area of effect, its short term nature and the lack of qualifying interest habitats in this location, the effect of 24hr NO_x is not expected to be significant or negatively affect the conservation objectives of the Humber Estuary

³⁵ 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.

SAC/Ramsar. It is concluded that there will be no adverse effect on site integrity.

5.2.2 *Effects of Ammonia*

- 5.2.2.1 The PC for ammonia at the Humber Estuary SAC / Ramsar site marginally exceeded the 1% threshold at 1.6% of the critical level. The PEC was also exceeded (120.9% of the critical level) due to high background levels of ammonia (predominantly due to agricultural sources) in the local area.
- 5.2.2.2 A contour plot (Figure 9) was produced to illustrate the main locations where ammonia was predicted to exceed the 1% threshold. This plot shows that the areas of the Humber Estuary SAC / Ramsar site affected by an exceedance of the 1% threshold are extremely limited. One small section of the River Trent lies within the 1% critical level contour line south of Flixborough Industrial Estate, where the PCs are predicted to reach between 1 and 1.6% of the critical level (i.e. only marginally over the 1% exceedance threshold). This area is dominated by reedbed habitat. There is one further area north of the industrial estate where the 1% contour line just skims the edge of the River Trent.
- 5.2.2.3 As detailed above, qualifying interest habitats in this area are limited, with reedbed dominating the riverside vegetation. It is possible that there are small areas of saltmarsh (a qualifying interest habitat) alongside this stretch of the River Trent but these would be small, marginal areas of habitat. The EA dataset suggests that 3.7 ha of reedbed vegetation (0.4% of the total extent of reedbed across the SAC / Ramsar) and 0.3 ha of upper saltmarsh (0.03% of the total extent of saltmarsh) will be affected.
- 5.2.2.4 Given the very small areas of the River Trent affected, and the marginal exceedance of the 1% threshold, it is considered unlikely that the exceedance of ammonia will result in any significant effects. The conservation objectives of the Humber Estuary SAC will not be affected and no adverse effect on site integrity is expected.

5.2.3 *Effects of Deposited Nitrogen*

- 5.2.3.1 The effects of deposited nitrogen were assessed further for the Humber Estuary SAC / Ramsar site, in relation to Atlantic saltmeadow (saltmarsh) and estuary habitats.
- 5.2.3.2 The PC for deposited nitrogen at the Humber Estuary SAC / Ramsar site exceeded the 1% threshold (2.3% of the critical load) and the PEC exceeded the 70% threshold (146.8% of the critical load) for Atlantic saltmeadow (saltmarsh) and estuary habitat types, hence the site was taken forwards for further consideration. For the estuary habitat type, the underlying sensitive habitat assessed was also saltmarsh. Background levels of nutrient nitrogen are high, predominantly due to agricultural practices which led to the exceedance of PEC.

- 5.2.3.3 The contour plot for the Humber Estuary SAC / Ramsar site (Figure 10) shows that the areas of the designated site affected by an exceedance of the 1% threshold are extremely localised, mainly affecting short lengths of the River Trent directly adjacent to the Project (which are almost exactly the same locations as those affected in the ammonia contour plot). In total, 4.4 ha of reedbed and 1.2 ha of upper saltmarsh vegetation is located within the 1% critical load contour line, which equates to 0.4% and 0.1% of the total areas of these habitats across the SAC / Ramsar respectively.
- 5.2.3.4 Therefore, Figure 10 illustrates that a combination of reedbed and upper saltmarsh will be affected. Even if all of the habitat was saltmarsh (a qualifying feature of the Humber Estuary SAC / Ramsar), the very small areas of the River Trent affected, the localised areas of effect (the peak of 2.3% of the critical load is restricted to one location immediately adjacent to Flixborough Industrial Estate) and the fact that the majority of the area is affected by contours only marginally over the 1% exceedance threshold means that it is considered unlikely that there will be any significant effects on the saltmarsh habitat. The conservation objectives of the Humber Estuary SAC / Ramsar will not be affected and no adverse effect on site integrity is expected.

5.2.4 Surface Water Quality

- 5.2.4.1 The HRA screening identified that, in the absence of mitigation, there was potential for the Humber Estuary SAC / Ramsar site to be adversely affected by contaminated surface water runoff into the River Trent.
- 5.2.4.2 The River Trent is downstream of the Project and surface water interactions from the Project (e.g. through local drains and ditches) will ultimately run in to the river. However, industry best practice techniques will be followed for all surface water crossings and interactions (such as the crossing of drains and agricultural ditches within the Order Limits) which is expected to result in negligible impacts on local water resources (as detailed in Chapter 9 Water Resources and Flood Risk, **Document Reference 6.2.9**). Therefore, it is reasonably expected that any effects further downstream at the River Trent would also be negligible. Therefore no likely significant effect on water quality is expected. No adverse effect on the site integrity of the Humber Estuary SAC / Ramsar site is expected.

5.2.5 Construction Dust

- 5.2.5.1 In the absence of mitigation, the HRA screening identified the potential for construction dust impacts on the qualifying interest habitats or species of the Humber Estuary SAC / Ramsar site.
- 5.2.5.2 With embedded, standard best practice measures in place, the impacts of construction dust were predicted to be of negligible or at worst, minor significance in the air quality assessment (see Chapter 5 Air Quality, **Document Reference 6.2.5**). The nearby habitats of the Humber Estuary SAC / Ramsar that could be affected by dust are reedbeds and small areas of saltmarsh lining the River Trent. The existing port (Flixborough Wharf)

lies between the river and construction work to the north but there are some areas to the south where work will be very close to the River Trent (e.g. the railway reinstatement). Any increased dust at these locations would be a localised and small scale impact on these habitats which is not predicted to be significant. Therefore, no adverse effect on the site integrity of the Humber Estuary SAC / Ramsar site is expected.

5.3 Humber Estuary SPA

5.3.1 Disturbance to Functionally Linked Land

- 5.3.1.1 The effects of potential disturbance to wintering mallard using the River Trent were also assessed further, as surveys established that the river and its immediately adjacent banks could be classed as functionally linked land used by mallards outside of the Humber Estuary SPA boundary.
- 5.3.1.2 Increased vessel movement has the potential to cause disturbance to mallard using the River Trent and its immediately adjacent banks. Freight transport by river during construction (2023 – 2028) would mainly comprise bringing imported fill to the site and is expected to result in between 4 and 16 additional vessel movements at Flixborough Wharf per month, with a maximum total of 80 vessel movements per year between 2023 and 2028 (see Chapter 13 Traffic and Transport, **Document Reference 6.2.13**). Therefore, there would be an estimated 4 extra vessels per week at peak in addition to the approximate one vessel per day currently. Freight transport by river during the operational phase is estimated to result in 580 additional vessel movements at Flixborough Wharf per year. Compared to the 305 vessel movements in 2019, this is an increase of almost 200% and nearly 50 additional vessel movements per month. This increased movement would result in approximately 2 – 4 vessel movements per day (based on 360 or 240 days per annum scenarios), in comparison to approximately one vessel per day previously.
- 5.3.1.3 Mallard using the River Trent and its immediately adjacent banks will be habituated already to the movement of vessels on the water currently and it is not expected that a small increase in boat movements per day would create a significant disturbance effect. The increase in vessel movements is very small in the construction phase (a 6 year period), which will allow habituation to small increases in vessel movements before the operational phase of the Project. Mallard are also a species that are often tolerant of humans and not particularly sensitive to disturbance³⁶.
- 5.3.1.4 The construction and operation of the Project will result also in increased noise, artificial lighting, traffic and human disturbance which could lead to disturbance or displacement of birds. However, the mallard populations are highly mobile and there are extensive areas of similar habitat in the local area which any displaced birds could move in to. The raised earth embankments around the River Trent also provide some screening of

³⁶ Woodward, I. D., Calbrade, N. A. and Holt, C.A. (2015) Humber Estuary Bird Decline Investigation 2014. BTO Research Report No. 668.

activity to birds on the river and its immediately adjacent banks. The existing industrial location of the site means that birds will be habituated to some disturbance already, and surveys have confirmed that only low numbers of birds are present. Therefore the effect of disturbance such as noise, lighting or traffic on mallard associated with the Humber Estuary SPA would be low. The majority of the SPA mallard population will be situated far from the Project around the main Humber Estuary and any short term and small scale effects along a short section of the River Trent are expected to be negligible. Therefore no adverse effect on the site integrity of the Humber Estuary SPA is expected.

5.4 Summary of Appropriate Assessment

- 5.4.1.1 The background levels of ammonia and nutrient nitrogen around the Humber Estuary are already high (exceeding the critical level or load), largely as a result of agricultural practices. This means that there is little capacity for increased PC levels in the air quality modelling which has flagged up potential exceedances.
- 5.4.1.2 However, by looking closer at habitat locations and contour plots illustrating where the qualifying interest features and main areas of effect are likely to be, it was possible to rule out any potential significant effects as a result of the Project. The AA concluded that there will be no adverse effects on site integrity at the Humber Estuary SAC / Ramsar site in terms of NO_x (24 hour), ammonia and deposited nitrogen (for saltmarsh habitats).
- 5.4.1.3 It is also worth giving consideration to recent and on-going trends in the baseline emissions and concentrations of the pollutants of concern. This is discussed in Section 5.5 in the context of in-combination effects.
- 5.4.1.4 The potential effects of disturbance on mallard using functionally linked land associated with the Humber Estuary SPA were also considered. It was concluded that any short term and small scale disturbance to the mallard present along a short section of the River Trent and its immediately adjacent banks would have no adverse effects on the site integrity of the Humber Estuary SPA.

