KEADBY 3
# CARBON CAPTURE POWER STATION

A collaboration between **SSE Thermal** and **Equinor**

**Document Ref: 10.8**

**Planning Inspectorate Ref: EN010114**

**The Keadby 3 (Carbon Capture Equipped Gas Fired Generating Station) Order**

**Land at and in the vicinity of the Keadby Power Station site, Trentside, Keadby, North Lincolnshire**

# Proposed Development Changes: Environmental Statement (ES) Addendum – Volume II (Chapters and Appendices)

**The Planning Act 2008**

**The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017**

**Applicant: Keadby Generation Limited**

**Date: May 2022**

# DOCUMENT HISTORY

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|---|---|
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# GLOSSARY

| Abbreviation | Description |
|---|---|
| ABP | Associated British Ports – UK port operator; relevant navigational authority for the River Trent as 'ABP Humber' |
| ADMS | Atmospheric Dispersion Modelling System - a proprietary model for the assessment of effect of emissions to air from point sources and road sources. |
| AGI | Above Ground Installation - installations used to support the safe and efficient operation of a pipeline; above ground installations are needed at the start and end of a cross-country pipeline and at intervals along the route. |
| AGL | Above Ground Level - a height above ground level is a height measured with respect to the underlying ground surface. |
| AIL | Abnormal Indivisible Load - a load that cannot be broken down into smaller loads for transport without undue expense or risk of damage. It may also be a load that exceeds certain parameters for weight, length and width. |
| ALARP | As Low As Reasonably Practicable - a term often used in the regulation and management of safety-critical and safety-involved systems. The ALARP principle is that the residual risk shall be reduced as far as reasonably practicable. |
| ALC | Agricultural Land Classification - part of the planning system in England and Wales which classifies agricultural land into five categories according to versatility and suitability for growing crops. |
| AOD | Above Ordnance Datum - a spot height (an exact point on a map) with an elevation recorded beside it that represents its height above a given datum. |
| APFP | Applications: Prescribed Forms and Procedure related to The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 |
| APIS | Air Pollution Information System - provides a comprehensive source of information on air pollution and the effects on habitats and species. It supports the assessment of potential effects of air pollutants on habitats and species. |
| AQAL | Air Quality Assessment Levels - the baseline level of each pollutant species used during air quality assessments. The results of modelling undertaken to predict concentrations of pollutants are compared against these AQALs. |

| Abbreviation | Description |
|---|---|
| AQS | Air Quality Objectives - the target date on which exceedances of an air quality standard must not exceed a specified number. |
| BAT | Best Available Techniques - the available techniques which are the best for preventing or minimising emissions and impacts on the environment. BAT is required for operations involving the installation of a facility that carries out industrial processes. Techniques can include both the technology used and the way an installation is designed, built, maintained, operated and decommissioned. |
| BAT-AELS | Best Available Techniques – Associated Emission Levels - Achievable emissions values following the implementation of the best available techniques for preventing or minimising emissions and impacts on the environment. |
| BEIS | Department for Business, Energy and Industrial Strategy – department of the UK Government. |
| BMV | Best and Most Versatile - the best and most versatile land is defined as Grades 1 (excellent quality), 2 (very good quality) and 3a (good quality) agricultural land. |
| BNG | Biodiversity Net Gain - an approach to development that intends to leave biodiversity in a better state than before. It encourages developers to provide an increase (in extent and/or quality) in appropriate natural habitat over and above that required to compensate for the habitat losses that would arise from the development concerned. In so doing, the BNG approach aims to assess the current loss of biodiversity through development and contribute to the restoration of ecological networks. |
| BS | British Standard - Standard produced by the British Standards Institution based upon the principles of standardisation recognised inter alia in European Policy. |
| CCGT | Combined Cycle Gas Turbine - a highly efficient form of energy generation technology. An assembly of heat engines work in tandem using the same source of heat to convert it into mechanical energy which drives electrical generators and consequently generates electricity. |
| CCP | Carbon Capture Plant – plant used to capture carbon dioxide ($CO_2$) emissions produced from the use of fossil fuels in electricity generation and industrial processes. |

| Abbreviation | Description |
|---|---|
| CCUS | Carbon Capture, Usage and Storage - group of technologies designed to reduce the amount of carbon dioxide (CO2) released into the atmosphere from coal and gas power stations as well as heavy industry including cement and steel production. Once captured, the CO2 can be either re-used in various products, such as cement or plastics (usage), or stored in geological formations deep underground (storage). |
| CEMP | Construction Environmental Management Plan - a plan to outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area. |
| CERC | Cambridge Environmental Research Consultants |
| CIEEM | Chartered Institute of Ecology and Environmental Management - professional body for ecologists and environmental managers in the United Kingdom. |
| $CO_2$ | Carbon Dioxide - an inorganic chemical compound with a wide range of commercial uses. |
| CTMP | Construction Traffic Management Plan - a plan outlining measures to organise and control vehicular movement on a construction site so that vehicles and pedestrians using site routes can move around safely. |
| dB | Decibel. A unit used to express relative differences in sound power or intensity. The decibel (dB) scale is logarithmic and used to describe the measurement and audibility of sounds within the range of approximately 0-140dB |
| DBA | Desk Based Assessment - sets out the heritage baseline for the Proposed Development Site in order to identify all known designated and non-designated heritage assets |
| DCC | Direct Contact Cooler |
| DCO | Development Consent Order - made by the relevant Secretary of State pursuant to The Planning Act 2008 to authorise a Nationally Significant Infrastructure Project. A DCO can incorporate or remove the need for a range of consents which would otherwise be required for a development. A DCO can also include rights of compulsory acquisition. |
| DEFRA | Department for Environment, Food and Rural Affairs – the UK government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health. |