5.5 In-combination Effects – Appropriate Assessment

- 5.5.1.1 The HRA screening found that further assessment was required to assess the potential effects of operational emissions to air from the Project in-combination with operational emissions from the Keadby 2 Power Station Project and the Keadby 3 Low Carbon Gas Power Station Project. This section assesses the potential for in-combination effects on designated sites as a result of these combined emissions.
- 5.5.1.2 As described in Section 5.2, several of the European sites that are affected by significant or insignificant contributions by Keadby 2, Keadby 3 and the Project have predicted environmental concentrations that exceed their critical levels for ammonia and/or their critical loads for nutrient nitrogen and acid deposition. As a result, any further exposure to atmospheric

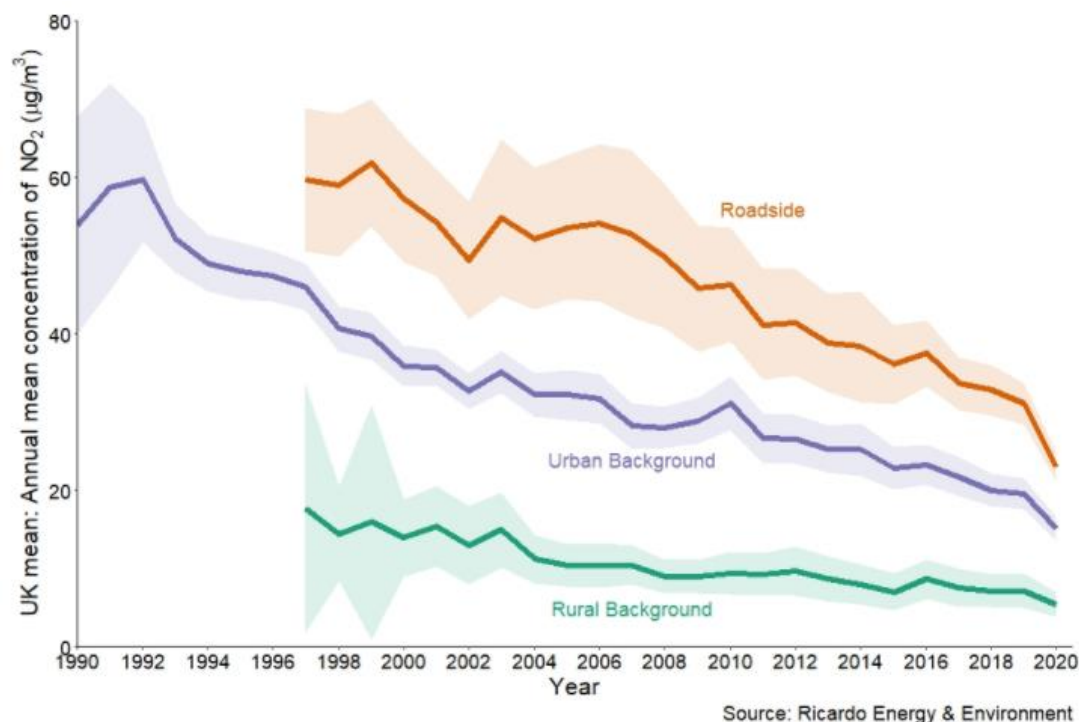
concentrations of ammonia or to deposition of nutrient nitrogen and acid could have in-combination effects. It is important therefore to consider the wider context, particularly in terms of future trends given the Project Development will not begin to emit until 2028.

5.5.2 *Baseline Trends*

- 5.5.2.1 Air quality has been regulated in the UK for many hundreds of years. Modern regulation really began in earnest in the 1950s in response to the widespread pollution episodes (smogs) that afflicted UK cities. More recently regulation has been driven further by the need to improve urban air quality for the protection of health and the need to protect biodiversity in particular from acid rain events linked to UK emissions.
- 5.5.2.2 These regulatory drivers, alongside social, health and climate change pressures, have seen very substantial reductions in emissions in the UK. The use of coal for power generation has all but disappeared; renewable electricity has further reduced the use of coal, gas, and oil for power; emissions from road vehicles have continuously decreased; and industrial emissions have decreased substantially in line with ever more stringent emissions regulations.
- 5.5.2.3 In the case of in-combination effects, the principal pollutants of interest emitted by the Project are oxides of nitrogen (NO_x) and nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and ammonia (NH₃), all of which are pollutants in their own right as well as all contributing to acid deposition. Sulphur emitted by the Project is considered in terms of its contribution to acid deposition only as the other developments screened in are not emitters of sulphur. Figure 1 shows the trend in ambient concentrations of NO₂ in the UK 1990 to 2020. This highlights the magnitude of the change, noting that ambient concentrations of rural NO₂ has reduced by more than half in this period.

Figure 1: Pollution Trend NO₂

Figure 1: Annual mean concentrations of NO₂ in the UK, 1990 to 2020



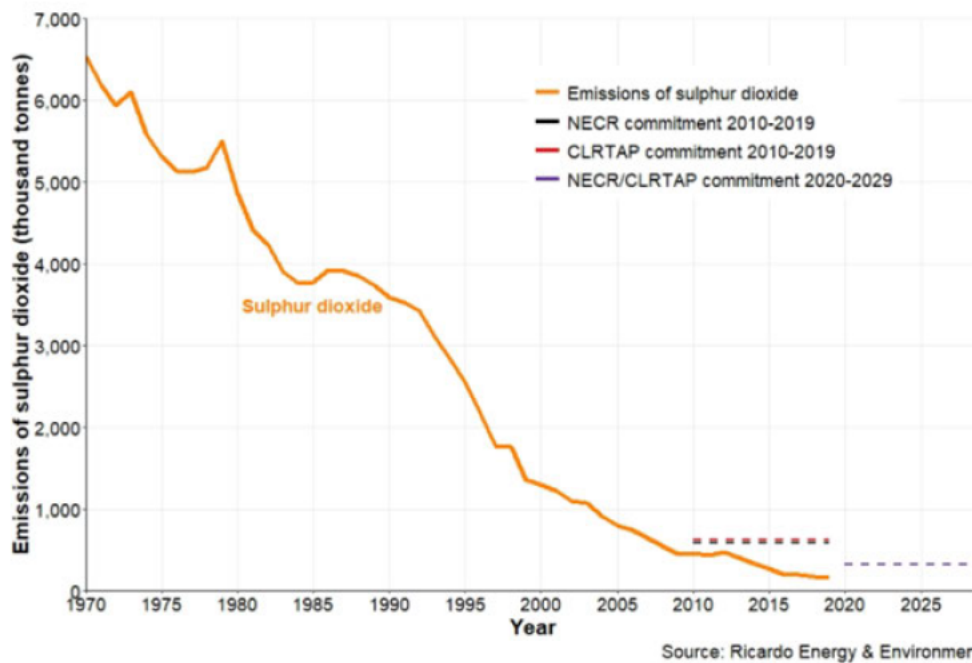
Source: gov.uk ³⁷

- 5.5.2.4 NO₂ emissions, and by definition their contribution to acid and nitrogen deposition, will continue to reduce in the future. The UK remains committed to the European Union’s Best Available Techniques Reference Notes (Bref Notes), which will continue to drive down emissions. Vehicle emissions will continue on a downward trajectory, and this will accelerate with the increasing uptake of electric vehicles.
- 5.5.2.5 The trend in SO₂ emissions has been even more pronounced than NO₂, with a 97% reduction between 1970 and 2020. The wind down of coal fired power generation, the replacement of domestic coal with gas and electricity, road fuel desulphurisation and the increased regulation of industrial SO₂ emissions has drastically reduced emissions. This is illustrated in Figure 2.

³⁷ Office of National Statistics (accessed January 2022) Concentrations of nitrogen dioxide

Figure 2: Emissions Trend SO₂

Figure 2: Annual emissions of sulphur dioxide in the UK: 1970 – 2019



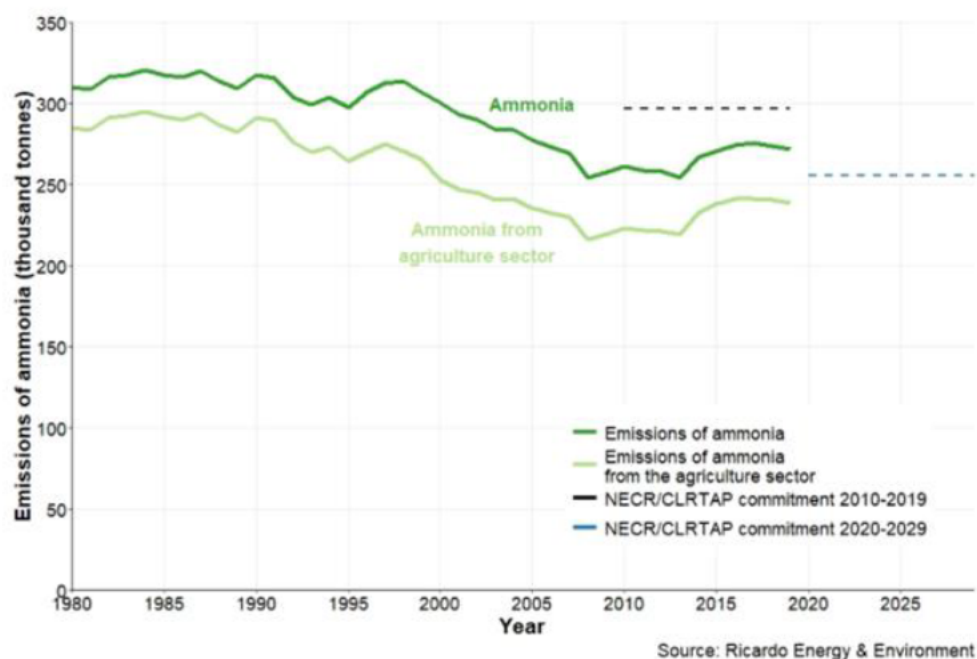
Source: Office of National Statistics³⁸

- 5.5.2.6 SO₂ emissions, and their contribution to acid deposition, will also continue to reduce. Clearly the trend will be less than previously due to the huge gains made in emissions reductions over the last fifty years, but improvements, for example driven through the Bref process and uptake of zero carbon technologies will continue.
- 5.5.2.7 The trend in emissions of ammonia to air are far less pronounced compared to NO₂ and SO₂. The trends in ammonia emissions are shown in Figure 3.

³⁸ Office of National Statistics (accessed January 2022) Emissions of air pollutants in the UK – Sulphur dioxide (SO₂) <https://www.gov.uk/government/statistics/emissions-of-air-pollutants/emissions-of-air-pollutants-in-the-uk-sulphur-dioxide-so2#:~:text=Emissions%20of%20sulphur%20dioxide%20have,level%20in%20the%20time%20series.&text=The%20UK%20meets%20the%20current,the%20period%202010%20to%202019.>

Figure 3: Emissions Trend NH3

Figure 3: Annual emissions of ammonia in the UK: 1980 to 2019



5.5.2.8 By far the greatest source of ammonia emissions is agriculture with over 80% of emissions from this sector. The trend at the moment is, if anything, towards higher emissions. However, the agricultural sector has been paid scant attention in terms of the emissions to air with little meaningful regulation of emissions. Agricultural emissions are specifically picked up as a key topic in the UK Government’s 2019 Air Quality Strategy. The strategy sets out national policy to address ammonia emissions from agriculture with the specific intention of driving these downwards.

5.5.3 Conclusions on In-combination Effects on European Sites

5.5.3.1 Clearly UK emissions, and their contribution to acid and nutrient nitrogen deposition, will be dominant at the designated sites close to the project. However, transboundary pollution also contributes to the overall pollution burden and acid and nitrogen deposition in the UK. Emissions from the European Union (EU) dominate transboundary emissions of NO_x/NO₂, SO₂ and NH₃. Similar to the UK, there have been substantial reductions in emissions and airborne concentrations of pollutants across the EU. These improvements have been driven by the same drivers as exist in the UK and will also continue in the future.

5.5.3.2 In addition to the wider baseline it is also worth considering the likely changes to emissions and ambient concentrations in closer proximity to the Project. There are new emission sources in the form of Keadby 2 and Keadby 3 gas fired power plants a few kilometres to the southwest. However, there are several notable emission reductions, for example the

Keadby 1 gas fired power station that has been taken completely off-line. It had emissions limits at least twice that of the new Keadby plants. The fleet of coal fired power plants that once dominated the Trent valley are all defunct now or very soon will be, Drax has moved to biomass with lower emissions of SO₂ in particular and Scunthorpe steelworks is required to meet BAT through the Bref process, further reducing emissions. The regional vehicle and transportation emissions continue to reduce, mirroring the national trend.

- 5.5.3.3 When the international, national, and local factors are all combined, a clear trend emerges that emissions and ambient concentrations, and therefore associated acid and nitrogen deposition, have reduced massively over the last 50 years and will continue to decrease. Whilst there have been ‘big wins’ in industry in the last 50 years, the downward trend will continue with the further uptake of BAT at industrial sites and further improvements in traffic and uptake of electrical vehicles. The Low Carbon Economy (LCE) may also further accelerate emissions reductions as industries move towards low and zero carbon technologies, further removing combustion sources.
- 5.5.3.4 When taken in this wider context, it is clear that the continued improvement in baseline air quality and deposition described above in a local context, are important in assessing whether there are likely to be any adverse effects on European site integrity from in-combination effects. The effects of the project alone are predicted not to have adverse effects on the site integrity of the Humber Estuary SAC, SPA or Ramsar site, Thorne Moor SAC or Thorne & Hatfield Moors SPA, for the reasons described in Section 5.2 above. Whilst Keadby 2 and 3 power plants are both much larger emitters than the Project, it is clear that the new emissions from them will be offset by the closure of Keadby 1, the changes to the other facilities described and other continuing improvements to the background levels and loads. Hence adverse effects on the integrity of these European sites are not predicted as a result of emissions to air and associated acid and nitrogen deposition in-combination with other developments.

APPENDIX 1 HRA MATRICES

December 2022



NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning

(Applications Prescribed Forms
and Procedure) Regulations 2009

North Lincolnshire Green Energy Park

Appendix 1 HRA Matrices

December 2022

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1. APPENDIX 1 – HRA MATRICES

1.1.1.1 This appendix presents the HRA Matrices which are required as part of the DCO submission as described in the Planning Inspectorate’s Advice Note 10¹. These matrices provide a summary of Stage 1 and Stage 2 of the shadow HRA in a standardised form.

1.1.1.2 The European sites included within the screening assessment are:

- Humber Estuary SAC;
- Humber Estuary Ramsar;
- Humber Estuary SPA;
- Thorne Moor SAC; and
- Thorne & Hatfield Moors SPA.

1.1.1.3 Potential effects upon the European sites which are considered within the submitted HRA report (Annex 5: HRA Report) are provided in the table below.

Table 1: Effects considered within the screening matrices

Designated Site	Effects described in submission information	Presented in screening matrices as
<ul style="list-style-type: none"> ■ Humber Estuary SAC ■ Humber Estuary Ramsar ■ Humber Estuary SPA ■ Thorne Moor SAC ■ Thorne & Hatfield Moors SPA 	<ul style="list-style-type: none"> ■ operational emissions to air including effects of NO_x (annual mean and 24 hr), NH₃, SO₂, HF (weekly and 24 hr), nitrogen deposition and acid deposition 	<ul style="list-style-type: none"> ■ Air Quality
<ul style="list-style-type: none"> ■ Humber Estuary SAC ■ Humber Estuary Ramsar 	<ul style="list-style-type: none"> ■ construction dust and traffic emissions 	<ul style="list-style-type: none"> ■ Air Quality
<ul style="list-style-type: none"> ■ Humber Estuary Ramsar 	<ul style="list-style-type: none"> ■ disturbance or displacement of qualifying interest birds due to factors such as noise, vibration, lighting, traffic, vessel movement and human disturbance ■ recreational disturbance 	<ul style="list-style-type: none"> ■ Disturbance
<ul style="list-style-type: none"> ■ Humber Estuary SPA 	<ul style="list-style-type: none"> ■ disturbance or displacement of SPA qualifying feature birds from the River Trent (functionally linked land) 	<ul style="list-style-type: none"> ■ Disturbance to Functionally Linked Land
<ul style="list-style-type: none"> ■ Humber Estuary SAC ■ Humber Estuary Ramsar 	<ul style="list-style-type: none"> ■ changes in water quality due to surface water interactions 	<ul style="list-style-type: none"> ■ Water Quality

¹ Advice Note 10: *Habitats Regulations Assessment relevant to nationally significant infrastructure projects*. The Planning Inspectorate. Republished November 2017, Version 8.

1.1.1.4

Evidence for, or against, likely significant effects on the European site(s) and its qualifying feature(s) is detailed within the footnotes to the screening matrices below.

Matrix Key:

✓ = Likely significant effect cannot be excluded

✗ = Likely significant effect can be excluded

C = construction

O = operation

D = decommissioning

Where effects are not applicable to a particular feature the matrix cell is formatted as follows:



1.2 Stage 1: Screening Matrices

Table 2: HRA Screening Matrix 1 – Humber Estuary SAC

Name of European site and designation: Humber Estuary Special Area of Conservation (SAC)												
EU Code: UK0030170												
Distance to NSIP: Adjacent at nearest point												
European Site Features	Likely effects of NSIP											
	Air Quality			Disturbance			Water Quality			In-combination effects		
Effect	C	O	D	C	O	D	C	O	D	C	O	D
<i>Stage of Development</i>												
1130 Estuaries	✓c	✓d	✓c				✓e	✓e	✓e	xf	✓g	xf
1140 Mudflats and sandflats not covered by seawater at low tide	xb	xb	xb				xb	xb	xb	xb	xb	xb
1110 Sandbanks which are slightly covered by sea water all the time	xb	xb	xb				xb	xb	xb	xb	xb	xb
1150 Coastal lagoons	xa	xa	xa				xa	xa	xa	xa	xa	xa
1310 <i>Salicornia</i> and other annuals colonising mud and sand	xa	xa	xa				xa	xa	xa	xa	xa	xa
1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)	✓c	✓d	✓c				✓e	✓e	✓e	xf	✓g	xf
2110 Embryonic shifting dunes	xa	xa	xa				xa	xa	xa	xa	xa	xa
2120 Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (“white dunes”)	xa	xa	xa				xa	xa	xa	xa	xa	xa
2130 Fixed coastal dunes with herbaceous vegetation (“grey dunes”)	xa	xa	xa				xa	xa	xa	xa	xa	xa
2160 Dunes with <i>Hippophae rhamnoides</i>	xa	xa	xa				xa	xa	xa	xa	xa	xa
1095 Sea lamprey (<i>Petromyzon marinus</i>)	xb	xb	xb	xb	xb	xb	xb	xb	xb	xb	xb	xb
1099 River lamprey (<i>Lampetra fluviatilis</i>)	xb	xb	xb	xb	xb	xb	xb	xb	xb	xb	xb	xb
1364 Grey seal (<i>Halichoerus grypus</i>)	xa	xa	xa	xa	xa	xa	xa	xa	xa	xa	xa	xa

- a. European site feature is located within a part of the SAC which is over 15 km from the Project and no effects during construction, operation or decommissioning are expected for the Project alone, or in-combination with other developments (e.g. dune habitats are located at least 45 km from the Project) (Annex 5: HRA, Section 4.2.2).
- b. European site features (habitat or species) are not considered sensitive and have been screened out as no effects are expected from the Project alone or in-combination with other developments (Annex 5: HRA, Section 4.2.2).
- c. Impacts from emissions during construction and decommissioning (such as from traffic) were considered negligible and have been screened out from further consideration. However, in the absence of mitigation, potentially significant local impacts from construction dust on areas of upper saltmarsh or reedbed along the River Trent could not be excluded and further assessment was required (Annex 5: HRA, Section 4.5.5).
- d. The screening assessment could not rule out the potential for significant effects of operational emissions as a result of NO_x (24 hr), ammonia and nitrogen deposition (for estuary and Atlantic saltmeadow habitats) so further assessment was required (Annex 5: HRA, Section 4.4).
- e. In the absence of mitigation, the screening assessment could not exclude the potential for significant water quality impacts on the River Trent section of the Humber Estuary SAC so further assessment was required (Annex 5: HRA, Section 4.5.4).
- f. Potential impacts from the in-combination effect of other plans / projects during construction and decommissioning (such as from construction dust and surface water interactions) have been considered and the potential for significant in-combination effects was screened out. No likely significant effects were concluded (Annex 5: HRA, Section 4.6.2).
- g. Potential in-combination effects of other plans / projects with regard to operational emissions to air (for ammonia and nitrogen deposition) could not be screened out and were assessed in the AA (Annex 5: HRA, Section 4.6.3).