| Abbreviation | Description |
|---|---|
| DML | Deemed Marine Licence – licence provided by the Marine Management Organisation (MMO), granted as part of a DCO. |
| EA | Environment Agency - a non-departmental public body sponsored by the United Kingdom government's Department for Environment, Food and Rural Affairs (DEFRA), with responsibilities relating to the protection and enhancement of the environment in England. |
| EIA | Environmental Impact Assessment - a term used for the assessment of environmental consequences (positive or negative) of a plan, policy, program or project prior to the decision to move forward with the proposed action. |
| EPR | The Environmental Permitting (England and Wales) Regulations 2016 - Regulations that came into force in 2008 combining Pollution Prevention and Control and Waste Management Licensing regulations. |
| ExA | Examining Authority |
| ES | Environmental Statement - a report in which the process and results of an Environment Impact Assessment are documented. |
| FRA | Flood Risk Assessment - an assessment of the flood risk from all sources of flooding for a development |
| FRAP | Flood Risk Activity Permit – permit to work in, under and over a main river or if work could affect flooding from a main river or sea. |
| GHG | Greenhouse Gases - atmospheric gases such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapour that absorb and emit infrared radiation emitted by the Earth's surface, the atmosphere and clouds. |
| Ha | Hectare – a metric unit of measurement, equal to 2.471 acres or 10,000 square metres. |
| HE | Historic England - an executive non-departmental body of the British Government tasked with protecting the historical environment of England. |
| HGV | Heavy Goods Vehicle - vehicles with a gross weight in excess of 3.5 tonnes. |

| Abbreviation | Description |
|---|---|
| HLCP | Humber Low Carbon Pipelines – a Nationally Significant Infrastructure Project promoted by National Grid Ventures intended to help decarbonise industry by connecting major emitters and power stations in the Humber region (including the Proposed Development at Keadby) to enable transportation of captured carbon dioxide to the East Coast for onward connection to an offshore pipeline. |
| HRSG | Heat Recovery Steam Generator - an energy recovery heat exchanger that recovers heat from a hot gas stream. It produces steam that can be used in a process (cogeneration) or used to drive a steam turbine (combined cycle). |
| HRA | Habitats Regulations Assessment - the assessment of the impacts of implementing a plan or policy on a Natura 2000 site required under the Habitats Directive. |
| HSE | Health and Safety Executive - the body responsible for the encouragement, regulation and enforcement of workplace health, safety and welfare. |
| IAQM | Institute of Air Quality Management - professional body for air quality air professionals. |
| IEMA | Institute of Environmental Management and Assessment |
| IED | Industrial Emissions Directive – European Union Directive (2010/75/EU) committing member states to control and reduce the impact of industrial emissions on the environment. |
| INNS | Invasive Non-Native Species - species that have occurred outside of their natural range. Invasive species have the potential to hinder or prevent survival of others within the ecosystem. |
| ISO | International Organization for Standardization - an international standard setting body composed of representatives for various national standards organisations. |
| JNCC | The Joint Nature Conservation Commission - the public body that advises the UK Government and devolved administrations on UK-wide and international nature conservation. |
| KGL | Keadby Generation Limited |
| kV | Kilovolt - unit of electrical potential. There are 1,000 volts in a kilovolt. |
| kW | Kilowatt - unit of power. |
| LBMEP | Landscaping and Biodiversity Management and Enhancement Plan |

| Abbreviation | Description |
|---|---|
| LVIA | Landscape and Visual Impact Assessment – the process of evaluating the effect of a proposal upon the landscape and views of it. |
| LWS | Local Wildlife Site - defined areas, identified and selected for their nature conservation value, based on important, distinctive and threatened habitats and species with a national, region. |
| MA&D | Major Accidents and Disasters - the potentially significant effects of a development. |
| mAOD | Metres above Ordnance Datum |
| MCA | Maritime Coastguard Agency - an Executive Agency of the Department for Transport concerned with maritime safety. |
| MHCLG | Ministry of Housing, Communities and Local Government |
| MW | Megawatt - unit of energy. |
| National Highways | Formerly Highways England – National Highways operate, maintain and improve England's motorways and major A-roads. |
| NEP | The Northern Endurance Partnership - a partnership between bp, Eni, Equinor, National Grid, Shell and Total to develop infrastructure to transport and store CO2 emissions. |
| NGC | National Grid Carbon |
| NGCL | National Grid Carbon Limited |
| NGR | National Grid Reference - system of geographical grid references. |
| $NH_3$ | Ammonia |
| NLC | North Lincolnshire Council |
| $NO_2$ | Nitrogen Dioxide |
| NOx | Oxides of Nitrogen |
| NPPF | National Planning Policy Framework - the NPPF came into effect on 27 March 2012 (with some transitional arrangements), replacing the majority of national planning policy other than NPS. The NPPF is part of the Government's reform of the planning system intended to make it less complex, to protect the environment and to promote sustainable growth. It does not contain any specific policies on Nationally Significant Infrastructure Projects, but its policies may be taken into account in decisions on DCOs if the Secretary of State considers them to be both important and relevant. |

| Abbreviation | Description |
|---|---|
| NPS | National Policy Statement - Statement produced by Government under the Planning Act 2008 providing the policy framework for Nationally Significant Infrastructure Projects. They include the Government's view of the need for and objectives for the development of Nationally Significant Infrastructure Projects in a particular sector such as energy and are used to determine applications for such development. |
| NRA | Navigation Risk Assessment - assesses the hazards and risks affecting vessel navigation. |
| NSIP | Nationally Significant Infrastructure Project - defined by the Planning Act 2008 and cover projects relating to energy (including generating stations, electric lines and pipelines); transport (including trunk roads and motorways, airports, harbour facilities, railways and rail freight interchanges); water (dams and reservoirs, and the transfer of water resources); wastewater treatment plants and hazardous waste facilities. These projects are only defined as nationally significant if they satisfy a statutory threshold in terms of their scale or effect. |
| NSR | Noise Sensitive Receptor - locations or areas where dwelling units or other fixed, developed sites of frequent human use occur which may be sensitive to noise impacts. |
| NTS | Non-Technical Summary - a summary of the Environmental Statement written in non-technical language for ease of understanding. |
| OEP | Office for Environmental Protection - new, independent statutory body with the principal objective of contributing to environmental protection and the improvement of the natural environment under the Environment Act 2021 |
| OMH | Open Mosaic Habitats - found mainly in urban and formerly industrial areas and have high biodiversity value. |
| Opening Year | The year of opening (post-construction) of a scheme when it becomes operational. |
| OS | Ordnance Survey - the national mapping agency for Great Britain. |
| PC | Process Contribution - represents the change caused by the Proposed Development. |
| PCC | Power and Carbon Capture |
| PEA | Preliminary Ecological Appraisal - an ecological assessment method which evaluates the existing ecological value of a site. |