Table 3: HRA Screening Matrix 2 – Humber Estuary Ramsar

Name of European site and designation: Humber Estuary Ramsar												
EU Code: UK11031												
Distance to NSIP: Adjacent at nearest point												
European Site Features	Likely effects of NSIP											
	Air Quality			Disturbance			Water Quality			In-combination effects		
Effect	C	O	D	C	O	D	C	O	D	C	O	D
Stage of Development	C	O	D	C	O	D	C	O	D	C	O	D
Criterion 1 – Representative example of a near-natural estuary and associated estuarine habitats – saltmarsh habitats	✓e	✓a xb	✓e				✓h	✓h	✓h	xi	✓k	xi
Criterion 3 – Breeding colony of grey seal (<i>Halichoerus grypus</i>) at Donna Nook and breeding site for natterjack toad (<i>Bufo calamita</i>) on the dune slacks at Saltfleetby-Theddlethorpe.	xc	xc	xc	xc	xc	xc	xc	xc	xc	xc	xc	xc
Criterion 5 – Waterfowl assemblage of international importance (non-breeding) ² .	✓e	xf	✓e	xg	xg	xg	✓h	✓h	✓h	xj	✓k	xj
Criterion 6 – species/populations occurring at levels of international importance. Includes wintering shelduck (<i>Tadorna tadorna</i>), golden plover (<i>Pluvialis apricaria</i>), knot (<i>Calidris canutus</i>), dunlin (<i>Calidris alpina alpina</i>), black-tailed godwit (<i>Limosa limosa islandica</i>), bar-tailed godwit (<i>Limosa lapponica</i>), and redshank (<i>Tringa totanus</i>) ³ .	✓e	xf	✓e	xg	xg	xg	✓h	✓h	✓h	xj	✓k	xj
Criterion 8 – Migration route for both river lamprey (<i>Lampetra fluviatilis</i>) and sea lamprey (<i>Petromyzon marinus</i>) between coastal waters and their spawning areas	xd	xd	xd	xd	xd	xd	xd	xd	xd	xd	xd	xd

- a. The only Ramsar habitat sensitive to the predicted emissions to air identified within 15 km of the Project was saltmarsh. The screening assessment could not rule out the potential for significant effects as a result of operational emissions of NOx (24 hr), ammonia and nitrogen deposition on saltmarsh habitats of the Humber Estuary SAC and Ramsar (Annex 5: HRA, Section 4.4) so further assessment was required in the AA.

² Species with broad habitat types sensitive to emissions to air designated under this site feature include great bittern (*Botaurus stellaris*), marsh harrier (*Circus aeruginosus*), avocet (*Recurvirostra avosetta*), little tern (*Sterna albifrons*), dark-bellied brent goose (*Branta bernicla bernicla*), wigeon (*Anas penelope*) and curlew (*Numenius arquata*).

³ Note: of this species list, only golden plover and black-tailed godwit have broad habitat types that are sensitive to emissions to air.

- b. All other habitats designated under the Ramsar designation were either over 15 km from the Project so potential effects were screened out (e.g. dune habitats), or were located within 15 km from the Project but not sensitive to emissions to air (eg sandflats and mudflats). No effects on these habitats during construction, operation or decommissioning were expected for the Project alone, or in-combination with other developments (Annex 5: HRA, Section 4.2.2).
- c. European site features over 15 km from the Project were screened out. Breeding colonies of grey seal and natterjack toad are situated in the outer Estuary, over 60 km from the Project. No effects are expected for the Project alone or in-combination with other developments (Annex 5: HRA, Section 4.2.2).
- d. River and sea lamprey are not considered sensitive in this location and have been screened out as no effects are expected from the Project alone or in-combination with other developments (Annex 5: HRA, Section 4.2.2).
- e. Impacts from emissions during construction and decommissioning (such as from traffic) were considered negligible and have been screened out from further consideration. However, in the absence of mitigation, potentially significant local impacts from construction dust on areas of upper saltmarsh or reedbed along the River Trent could not be excluded and further assessment was required (Annex 5: HRA, Section 4.5.5).
- f. The operational emissions were not predicted to have a significant effect on the Humber Estuary SPA for NO_x (annual or 24 hr), ammonia, SO₂, HF or deposited nitrogen (in relation to the broad habitat type for qualifying bird species) as PC < 1% of the CL, or PEC < 70% of the CL for all of the emissions (which is classed as an insignificant contribution). As the Ramsar designation protects the same species, no likely significant effects on the qualifying interest birds of the Ramsar were identified as a result of emissions to air (Annex 5: HRA, Section 4.4).
- g. Only small numbers of bird species designated as part of the Ramsar were recorded during bird surveys around the Project and no likely significant effect on the Humber Estuary Ramsar from disturbance to qualifying interest bird species was predicted (Annex 5: HRA, Section 4.5.1 and Section 4.5.3).
- h. In the absence of mitigation, the screening assessment could not exclude the potential for significant water quality impacts on the River Trent section of the Humber Estuary Ramsar so further assessment was required (Annex 5: HRA, Section 4.5.4).
- i. Potential impacts from the in-combination effect of other plans / projects during construction and decommissioning (such as from construction dust and surface water interactions) have been considered and the potential for significant in-combination effects was screened out. No likely significant effects in-combination with other developments were expected (Annex 5: HRA, Section 4.6.2).
- j. The potential for additional disturbance to qualifying interest bird species of the Humber Estuary Ramsar was considered in-combination with other local projects. While some localised disturbance to local bird populations was predicted, the majority of developments were located over 1 km from the Humber Estuary Ramsar designation and the potential for in-combination disturbance effects was low. No likely significant in-combination disturbance effects on the Ramsar bird populations were expected (Annex 5: HRA, Section 4.6.4).
- k. Potential in-combination effects of other plans / projects with regard to operational emissions to air (for ammonia and nitrogen deposition) could not be screened out and were assessed in the AA (Annex 5: HRA, Section 4.6.3).

Table 4: HRA Screening Matrix 3 – Humber Estuary SPA

Name of European site and designation: Humber Estuary Special Protection Area (SPA)									
EU Code: UK9006111									
Distance to NSIP: 6.5 km									
European Site Features	Likely effects of NSIP								
	Air Quality			Disturbance to Functionally Linked Land			In-combination effects		
Effect	C	O	D	C	O	D	C	O	D
Stage of Development	C	O	D	C	O	D	C	O	D
Avocet (<i>Recurvirostra avosetta</i>), breeding and non-breeding	x c	x b	x c	x d	x d	x d	x f	✓ h	x f
Bar-tailed godwit (<i>Limosa lapponica</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Bittern (<i>Botaurus stellaris</i>), Breeding and non-breeding	x c	x b	x c	x d	x d	x d	x f	✓ h	x f
Black-tailed godwit (<i>Limosa limosa islandica</i>), Non-breeding	x c	x b	x c	x d	x d	x d	x f	✓ h	x f
Dunlin (<i>Calidris alpina alpina</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Golden plover (<i>Pluvialis apricaria</i>), Non-breeding	x c	x b	x c	x d	x d	x d	x f	✓ h	x f
Hen harrier (<i>Circus cyaneus</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Knot (<i>Calidris canutus</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Little tern (<i>Sternula albifrons</i>), Breeding	x c	x b	x c	x d	x d	x d	x f	✓ h	x f
Marsh harrier (<i>Circus aeruginosus</i>), Breeding	x c	x b	x c	x d	x d	x d	x f	✓ h	x f
Redshank (<i>Tringa totanus</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Ruff (<i>Calidris pugnax</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Shelduck (<i>Tadorna tadorna</i>), Non-breeding	x a	x a	x a	x d	x d	x d	x f	x f	x f
Waterbird assemblage, Non-breeding ⁴	x c	x b	x c	✓ e	✓ e	✓ e	x g	x g	x g

⁴ Of the waterbird assemblage, the only listed species with broad habitat types sensitive to emissions to air are dark-bellied brent goose (*Branta bernicla bernicla*), wigeon (*Anas penelope*) and curlew (*Numenius arquata*).

- a. Emissions to air were not expected to have a negative effect on a number of the qualifying bird species, either because the birds' broad habitat types were not sensitive, or there were no expected negative effects on the species as a result of effects on the species' broad habitat type. As these birds were not sensitive to the effects of emissions to air, no effects were expected for the Project alone or in-combination with other developments (Annex 5: HRA, Section 4.2.2).
- b. The operational emissions were not predicted to make a significant contribution to the Humber Estuary SPA for NO_x (annual or 24 hr), ammonia, SO₂, HF or deposited nitrogen (in relation to the broad habitat type for these species) as PC < 1% of the CL, or PEC < 70% of the CL for all of the emissions. No likely significant effects on the SPA were identified (Annex 5: HRA, Section 4.4).
- c. Impacts from emissions during construction and decommissioning (such as from traffic) were considered negligible and have been screened out from further consideration (Annex 5: HRA, Section 4.5.5). Therefore no effects on qualifying interest species are expected as a result of effects on their broad habitat types.
- d. No functionally linked land was identified for these bird species. The Humber Estuary SPA lies 6.5 km to the north of the Project. At these distances, the potential for significant disturbance to bird species from the SPA (which have not been identified as using functionally linked land and only occur around the Project in low numbers) is negligible and no likely significant effect is expected (Annex 5: HRA, Section 4.5.2 and Section 4.5.3).
- e. As surveys suggested mallard (part of the waterbird assemblage) use the area of the River Trent adjacent to the Project in large enough numbers that it can be considered functionally linked land to the SPA, potential disturbance to mallard could not be screened out and further assessment was required (Annex 5: HRA, Section 4.5.2).
- f. No pathway for in-combination effects identified during the assessment.
- g. The in-combination screening assessment did not find potential for significant disturbance effects in-combination with other projects for mallard from the Humber Estuary SPA using the River Trent (functionally linked land). Only one other potential development was identified nearby to the River Trent which was at a sufficient distance from the Project that in-combination effects were considered unlikely (Annex 5: HRA, Section 4.6.4).
- h. Potential in-combination effects of other plans / projects with regard to operational emissions to air (for ammonia and nitrogen deposition) could not be screened out and were assessed in the AA (Annex 5: HRA, Section 4.6.3).

Table 5: HRA Screening Matrix 4: Thorne Moor SAC

Name of European site and designation: Thorne Moor Special Area of Conservation (SAC)						
EU Co: UK0012915						
Distance to NSIP: 10.1 km						
European Site Features	Likely effects of NSIP					
Effect	Air Quality			In combination effects		
Stage of Development	C	O	D	C	O	D
7120 Degraded raised bogs still capable of natural regeneration		x a			✓ b	

- a. The operational emissions from the Project on the SAC were found to be insignificant (PC < 1%, or PC <10% of critical level / load) and no likely significant effects on Thorne Moor SAC were predicted as a result of emissions to air (Annex 5: HRA, Section 4.4).
- b. Potential in-combination effects of other plans / projects with regard to operational emissions to air (for ammonia, nitrogen deposition and acid deposition) could not be screened out and were assessed in the AA (Annex 5: HRA, Section 4.6.3).

Table 6: HRA Screening Matrix 5: Thorne & Hatfield Moors SPA

Name of European site and designation: Thorne & Hatfield Moors Special Protection Area (SPA)						
EU Co: UK9005171						
Distance to NSIP: 10.1 km						
European Site Features	Likely effects of NSIP					
Effect	Air Quality			In combination effects		
Stage of Development	C	O	D	C	O	D
Coniferous woodland and dwarf shrub heath⁵ supporting European nightjar		x a			✓ b	

- a. The operational emissions from the Project on the SAC were found to be insignificant (PC < 1%, or PC <10% of critical level / load) and no likely significant effects on Thorne & Hatfield Moors SPA were predicted as a result of emissions to air (Annex 5: HRA, Section 4.4).
- b. Potential in-combination effects of other plans / projects with regard to operational emissions to air (for ammonia and nitrogen deposition) could not be screened out and were assessed in the AA (Annex 5: HRA, Section 4.6.3).

⁵ Of these habitat types supporting European nightjar, only dwarf shrub heath is sensitive to the potential effects of emissions to air.

1.3 Stage 2: Integrity Matrices

1.3.1.1 Stage 2 Integrity Matrices are provided for each European site where a likely significant effect was identified at Stage 1 (Screening).

1.3.1.2 Likely significant effects could not be excluded for the following sites:

- Humber Estuary SAC;
- Humber Estuary Ramsar;
- Humber Estuary SPA;
- Thorne Moor SAC; and
- Thorne & Hatfield Moors SPA.

1.3.1.3 These sites have been subject to further assessment in order to establish if the NSIP could have an adverse effect on their integrity. Potential effects upon the European sites which are considered within the AA section of the HRA report (Annex 5: HRA Report) are summarised in the table below.

Table 7: Effects considered within the integrity matrices

Designated Site	Effects described in submission information	Presented in integrity matrices as
<ul style="list-style-type: none"> ■ Humber Estuary SAC ■ Humber Estuary Ramsar ■ Humber Estuary SPA ■ Thorne Moor SAC ■ Thorne & Hatfield Moors SPA 	<ul style="list-style-type: none"> ■ operational emissions to air including effects of NO_x (24 hour), ammonia, nitrogen and acid deposition 	<ul style="list-style-type: none"> ■ Air Quality
<ul style="list-style-type: none"> ■ Humber Estuary SAC ■ Humber Estuary Ramsar 	<ul style="list-style-type: none"> ■ construction dust 	<ul style="list-style-type: none"> ■ Air Quality
<ul style="list-style-type: none"> ■ Humber Estuary SPA 	<ul style="list-style-type: none"> ■ disturbance or displacement of mallard (an SPA qualifying species as part of the wintering waterbird assemblage) using the River Trent as functionally linked land 	<ul style="list-style-type: none"> ■ Disturbance to Functionally Linked Land
<ul style="list-style-type: none"> ■ Humber Estuary SAC ■ Humber Estuary Ramsar 	<ul style="list-style-type: none"> ■ changes in water quality due to surface water interactions 	<ul style="list-style-type: none"> ■ Water Quality

1.3.1.4

Evidence for the conclusions on integrity is detailed within the footnotes to the matrices below.

Matrix Key:

✓ = Adverse effect on integrity **cannot** be excluded

✗ = Adverse effect on integrity **can** be excluded

C = construction

O = operation

D = decommissioning

Where effects are not applicable to a particular feature the matrix cell is formatted as follows:



Table 8: HRA Integrity Matrix 1 – Humber Estuary SAC

Name of European site and designation: Humber Estuary Special Area of Conservation (SAC)									
EU Code: UK0030170									
Distance to NSIP: Adjacent at nearest point									
European Site Features	Adverse effect on integrity								
	Air Quality			Water Quality			In-combination effects		
Effect	C	O	D	C	O	D	C	O	D
Stage of Development									
1130 Estuaries	x a	x b	x a	x c	x c	x c		x d	
1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) (saltmarsh)	x a	x b	x a	x c	x c	x c		x d	

- a. The final CEMP will contain best practice measures that will be implemented by the site contractors to control dust, so that there is negligible effect beyond the Red Line Boundary. Therefore, no adverse effect on the site integrity of the Humber Estuary SAC is expected (Annex 5: HRA, Section 5.2.5).
- b. For both European site features, the underlying sensitive habitat assessed was saltmarsh. Operational emissions to air of NO_x (24 hr), ammonia and nitrogen deposition were not expected to have a significant effect on the sensitive saltmarsh habitats of the SAC. The main reasons were that the majority of emissions only slightly exceeded the 1% threshold of the critical level / load, the localised areas of effect and the very small percentage of these habitats being affected across the Humber Estuary SAC as a whole. No adverse effects on the integrity of the Humber Estuary SAC were predicted (Annex 5: HRA, Section 5.2).
- c. There will be no direct construction, operational or decommissioning water interactions with the River Trent. The River Trent is downstream of the Project and may be indirectly affected by surface water runoff which will ultimately enter the river. However, as industry best practice techniques and mitigation measures will be followed for all surface water crossing and interactions, impacts on local water resources are expected to be negligible. No adverse effects on the integrity of the Humber Estuary SAC are expected (Annex 5: HRA, Section 5.2.4).
- d. In-combination effects of operational emissions to air were considered but factors such as local emissions reductions (e.g. closure of Keadby 1), changes in other local facilities and continued improvements to the background air quality and deposition levels locally and nationally were expected to offset increased emissions from the combined local developments. The in-combination assessment found that adverse effects on the integrity of Humber Estuary SAC were not predicted as a result of emissions to air in-combination with other developments (Annex 5: HRA, Section 5.5.3).

Table 9: HRA Integrity Matrix 2 – Humber Estuary Ramsar

Name of European site and designation: Humber Estuary Ramsar									
EU Code: UK11031									
Distance to NSIP: Adjacent at nearest point									
European Site Features	Adverse effect on integrity								
Effect	Air Quality			Water Quality			In-combination effects		
Stage of Development	C	O	D	C	O	D	C	O	D
Criterion 1 – Representative example of a near-natural estuary and associated estuarine habitats	x a	x b	x a	x c	x c	x c		x d	

- a. The final CEMP will contain best practice measures that will be implemented by the site contractors to control dust, so that there is negligible effect beyond the Red Line Boundary. Therefore, no adverse effect on the site integrity of the Humber Estuary Ramsar is expected (Annex 5: HRA, Section 5.2.5).
- b. Operational emissions to air of NOx (24 hr), ammonia and nitrogen deposition were not expected to have a significant effect on the sensitive saltmarsh habitats of the Humber Estuary Ramsar. The main reasons were that the majority of emissions only slightly exceeded the 1% threshold of the critical level / load, the localised areas of effect and the very small percentage of these habitats being affected across the Humber Estuary Ramsar as a whole. No adverse effects on the integrity of the Humber Estuary Ramsar were predicted (Annex 5: HRA, Section 5.2).
- c. There will be no direct construction, operational or decommissioning water interactions with the River Trent. The River Trent is downstream of the Project and may be indirectly affected by surface water runoff which will ultimately enter the river. However, as industry best practice techniques and mitigation measures will be followed for all surface water crossing and interactions, impacts on local water resources are expected to be negligible. No adverse effects on the integrity of the Humber Estuary Ramsar are expected (Annex 5: HRA, Section 5.2.4).
- d. In-combination effects of operational emissions to air were considered but factors such as local emissions reductions (e.g. closure of Keadby 1), changes in other local facilities and continued improvements to the background air quality and deposition levels locally and nationally were expected to offset increased emissions from the combined local developments. The in-combination assessment found that adverse effects on the integrity of Humber Estuary Ramsar were not predicted as a result of emissions to air in-combination with other developments (Annex 5: HRA, Section 5.5.3).

Table 10: HRA Integrity Matrix 3 – Humber Estuary SPA

Name of European site and designation: Humber Estuary Special Protection Area (SPA)						
EU Code: UK9006111						
Distance to NSIP: 6.5 km						
European Site Features	Adverse effect on integrity					
Effect	Disturbance to Functionally Linked Land			In-combination effects		
Stage of Development	C	O	D	C	O	D
Waterbird assemblage, Non-breeding (mallard only)	x a	x a	x a		x b	

- a. The potential effects of disturbance (e.g. noise, visual disturbance, traffic, human disturbance) on mallard using functionally linked land associated with the Humber Estuary SPA were assessed further. In particular, the small increases in vessel movements over the course of the Project were considered but were not expected to create a significant disturbance effect. It was concluded that any short term and small scale disturbance to the mallard present along a short section of the River Trent would have no adverse effect on the site integrity of the Humber Estuary SPA (Annex 5: HRA, Section 5.3).
- b. In-combination effects of operational emissions to air were considered but factors such as local emissions reductions (e.g. closure of Keadby 1), changes in other local facilities and continued improvements to the background air quality and deposition levels locally and nationally were expected to offset increased emissions from the combined local developments. The in-combination assessment found that adverse effects on the integrity of Humber Estuary SPA were not predicted as a result of emissions to air in-combination with other developments (Annex 5: HRA, Section 5.5.3).

Table 11: HRA Integrity Matrix 4 – Thorne Moor SAC

Name of European site and designation: Thorne Moor Special Area of Conservation (SAC)			
EU Code: UK0012915			
Distance to NSIP: 10.1 km			
European Site Features	Adverse effect on integrity		
Effect	<i>In-combination effects</i>		
Stage of Development	C	O	D
7120 Degraded raised bogs still capable of natural regeneration		x a	

- a. In-combination effects of operational emissions to air were considered but factors such as local emissions reductions (e.g. closure of Keadby 1), changes in other local facilities and continued improvements to the background air quality and deposition levels locally and nationally were expected to offset increased emissions from the combined local developments. The in-combination assessment found that adverse effects on the integrity of Thorne Moor SAC were not predicted as a result of emissions to air in-combination with other developments (Annex 5: HRA, Section 5.5.3).