| Abbreviation | Description |
|---|---|
| PEC | Predicted Environmental Concentration – the Process Contribution (PC) plus background concentration. |
| PHE | Potentially Harmful Elements – for example arsenic (As), cadmium (Cd) and copper (Cu). |
| PHEA | Preliminary Hazard and Environmental Assessments - determines the scope of hazards and environmental impacts related to a project. |
| PIA | Personal Injury Accident - an incident to the body, mind or emotions. |
| PINS | Planning Inspectorate - executive agency of the Department for Communities and Local Government of the United Kingdom Government. It is responsible for determining final outcomes of town planning. |
| PRoW | Public Right of Way - a highway where the public has the right to walk. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (including motor vehicles). |
| SAC | Special Area of Conservation - high quality conservation sites that are protected under the European Union Habitats Directive, due to their contribution to conserving those habitat types that are considered to be most in need of conservation. |
| SoS | Secretary of State - the decision maker for DCO applications and head of Government department. |
| SPA | Special Protection Area - strictly protected sites classified in accordance with article 4 of the EC birds directive. Special Protection Areas are Natura sites which are internationally important sites for the protection of threatened habitats and species. |
| SSSI | Site of Special Scientific Interest - nationally designated Sites of Special Scientific Interest, an area designated for protection under the Wildlife and Countryside Act 1981 (as amended), due to its value as a wildlife and/or geological site. |
| SWMP | Site Waste Management Plan - a plan setting out how resources will be managed, and waste controlled at all stages during a construction project.. |
| TTWA | Travel to Work Area - statistical tool used by UK Government agencies and local authorities to indicate an area where the population would generally commute to a larger town or city for employment purposes. |

| Abbreviation | Description |
|---|---|
| UK | United Kingdom |
| UKHSA | The UK Health Security Agency is an executive government agency sponsored by the Department of Health and Social Care that commenced operation on 1 October 2021, taking over the responsibilities of Public Health England whose remit was to protect and improve the nation's health and wellbeing and reduce health inequalities. |
| WHO | World Health Organisation - an agency of the United Nations focusing on public health. |
| WSI | Written Scheme of Investigation |
| ZCH | Zero Carbon Humber - a consortium of energy and industrial companies and academic institutions with a shared vision to transform the Humber region into the UK’s first net-zero carbon cluster by 2040. |
| ZoI | Zone of Influence - study areas identified for the purposes of the Cumulative and Combined Effects assessment. |
| ZTV | Zone of Theoretical Visibility - a computer generated tool to identify the likely (or theoretical) extent of visibility of a development. |

# ES VOLUME II (CHAPTERS AND APPENDICES) CONTENTS

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| Document Ref. 6.2.9 | Chapter 9: Noise and Vibration – Rev 03 |
| Document Ref. 6.2.10 | Chapter 10: Traffic and Transport– Rev 03 |
| Document Ref. 6.2.11 | Chapter 11: Biodiversity and Nature Conservation– Rev 03 |
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# TABLES

# 8.0 ES ADDENDUM: AIR QUALITY

## 8.1 Introduction

8.1.1 This Chapter provides an addendum to the air quality assessment included within the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application:

- **Chapter 8**: Air Quality of the ES Volume I (Application Document Ref. 6.2.8) [**APP-051**]; and
- **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Application Document Ref. 6.3.6) [**APP-070**].

8.1.2 This assessment considers the air quality effects arising from the relevant Additional Information and Proposed Development Changes, as summarised in the sections below.

8.1.3 This Addendum only considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

8.1.4 Figures accompanying this chapter of the ES Addendum are referenced within.

8.1.5 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 8.2 Changes in Legislation, Planning Policy and Guidance

8.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets on air quality/ water quality, biodiversity, and resource efficiency and waste reduction.

8.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

8.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021, after submission of the Application. Consultation

closed on 29 November 2021 and BEIS is now considering consultation feedback prior to finalising the revised NPS. Until the reviewed NPS is finalised, the extant NPS remains in place. Based on the NPS changes consulted upon by BEIS, it is considered likely that the Proposed Development will remain in accordance with the approach to be set out in the revised NPS.

8.2.4 The emerging NPS EN-1 retains the focus on Air Quality and general emissions from development but also adds the requirement of a carbon assessment. Paragraph 5.3.4 instructs applicants to include a carbon assessment as part of any proposal for energy infrastructure projects.

8.2.5 Paragraph 5.3.7 states: "*Any carbon assessment will include an assessment of operational GHG emissions, but the policies set out in Part 2, including the UK ETS, apply to these emissions. Operational emissions will be addressed in a managed, economy-wide manner, to ensure consistency with carbon budgets, net zero and our international climate commitments. The Secretary of State does not, therefore need to assess individual applications for planning consent against operational carbon emissions and their contribution to carbon budgets, net zero and our international climate commitments*". The carbon assessment should be a part of the mitigation strategy to reduce greenhouse gas (GHG) emissions at every stage of development to ensure emissions are minimised as much as possible.

8.2.6 The Applicant has considered the impact of the development on Air Quality through an assessment of carbon emissions included in **Chapter 17**: Climate Change and Sustainability (ES Volume I – Application Document Ref. 6.2) [**APP-060**]. Furthermore, this Proposed Development also purposefully seeks to abate carbon dioxide emissions through the proposed carbon capture plant. Accordingly, the change of policy in EN-1 Paragraph 5.3.7 has no impact on the Proposed Development.

8.2.7 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG, 2021). With regard to air quality, whilst the policy paragraphs have been renumbered, the policy text remains largely unchanged from that reported in **Chapter 8**: Air Quality of the ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

## 8.3 Proposed Development Changes

8.3.1 Section 2 of ES Addendum Volume I (**Application Document Ref. 6.2.1 - 6.2.7 – Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require re-assessment in this chapter.