Table 12: HRA Integrity Matrix 5 – Thorne & Hatfield Moors SPA

Name of European site and designation: Thorne & Hatfield Moors Special Protection Area (SPA)			
EU Code: UK9005171			
Distance to NSIP: 10.1 km			
European Site Features	Adverse effect on integrity		
Effect	<i>In-combination effects</i>		
Stage of Development	C	O	D
Coniferous woodland and dwarf shrub heath supporting European nightjar		x a	

- a. In-combination effects of operational emissions to air were considered but factors such as local emissions reductions (e.g. closure of Keadby 1), changes in other local facilities and continued improvements to the background air quality and deposition levels locally and nationally were expected to offset increased emissions from the combined local developments. The in-combination assessment found that adverse effects on the integrity of Thorne & Hatfield Moors SPA were not predicted as a result of emissions to air in-combination with other developments (Annex 5: HRA, Section 5.5.3).

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APPENDIX 2 FIGURES

December 2022

North Lincolnshire Green Energy Park

Title Figure 4
European Sites and SSSIs within 15 km of the Emissions Source

Client Information








Client North Lincolnshire Green Energy Park Ltd.
PINS Proj No EN010116
Date 15/03/2022
Drawn by MTC
Checked by SD
Version P0

Map Information

CRS EPSG 27700
CRS Name British National Grid
Scale 120,000
ArcMap File \\UKSSMBNAF-

AQ_ES_DesignatedSites_15kmBuffer_A01

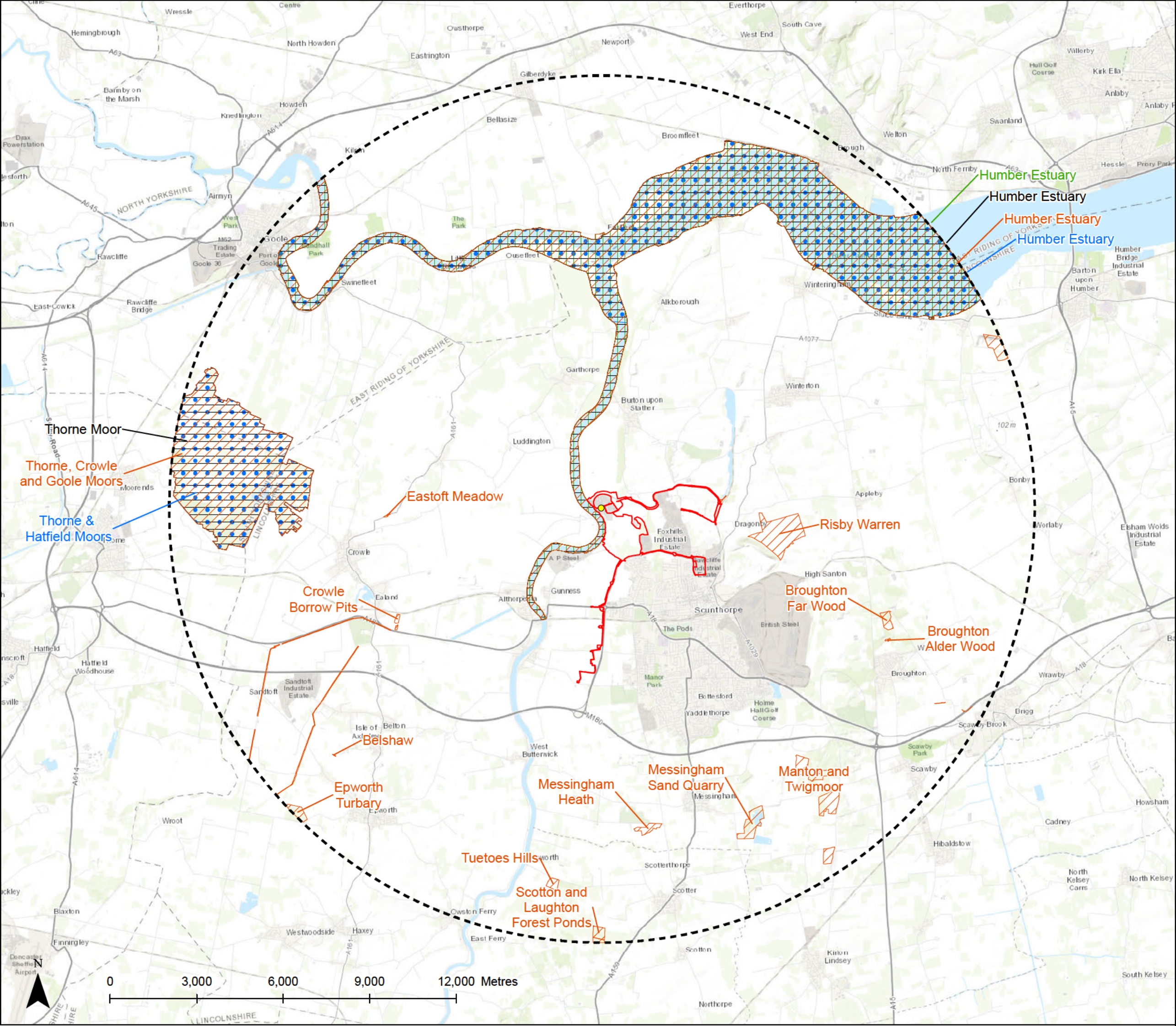
Legend

-  Stack Location
-  Order Limits
-  15km Buffer from Stack Location
-  Site of Special Scientific Interest (SSSI)
-  Special Area of Conservation (SAC)
-  Ramsar Site
-  Special Protection Area (SPA)

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

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North Lincolnshire Green Energy Park

Title Figure 5
Proposed Large-scale Combustion Projects that are within a 15 km buffer of the Project's Main Emissions Sources and others within a further 15 km of European Protected Sites that occur within the Buffer

Client Information

Client	North Lincolnshire Green Energy Park Ltd.
PINS Proj No	EN010116
Date	20/05/2022
Drawn by	MTC
Checked by	KM
Version	P0

Map Information

CRS EPSG	27700
CRS Name	British National Grid
Scale	200,000
ArcMap File	\\UKSSMBNAF-

HRA_ES_DesignatedSites_InCombination_15kmBuffer_A01

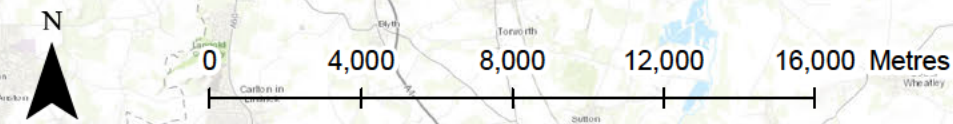
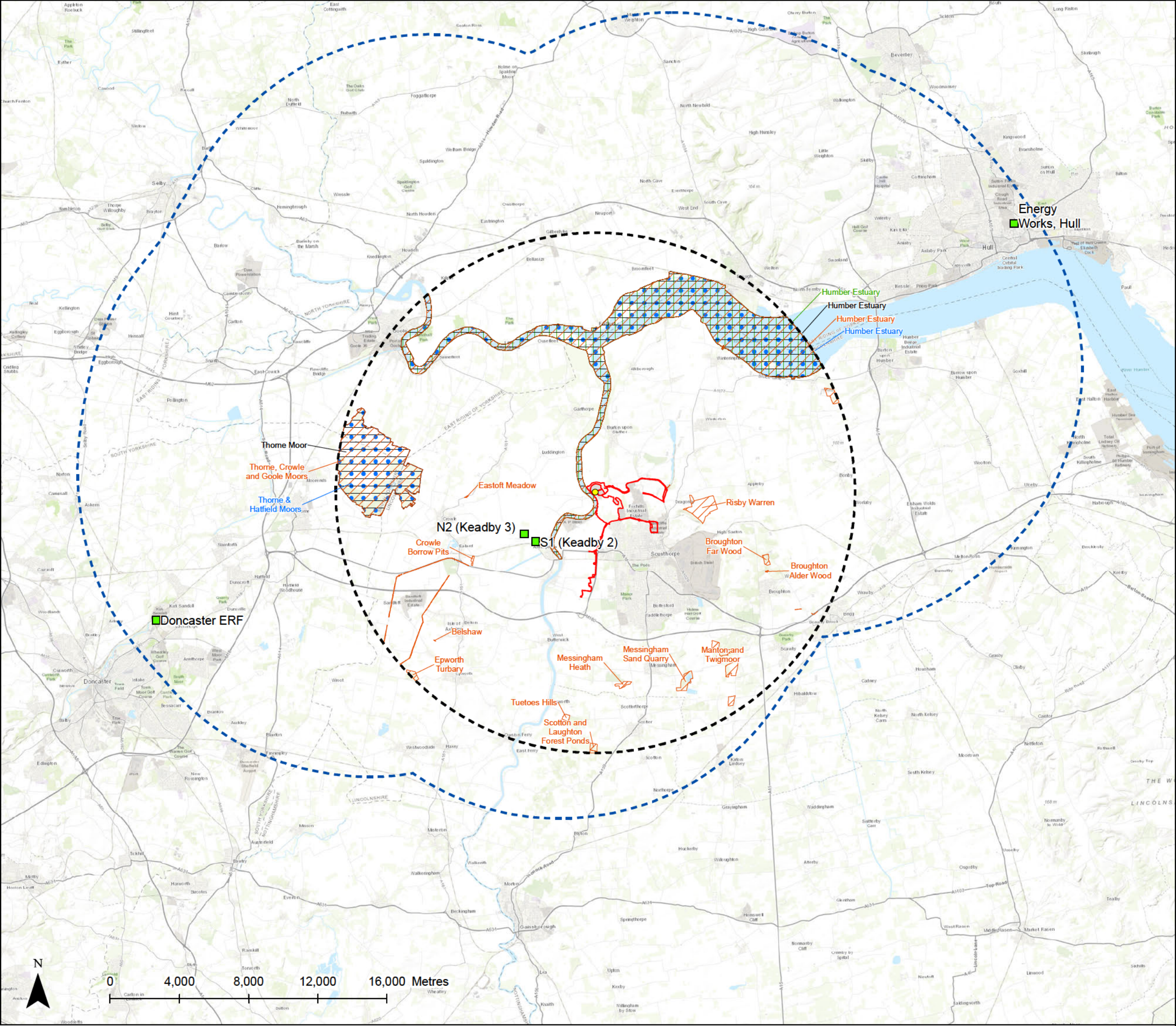
Legend