8.3.2 The following Proposed Development Changes have therefore been considered within the revised assessment for air quality at the Proposed Development Site:

- Proposed Development Change 3 - Increase to the maximum parameters (height) for up to two absorbers/ stacks - This Proposed Development Change is relevant to the assessment of potential operational impacts and effects.

8.3.3 All other Proposed Development Changes described in ES Addendum Volume I, would not alter the assessment of air quality effects and therefore, have not been considered further. This includes Proposed Development Change 4 – increase to the height of the carbon dioxide ($CO_2$) stripper, since that does not include any release point for emissions to air and is not at a height that is high enough to affect the dispersion of any emissions to air from other sources.

8.3.4 The Air Quality impact assessment carried out for the operational Proposed Development has been revised to take into account the updates to the building dimensions and stack heights associated with Proposed Development Change 3.

## 8.4 Relevant Additional Information

8.4.1 Since the submission of the Application, Additional Information (background monitoring data for oxides of nitrogen (NOx), nitrogen dioxide ($NO_2$) and ammonia ($NH_3$), carried out for the Keadby 2 Power Station project (ERM 2021) has been made available and considered for the Proposed Development. This has not affected any conclusions of the submitted ES but is discussed further in Section 8.6 below.

## 8.5 Consultation

8.5.1 Consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1- 6.2.7 - Rev 03**).

8.5.2 A summary of comments raised via the consultation and other technical engagement, is summarised in Table 8-1.

**Table 8-1: Consultation responses on Proposed Development Changes**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| UK Health Security Agency (UKHSA) | 20 March 2022. Letter response. | The UKHSA suggest that without reviewing the updated ES Air Quality Chapter (and associated technical appendices) they cannot comment on the impact of the Proposed Development Changes. | Noted and submission into examination will enable review. |
| Environment Agency | 14 March 2022. Letter response. | No comments on Proposed Development Change 3 or 4. | Noted. |
| Natural England | 14 March 2022. Letter response. | There should be assessment of changes to air quality impacts which may arise to the designated sites due to the proposed modifications. This should be considered for both the vessel movements, and for the increase in heights of the carbon dioxide absorbers and carbon dioxide stripper column. | Noted. Section 8.8 of this Chapter provides an updated assessment. As reported in the Application, 35 – 40 vessels is significantly lower than the threshold for screening of air quality effects and therefore the assessment of emissions from vessels was screened out of the Application. Change 1 does not change the number or |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | | type of vessels proposed to use the Wharf from those already assessed in the Application and this aspect has therefore not been considered further. |
| North Lincolnshire Council | 24 March 2022. Letter response. | The Non-Technical Summary for Consultation states that "An assessment of emissions resulting from the revised parameters for the twin absorbers (change 3) option has been undertaken, however there are no new or different significant operational air quality impacts at human health receptors as a result of Proposed Development Change 3."<br><br>The Local Planning Authority (LPA) would expect this assessment to be submitted as part of the application for a material change so that it has the opportunity to review and comment on the assessment as part of the ongoing examination. | Noted. Section 8.8 of this Chapter provides an updated assessment. **Appendix 8B**: Air Quality Operational Phase of ES Addendum Volume II (**Application Document Ref. 6.3.6 – Rev 03**) provides the results of updated dispersion modelling. |

## 8.6 Updated Baseline Conditions

Existing Baseline

8.6.1 The Additional Information changes the baseline conditions for one of the Air Quality receptors described in **Chapter 8** Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

8.6.2 Monitoring of oxides of NOx, $NO_2$ and $NH_3$ was carried out during 2020 - 2021 in the vicinity of the Proposed Development Site to inform the development of the Keadby 2 Power Station (ERM 2021). The monitoring was carried out at several locations, with one location being representative of the Humber Estuary ecological receptor, assessed as receptor OE1-5 in **Chapter 8** ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

8.6.3 The monitoring indicated slightly higher concentrations for background NOx and $NH_3$ than were obtained from the Air Pollution Information System (APIS) website and reported in Table 9, **Appendix 8B** ES Volume II (Application Document Ref. 6.3.6) [**APP-070**], as shown in Table 8-2.

**Table 8-2: Comparison of Baseline Data at Humber Estuary – Receptor OE1-5**

| Pollutant | Original Baseline (µg/m$^3$) | New Baseline with Additional Information (µg/m$^3$) |
|---|---|---|
| Annual average NOx | 13.0 | 13.1 |
| Annual average $NH_3$ | 2.3 | 3.1 |

8.6.4 The new baseline concentrations for NOx and $NH_3$ have been applied to the revised assessment detailed in **Appendix 8B**: Air Quality Operational Phase of ES Addendum Volume II (**Application Document Ref. 6.3.6 – Rev 03**).

Future Baseline

8.6.5 As noted in paragraph 8.4.27 of **Chapter 8**: Air Quality of the submitted ES, background concentrations of pollutants are expected to decrease in the future due to changes in technology and the types of emission sources; however, to provide a conservative prediction of pollutant concentrations in the future, the current baseline background concentrations are used for the future operational assessment scenarios, assuming no decrease in background concentrations. Therefore, future baseline conditions were assumed to be the same as the existing baseline, and therefore would be as described for the existing baseline above.

## 8.7 Changes to Development Design and Impact Avoidance

Construction

8.7.1 No changes as a result of the Proposed Development Changes, above those stated in **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

Operation

8.7.2 No changes as a result of the Proposed Development Changes, above those stated in **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

## 8.8 Likely Impacts and Effects

Construction

*Proposed Development Change 3*

Construction Dust

8.8.1 In relation to construction of Change 3, no changes from the submitted ES. As such, the effect at identified human health and ecological receptors is not significant with the embedded mitigation in place.

Construction Traffic

8.8.2 No changes from the submitted ES. As such, the effect at identified human health and ecological receptors is not significant.

Non-Road Mobile Machinery

8.8.3 No changes from the submitted ES. As such, the effect at identified human health and ecological receptors is not significant.

Abnormal loads (waterborne transport)

8.8.4 No changes from the submitted ES. As such, the effect at identified human health and ecological receptors is not significant.

Transport Emissions

8.8.5 No changes from the submitted ES. As such, the effect at identified human health and ecological receptors is not significant.

Operation

Process Emissions from the operational CCP

8.8.6 An assessment of emissions resulting from the revised parameters for up to two absorbers set out in ES Addendum Volume I (**Table 4**) (**Document Ref 6.2.1 – 6.2.7 – Rev 03**) has been undertaken. Modelled stack location, using the Rochdale Envelope approach, are shown on **Figure 8.4** (**Document Ref. 8.4.12 – Rev 03**) presented in ES Addendum Volume III. The results are presented in **Appendix 8B** of ES Addendum Volume II (**Application Document Ref. 6.3.6 – Rev 03**).

8.8.7 There are no new or different significant operational impacts or effects in relation to air quality at human health receptors as a result of Proposed Development Change 3, in comparison with **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

8.8.8 At ecological receptors, the results from the modelling of the up to two absorber stacks presented in Section 5.2 of **Appendix 8B** of ES Addendum Volume II (**Application Document Ref. 6.3.6 – Rev 03**) indicate that the concentrations of NOx and $NH_3$ are very slightly higher at the majority of the ecological receptors assessed, although the overall magnitude of impact and significance of effects remains comparable with those presented with **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

8.8.9 Overall, the increased height of up to two absorbers (Proposed Development Change 3) does not materially change the air quality effects of the Proposed Development which are classified as not significant, as presented in **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

Decommissioning

8.8.10 Proposed Development Change 3 gives rise to no changes from the submitted ES.

## 8.9 Additional Mitigation, Monitoring and Enhancement Measures

8.9.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Additional Information or Proposed Development Changes, above those stated in **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

## 8.10 Limitation or Difficulties of Additional Assessment

8.10.1 The limitations and/ or difficulties related to this chapter of the ES Addendum are consistent with those reported in **Chapter 8**: Air Quality of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

8.10.2 Until the preferred technology provider is selected, there will be some degree of uncertainty in the operational emissions used in the assessment. Therefore, in order to minimise the likelihood of under-estimating the predicted impacts for the operational emissions, a number of conservative assumptions have been made in the assessment. These are detailed in Section 3.4 of **Appendix 8B**: Air Quality – Operational Phase (ES Addendum Volume II – **Application Document Ref 6.3.6 – Rev 03**).

## 8.11 Summary of Updated Likely Significant Residual Effects

8.11.1 There are no changes to the likely residual effects identified in **Chapter 8** of the submitted ES [**APP-051**], as a result of the Additional Information or the Proposed Development Changes considered. The residual effects would remain as reported within Section 8.9 of **Chapter 8**: Air Quality (i.e. not significant).

## 8.12 References

BEIS (2021) *Planning for new energy infrastructure: review of energy National Policy Statements*.

ERM (2021). Keadby 2 – Ambient NOx, NO2 and $NH_3$ Monitoring Report – Final. 7th May 2021.

HMSO (2021) *Environment Act 2021*

Ministry of Housing, Communities and Local Government (2021). *National Planning Policy Framework*.

.

# CONTENTS



# TABLES

# 9.0 ES ADDENDUM: NOISE AND VIBRATION

## 9.1 Introduction

9.1.1 This Chapter provides an addendum to the noise and vibration assessment submitted with the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application:

- **Chapter 9:** Noise and Vibration of the ES Volume I (Application Document Ref. 6.2.9) [**APP-052**];
- **Appendix 9A:** Construction Noise Assessment Methodology (Application Document Ref. 6.3.5) [**APP-069**]; and
- **Appendix 9B:** Operational Noise Information (Application Document Ref. 6.3.9) [**APP-073**].

9.1.2 This assessment considers the noise and vibration effects arising from the relevant Additional Information and Proposed Development Changes, as summarised in sections below.

9.1.3 This Addendum only considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

9.1.4 There are no figures accompanying this chapter of the ES Addendum.

9.1.5 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 9.2 Changes in Legislation, Planning Policy and Guidance

9.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets on air quality/ water quality, biodiversity, and resource efficiency and waste reduction.

9.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

9.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021 after submission of the Application. Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback, prior to finalising the revised NPS. Until the reviewed NPS is finalised, the extant NPS remains in place. Based on the NPS changes consulted upon by BEIS, it is considered likely that the Proposed Development will remain in accordance with the approach to be set out in the revised NPS.

9.2.4 The emerging NPS EN-1 policy remains largely unchanged in relation to noise and vibration. Paragraph 5.12.8 expands on guidance for mitigating noise, stating that if the Proposed development should address the effect of underwater or subterranean noise in the required Noise Assessment. Furthermore, Paragraph 5.12.9 adds the requirement for development to be undertaken in accordance with statutory requirements for noise. Regard must be given to the relevant sections of the Noise Policy Statement for England, the NPPF, and the government's associated planning guidance on noise.

9.2.5 The submitted ES considers noise and vibration impacts on underwater ecological receptors. This is included in **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I - Application Document Ref. 6.2) [**APP-052**] and accompanying **Appendix 11H**: Underwater Sound Effects on Fish (ES Volume II - Application Document Ref. 6.3) [**APP-083**].

9.2.6 There are no notable changes to NPS EN-2 to EN-5 in relation to noise and vibration.

9.2.7 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG 2021). With regard to noise and vibration, whilst the policy paragraphs have been renumbered, the policy text remains unchanged from that reported in **Chapter 9**: Noise and Vibration of the ES Volume I (Application Document Ref. 6.2.9) [**APP-052**].

## 9.3 Proposed Development Changes

9.3.1 Section 2 of ES Addendum Volume I (**Application Document Ref. 6.2.1 - 6.2.27 – Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require re-assessment in this chapter.

9.3.2 The following Proposed Development Change has therefore been considered within the revised assessment for noise and vibration at the Proposed Development Site:

- Proposed Development Change 3 - Increase to the maximum parameters (height) for up to two absorbers/ stacks. This Proposed Development

Change is relevant to the assessment of potential operational impacts and effects of noise and vibration.