- Project Locations
- Stack Location
- Order Limits
- 15km Buffer from Stack
- 15km Buffer from Designated Sites
- Site of Special Scientific Interest
- Special Area of Conservation
- Ramsar Site
- Special Protection Area

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

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North Lincolnshire Green Energy Park

Title Figure 6
Proposed Developments that are within a 2 km buffer of the Order Limits and others within a further 2 km of European Protected Sites that occur within the Buffer

Client Information

Client North Lincolnshire Green Energy Park Ltd.
PINS Proj No EN010116
Date 20/05/2022
Drawn by MTC
Checked by SD
Version P0

Map Information

CRS EPSG 27700
CRS Name British National Grid
Scale 50,000
ArcMap File \\UKSSMBNAF-

HRA_ES_DesignatedSites_InCombination_2kmBuffer_A01

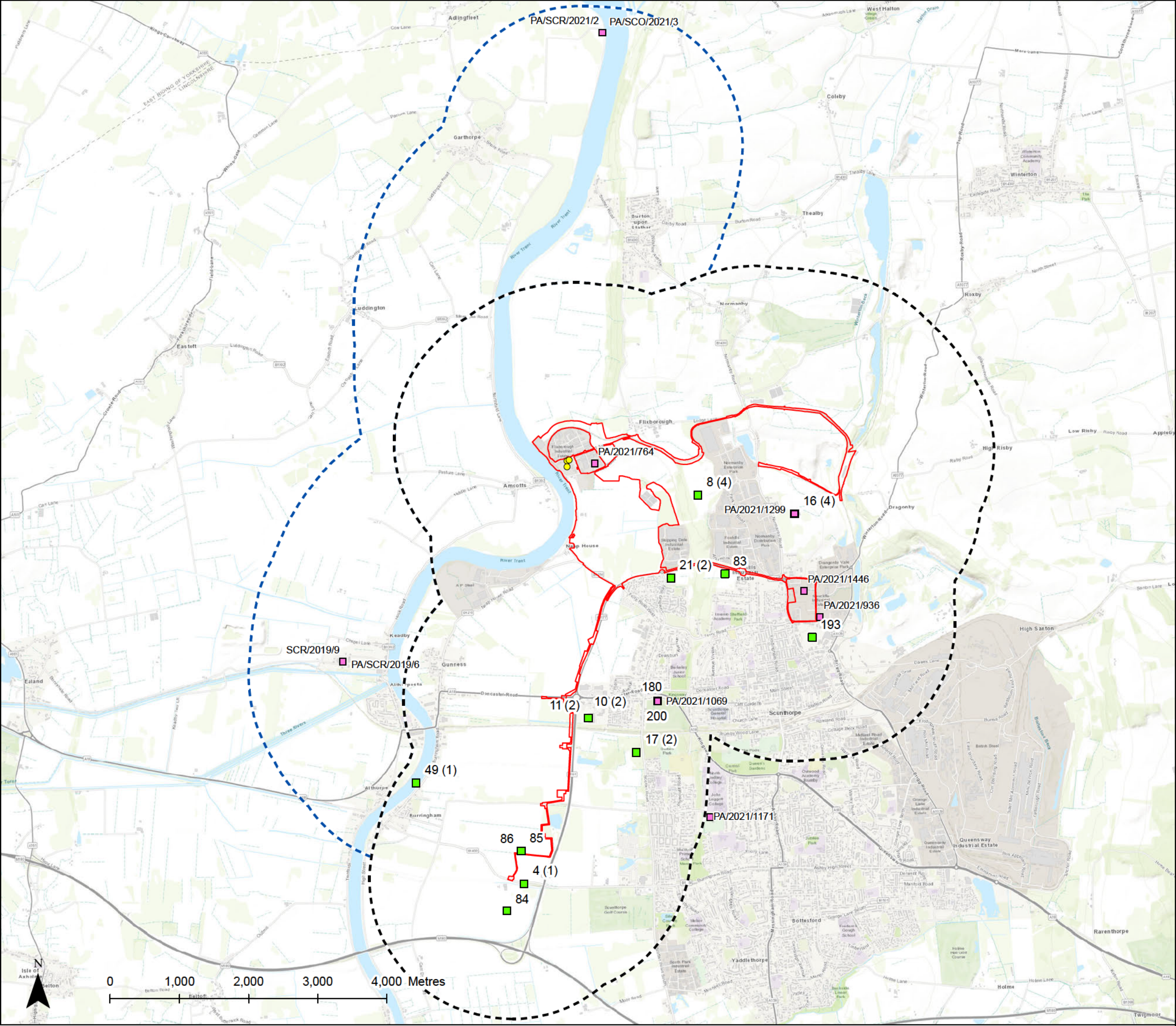
Legend

- Planning Applications
- Construction Project Location
- Stack Location
- Order Limits
- Order Limits 2km Buffer
- 2km Buffer from Designated Sites Beyond Order Limits 2km Buffer

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c)

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0 1,000 2,000 3,000 4,000 Metres



North Lincolnshire Green Energy Park

Title Figure 7
Reedbed Comparison

Client Information

Client North Lincolnshire Green
PINS Proj No Energy Park Ltd.
Date EN010116
Drawn by 16/03/2022
Checked by MTC
Version SD

Map Information

CRS EPSG 27700
CRS Name British National Grid
Scale 70,000

ArcMap File
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HRA_ES_ReedbedComparison_A01

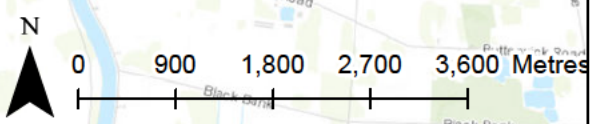
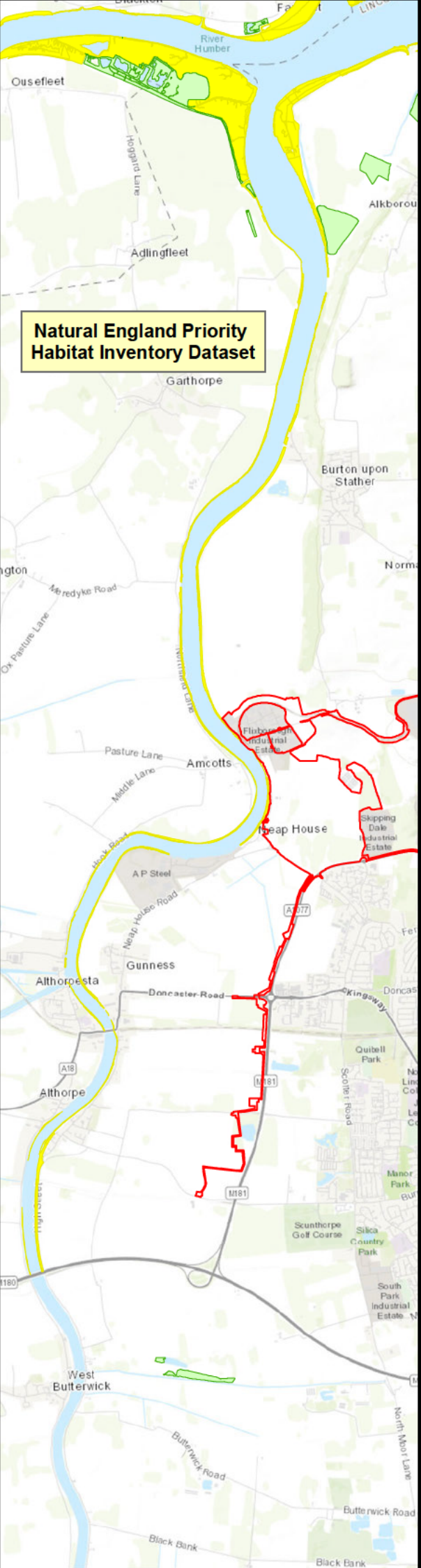
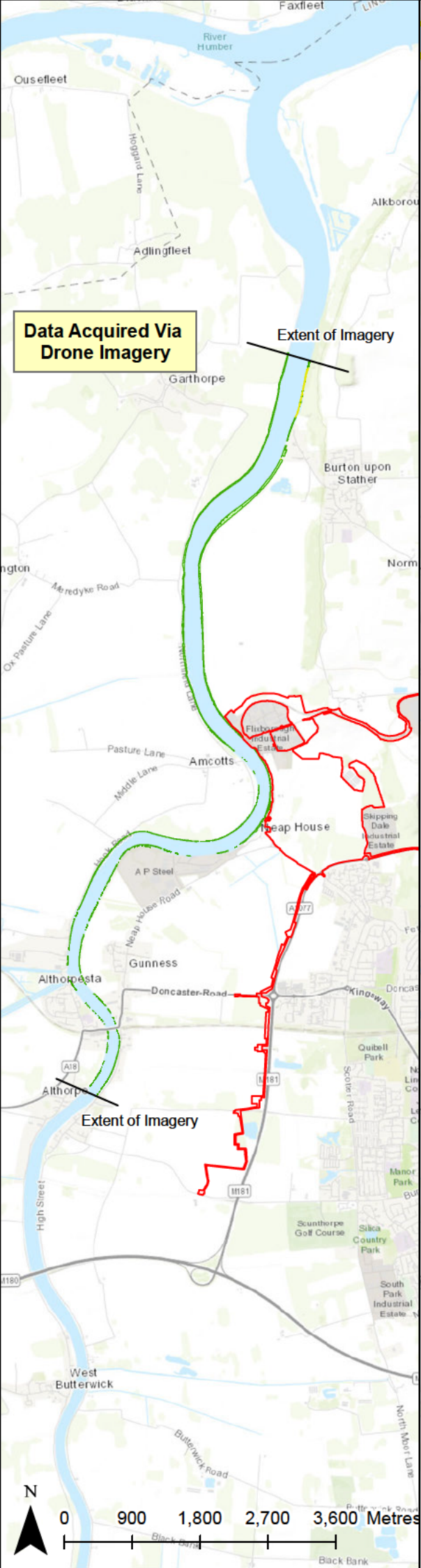
Legend

- Order Limits
- Reedbeds
- Coastal

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

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North Lincolnshire Green Energy Park

Title Figure 8
Contours NO_x
24hr

Client Information

Client North Lincolnshire Green Energy Park Ltd.
PINS Proj No EN010116
Date 16/03/2022
Drawn by MTC
Checked by SD
Version P0

Map Information

CRS EPSG 27700
CRS Name British National Grid
Scale 20,000

ArcMap File

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HRA_ES_Contours_NOX_24_Hour_CL75_v4_A01

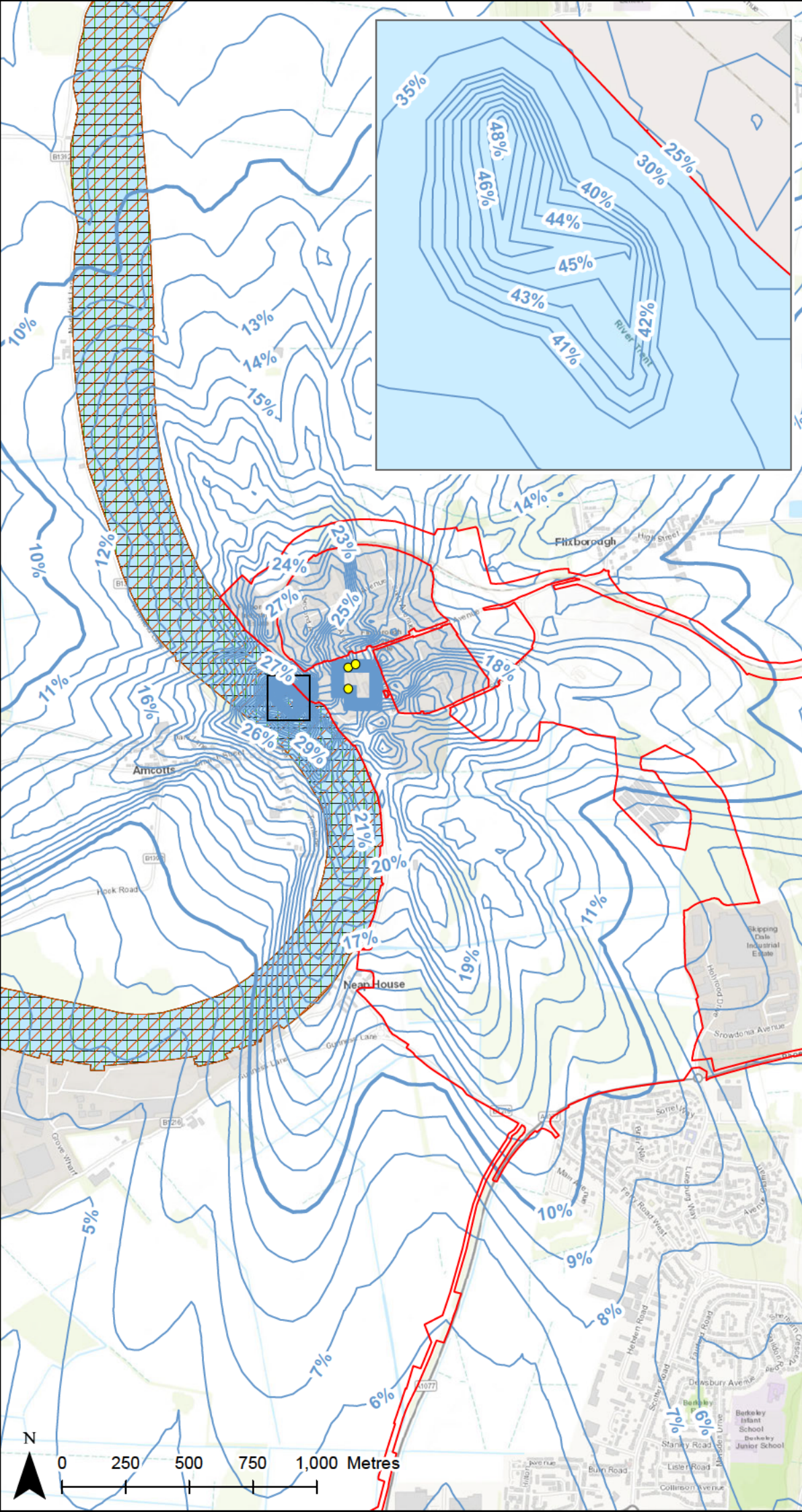
Legend

- Stack Location
- NO_x (24hr) Contour Plot: PC as % of Critical Level (CL). CL = 75 μg m⁻³**
- 10% of CL (threshold above which further assessment is required)
- 1% intervals
- Order Limits
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Ramsar Site
- Area Covered by all Three Designations (for inset map)

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

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North Lincolnshire Green Energy Park

Title Figure 9
Contours NH³
Annual

Client Information

Client North Lincolnshire Green Energy Park Ltd
PINS Proj No EN010116
Date 16/03/2022
Drawn by MTC
Checked by SD
Version P0

Map Information

CRS EPSG 27700
CRS Name British National Grid
Scale 40,000

ArcMap File

\\UKSSMBNAF-

HRA_ES_Contours_NH3_Annual_CL3_v4_A01

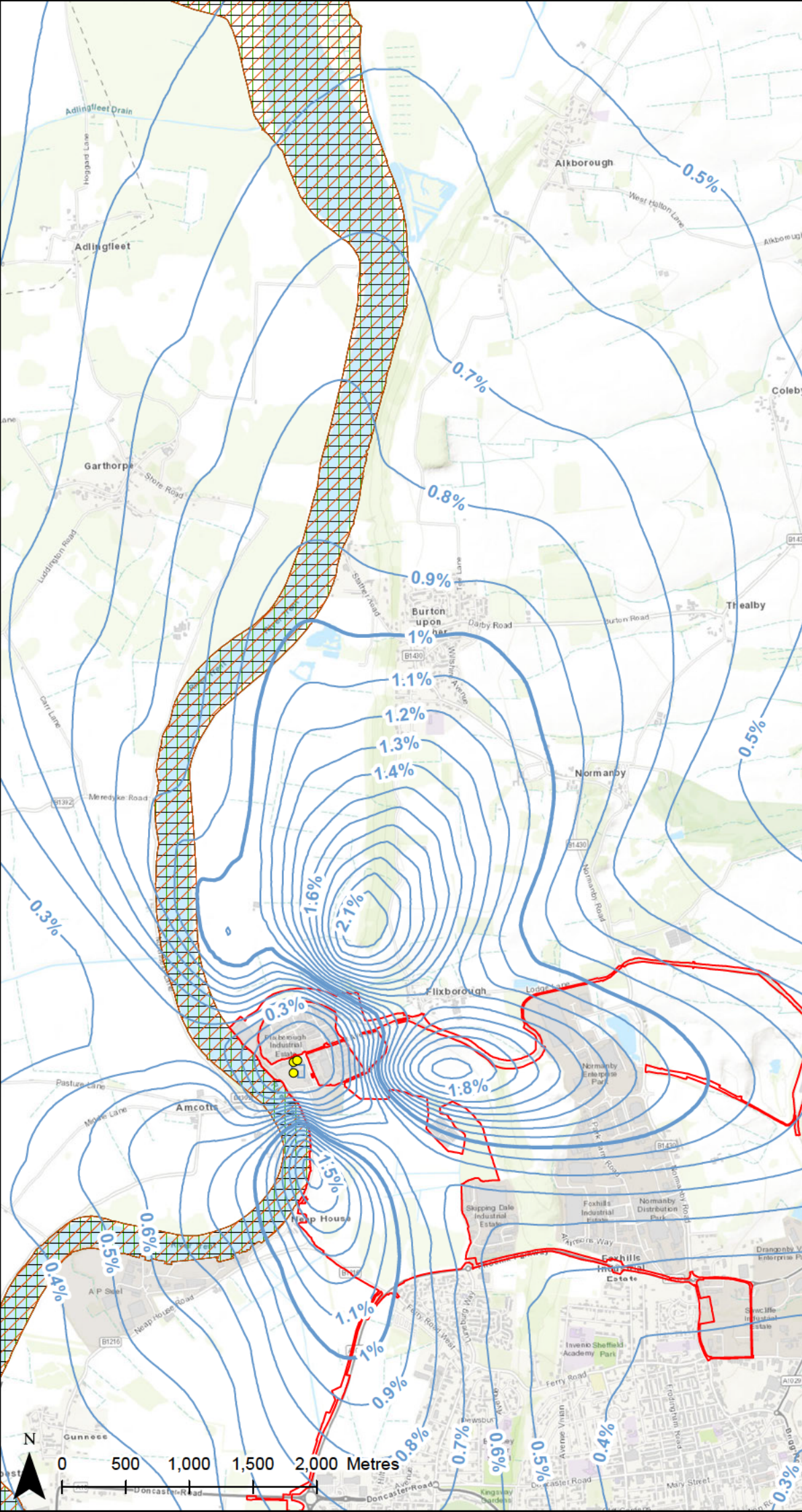
Legend

- Stack Location
- Ammonia Contour Plot: PC as % of Critical Level (CL). CL = 3 $\mu\text{g m}^{-3}$**
- 1% of CL (threshold above which further assessment is required)
- 0.1% intervals
- Order Limits
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Ramsar Site

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

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North Lincolnshire Green Energy Park

Title Figure 10
Contours ND Grassland

Client Information

Client North Lincolnshire Green Energy Park Ltd
PINS Proj No EN010116
Date 16/03/2022
Drawn by MTC
Checked by SD
Version P0

Map Information

CRS EPSG 27700
CRS Name British National Grid
Scale 40,000

ArcMap File
 \\UKSSMBAF-

HRA_ES_Contours_ND_CL20Grassland_v4_A01

Legend

- Stack Location
- Nutrient Nitrogen Contour Plot: PC as % of Critical Load (CL) (min)**
- 1% of CL (threshold above which further assessment is required)
- 0.1% intervals
- Order Limits
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Ramsar Site
- Reedbeds
- Upper Saltmarsh

Layer Source Information

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI,

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