9.3.3 All other Proposed Development Changes described in ES Addendum Volume I, would not alter the assessment of noise and vibration effects and therefore, have not been considered further.

## 9.4 Relevant Additional Information

9.4.1 Since submission of the Application, Additional Information that has been identified that is relevant to the assessment of noise and vibration includes:

- twin absorber sound power level data (provided by the supplier); and
- 3D model of the site layout with up to two absorbers configuration.

## 9.5 Consultation

9.5.1 Consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1 - 6.2.7 - Rev 03**).

9.5.2 A summary of comments raised via the consultation and other technical engagement, is summarised in Table 9-1.

**Table 9-1: Consultation responses on Proposed Development Changes**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| Natural England | 14 March 2022. Letter Response. | The assessment must also include consideration of the potential for additional disturbance impacts due to movements of the large vessels throughout the designated site. | Proposed Development Change 1 does not change the number or type of vessels proposed to use Railway Wharf from those already assessed in the Application and this aspect has therefore not been considered further in the noise and vibration chapter. |
| North Lincolnshire Council | 24 March 2022. Letter response. | Similar to the point on air quality … the (NTS for consultation) report states "Modelling and assessment of operational noise levels resulting from the revised parameters and additional information for the twin absorbers option has been undertaken. However, there are no new or different significant operational noise effects as a result of Proposed Development Change 3." Again, the LPA would expect to see this modelling and assessment presented as part of the Application for the material change. | Noted. Section 9.8 of this Chapter provides an updated assessment. **Appendix 9B**: Operational Noise Information of ES Addendum Volume II (**Application Document Ref. 6.3.9 – Rev 03**) provides the data and assumptions used in the updated modelling. |

## 9.6 Updated Baseline Conditions

Existing Baseline

9.6.1 No changes to the submitted ES. The Applicant has noted its proposals to obtain further representative background sound levels at noise sensitive receptors to inform the on-going design development of the Proposed Development and to confirm the mitigation required to achieve Requirement 29 of the draft DCO (**Application Document Ref. 2.1**). It is proposed that the surveys will take place once Keadby 2 Power Station is operational (anticipated, following commissioning, in circa October 2022) as confirmed in the Applicant's response to Q1.9.1 of the Examining Authority's first written questions [**REP2-006**].

Future Baseline

9.6.2 No changes to the submitted ES.

## 9.7 Development Design and Impact Avoidance

Construction

9.7.1 No further design and impact avoidance measures during construction are proposed as a result of the Additional Information/ Proposed Development Change, above those stated in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**].

Operation

9.7.2 No further design and impact avoidance measures as a result of the Proposed Development Change, above those stated in **Chapter 9:** Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**] are considered necessary.

## 9.8 Likely Impacts and Effects

Construction

*Proposed Development Change 3*

9.8.1 This Proposed Development Change does not affect the construction noise and vibration effects presented in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**].

Operation

*Proposed* D*evelopment Change 3*

Operational Noise Effects

9.8.2 Results from the operational noise modelling incorporating Proposed Development Change 3 and the Additional Information described in Section 9.4 of this ES Addendum are presented in this section.

9.8.3 Further details of the expected sound power level ($L_w$) from up to two absorbers/ stacks, the settings used in the noise model and the list of assumptions used in the assessment are presented in **Appendix 9B** of ES Addendum Volume II (**Application Document Ref. 6.3.9 - Rev 03**).

9.8.4 In the absence of additional mitigation, the predicted free-field operational *specific sound levels* at the NSR around the Proposed Development Site are presented in Table 9-4. The NSR presented represent the worst affected within the Study Area.

9.8.5 The plant is designed to operate flexibly during its lifetime with varying electricity demand. Given the anticipated load regimes (baseload and dispatchable) for the generating station, the predicted noise levels could apply to both the 1-hour daytime or 15-minute night-time BS 4142 assessment periods.

**Table 9-2: Predicted worst-case operational *specific sound levels***

| **Receptor** | **Predicted operational *specific sound level* $L_{Aeq,T}$ dB** | |
|---|---|---|
| | **Chapter 9: Noise and Vibration of ES Volume I** | **With Proposed Development Change 3** |
| NSR 1 - Vazon Bridge | 47 | 47 |
| NSR 1A - Roe Farm | 48 | 48 |
| NSR 2 - Hawthorne House, Chapel Lane | 44 | 43 |
| NSR 3 - Keadby Village | 41 | 41 |
| NSR 4 - Mariners Arms Flats | 38 | 38 |
| NSR 5 - Trent Side | 36 | 36 |
| NSR 6 - 9 Queens Crescent | 36 | 36 |
| NSR 7 - Keadby Grange | 44 | 43 |
| NSR 8 - North Pilfrey Farm | 40 | 39 |
| NSR 9 - Ealand Poultry Farm | 36 | 35 |
| NSR 10 - North Moor Farm | 45 | 45 |

9.8.6 The representative *background sound levels* are presented in Section 9.6 of **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**] and reproduced in Table 9-5.

9.8.7 As described in **Chapter 9**: Noise and Vibration of ES Volume I, adjustments have been made to the *background sound levels* to determine future *background sound levels* accounting for the increase in sound level when Keadby 2 Power Station becomes operational. With the exception of NSR 1 during the daytime, it is assumed that the *background sound level* will increase by the same amount as the *ambient sound level*, as a result of the operation of Keadby 2 Power Station. At NSR 1 during the daytime, the predicted Keadby 2 Power Station *specific sound level* has been summed with the Keadby 2 ES representative *background sound level* to determine the representative future *background sound level*. This is because the sound level from Keadby 2 Power Station, once operational, will be dominant compared with existing sources of *background sound*. The derived future *background sound level* also correlates with the $L_{Aeq,T}$ 50dB free-field limit at Vazon Bridge (NSR 1) as set out in Condition 28 of the final Section 36 consent (BEIS, 2019) for Keadby 2 Power Station.

**Table 9-3: Future *background sound levels* from Chapter 9: Noise and Vibration of ES Volume I**

| Receptor | Time period | Keadby 2 Power Station ES representative *background sound level* ($L_{A90,T}$), dB | Representative future *background sound level* ($L_{A90,T}$), dB |
|---|---|---|---|
| NSR 1 - Vazon Bridge | Daytime | 37 | 50 |
| | Night-time | 36 | 47 |
| NSR 1A - Roe Farm* | Daytime | 37 | 50 |
| | Night-time | 36 | 47 |
| NSR 2 - Hawthorne House, Chapel Lane | Daytime | 37 | 38 |
| | Night-time | 33 | 39 |
| NSR 3 - Keadby Village | Daytime | 35 | 36 |
| | Night-time | 30 | 34 |
| NSR 4 - Mariners Arms Flats | Daytime | 35 | 35 |
| | Night-time | 30 | 32 |
| NSR 5 - Trent Side | Daytime | 35 | 36 |
| | Night-time | 30 | 33 |
| | Daytime | 35 | 36 |

| Receptor | Time period | Keadby 2 Power Station ES representative *background sound level* ($L_{A90,T}$), dB | Representative future *background sound level* ($L_{A90,T}$), dB |
|---|---|---|---|
| NSR 6 - 9 Queens Crescent (South Bank data) | Night-time | 30 | 33 |
| NSR 7 - Keadby Grange** | Daytime | 35 | 35 |
| | Night-time | 30 | 32 |
| NSR 8 - North Pilfrey Farm** | Daytime | 35 | 35 |
| | Night-time | 30 | 31 |
| NSR 9 - Ealand Poultry Farm** | Daytime | 35 | 35 |
| | Night-time | 30 | 30 |
| NSR 10 - North Moor Farm** | Daytime | 35 | 36 |
| | Night-time | 30 | 33 |
| * NSR 1A uses data for NSR 1<br>**For NSR 7-10 Keadby 2 Power Station *specific sound levels* are not available in the Keadby 2 Power Station ES. Therefore, the predicted values presented are from the remodelling of Keadby 2 Power Station in-situ, as set out in paragraph 9.3.49. | | | |

BS4142 assessment results

9.8.8 The daytime BS 4142 assessments are presented in Table 9-6 and the night-time BS 4142 assessments are presented in Table 9-7. The values presented are the differences between the representative *background sound level* at each NSR and the predicted *rating level* (the *specific sound level* $L_{Aeq,T}$ presented in Table 9-4 plus the character correction). Positive values in the table indicate an excess of the *rating level* over the *background sound level*.

9.8.9 The magnitude of impact and initial effect classification has also been included in the tables, to provide context for the BS 4142 assessment outcomes, with reference to the semantic scales in Table 9.12, 9.13 and 9.14 of **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**]. The penultimate row in each table shows the initial effect classification assigned in Table 9.31 and Table 9.32 of the ES **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**]. Overall impacts and effects are slightly reduced or remain unchanged as a result of Proposed Development Change 3.

9.8.10 Consistent with the submitted ES, the assessment has assumed that potential noise of a tonal, impulsive or intermittent nature will be designed out of the Proposed Development during the detailed design phase by the selection of

appropriate plant, building cladding, louvres and silencers/ attenuators as necessary. This is consistent with the Keadby 2 Power Station ES. However, inclusion of a +3 dB correction for other distinctive character has been included at this stage as a conservative approach for NSR with the potential to identify the new sound source in their existing acoustic environment.

## Table 9-4: Daytime BS4142 assessment without additional mitigation

| Receptor | NSR 1 Vazon Bridge | NSR 1A - Roe Farm | NSR 2 Hawthorne House, Chapel Lane | NSR 3 Keadby Village | NSR 4 Mariners Arms Flats | NSR 5 Trent Side | NSR 6 Queens Crescent | NSR 7 Keadby Grange | NSR 8 North Pilfrey Farm | NSR 9 Ealand Poultry Farm | NSR 10 North Moor Farm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Specific sound level* $L_s$ ($L_{Aeq,Tr}$), dB | 52* | 52* | 43 | 41 | 38 | 36 | 36 | 43 | 39 | 35 | 45 |
| Acoustic feature correction, dB | 0* | 0* | +3 | +3 | +3 | +3 | +3 | +3 | +3 | +3 | +3 |
| *Rating level* ($L_{Ar,Tr}$), dB | 52* | 52* | 46 | 44 | 41 | 39 | 39 | 46 | 42 | 38 | 48 |
| Representative future *background sound level* ($L_{A90,T}$), dB | 50* | 50* | 38 | 36 | 35 | 36 | 36 | 35 | 35 | 35 | 36 |
| Excess of *rating level* over *background sound level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB | +2* | +2* | +8 | +8 | +6 | +3 | +3 | +11 | +7 | +3 | +12 |
| BS 4142:2014 effect category | Low/ Adverse | Low/ Adverse | Adverse/ Significant Adverse | Adverse/ Significant Adverse | Adverse | Low/ Adverse | Low/ Adverse | Significant Adverse | Adverse/ Significant Adverse | Low/ Adverse | Significant Adverse |
| Magnitude of impact (assigned from Table 9.12 of submitted ES) | Very Low/ Low | Very Low/ Low | Low/ Medium | Low/ Medium | Low | Very Low/ Low | Very Low/ Low | Medium | Low/ Medium | Very Low/ Low | Medium/ High |

| Receptor | NSR 1 Vazon Bridge | NSR 1A - Roe Farm | NSR 2 Hawthorne House, Chapel Lane | NSR 3 Keadby Village | NSR 4 Mariners Arms Flats | NSR 5 Trent Side | NSR 6 Queens Crescent | NSR 7 Keadby Grange | NSR 8 North Pilfrey Farm | NSR 9 Ealand Poultry Farm | NSR 10 North Moor Farm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Initial classification of effect | Negligible/ Minor adverse | Negligible / Minor adverse | Minor/ **Moderate adverse** | Minor/ **Moderate adverse** | Minor adverse | Negligible/ minor adverse | Negligible/ minor adverse | **Moderate** | Minor/ **Moderate adverse** | Negligible / Minor adverse | **Moderate / Major adverse** |
| **Chapter 9**: Noise and Vibration of ES Volume I Initial classification of effect | Negligible/ Minor adverse | Negligible / Minor adverse | **Moderate adverse** | Minor/ **Moderate adverse** | Minor adverse | Negligible/ minor adverse | Negligible/ minor adverse | **Moderate/ Major adverse** | Minor/ **Moderate adverse** | Minor adverse | **Moderate / Major adverse** |
| *See further information in context discussion<br>Uncertainty: Given the use of sound level data from surveys undertaken for Keadby 2 Power Station EIA, significantly different 'representative' *background* and *ambient sound level* values could be obtained using updated baseline data and using different statistical analysis methods. Additionally, *background/ ambient sound level* data measured at a small number of NSR are assumed to be representative of conditions at other NSR. | | | | | | | | | | | |

## Table 9-5: Night-time BS4142 assessment without additional mitigation

| Receptor | NSR 1 Vazon Bridge | NSR 1A - Roe Farm | NSR 2 Hawthorne House, Chapel Lane | NSR 3 Keadby Village | NSR 4 Mariners Arms Flats | NSR 5 Trent Side | NSR 6 Queens Crescent | NSR 7 Keadby Grange | NSR 8 North Pilfrey Farm | NSR 9 Ealand Poultry Farm | NSR 10 North Moor Farm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Specific sound level* $L_s$ ($L_{Aeq,Tr}$), dB | 47 | 48 | 43 | 41 | 38 | 36 | 36 | 43 | 39 | 35 | 45 |
| Acoustic feature correction, dB | +3 | +3 | +3 | +3 | +3 | +3 | +3 | +3 | +3 | +3 | +3 |
| *Rating level* ($L_{Ar,Tr}$), dB | 50 | 51 | 46 | 44 | 41 | 39 | 39 | 46 | 42 | 38 | 48 |

| **Receptor** | **NSR 1 Vazon Bridge** | **NSR 1A - Roe Farm** | **NSR 2 Hawthorne House, Chapel Lane** | **NSR 3 Keadby Village** | **NSR 4 Mariners Arms Flats** | **NSR 5 Trent Side** | **NSR 6 Queens Crescent** | **NSR 7 Keadby Grange** | **NSR 8 North Pilfrey Farm** | **NSR 9 Ealand Poultry Farm** | **NSR 10 North Moor Farm** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Representative future *background sound level* ($L_{A90,T}$), dB | 47 | 47 | 39 | 34 | 32 | 33 | 33 | 32 | 31 | 30 | 33 |
| Excess of *rating level* over *background sound level* ($L_{Ar,Tr}$ - $L_{A90,T}$), dB | +3 | +4 | +7 | +10 | +9 | +6 | +6 | +14 | +11 | +8 | +15 |
| BS 4142:2014 assessment outcome | Low/ Adverse | Adverse | Adverse/ Significant adverse | Significant Adverse | Significant Adverse | Adverse | Adverse | Significant adverse | Significant Adverse | Adverse/ Significant adverse | Significant adverse |
| Magnitude of impact | Very Low/ Low | Low | Low/ Medium | Medium | Medium | Low | Low | Medium/ High | Medium | Low/ Medium | High |
| Initial classification of effect | Negligible /Minor adverse | Minor adverse | Minor/ **Moderate adverse** | **Moderate adverse** | **Moderate adverse** | Minor adverse | Minor adverse | **Moderate/ Major adverse** | **Moderate adverse** | Minor/ **Moderate adverse** | **Major adverse** |
| **Chapter 9**: Noise and Vibration of ES Volume I classification of effect | Negligible /Minor adverse | Minor adverse | Minor/ **Moderate adverse** | **Moderate adverse** | **Moderate adverse** | Minor adverse | Minor adverse | **Major adverse** | **Moderate/ Major adverse** | **Moderate adverse** | **Major adverse** |
| Uncertainty: Given the use of sound level data from surveys undertaken for Keadby 2 Power Station EIA, significantly different 'representative' *background* and *ambient sound level* values could be obtained using updated baseline data and using different statistical analysis methods. Additionally, *background/ ambient sound level* data measured at a small number of NSRs are assumed to be representative of conditions at other NSRs. | | | | | | | | | | | |

9.8.11 In accordance with Table 9.14 of **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**], the values presented in Table 9-6 and Table 9-7 for the predicted worst-case scenario produce a range of impact magnitudes from very low/ low to high impact at the 10No. of the NSR. This would result in effects between negligible/ minor adverse (not significant) to major adverse (significant), subject to consideration of context.

*Consideration of context*

9.8.12 The majority of the context is unchanged from what is presented in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**]. However as the Proposed Development Change 3 gives rise to some reductions in the *specific sound level,* this has adjusted the assessment of absolute sound levels at the NSR.

9.8.13 Table 9-8 below presents existing and future predicted *ambient sound levels* (assuming constant operation through the night of both Keadby 2 Power Station and the Proposed Development) and compares them to the BS8233:2014 and WHO 'Guidelines for Community Noise' recommended indoor ambient sound level for sleeping. The recommended internal criterion is 30 dB $L_{Aeq,8h,}$ which would be equivalent to an external criteria of 45 dB $L_{Aeq,8h}$ assuming open bedroom windows for ventilation.

## Table 9-6: Comparison of night-time *ambient sound levels* without additional mitigation

| Receptor | Proposed Development predicted operational *specific sound level* ($L_{Aeq,T}$ dB) | Keadby 2 Power Station ES - predicted Keadby 2 operational *specific sound level* ($L_{Aeq,T}$ dB) | Night-time *ambient sound level* measured before Keadby 2 and the Proposed Development ($L_{Aeq,8h}$ dB) | Night-time future *ambient sound level* predicted with Keadby 2 Power Station in operation ($L_{Aeq,8h}$ dB) | Night-time future *ambient sound level* predicted with the Proposed Development in operation ($L_{Aeq,8h}$ dB) | Change in Night-time future *ambient sound level* due to the Proposed Development (dB) |
|---|---|---|---|---|---|---|
| NSR 1 - Vazon Bridge | 47 | 50 | 39 | **50** | **52** | +2 |
| NSR 1A - Roe Farm | 48 | 50 | 39 | **50** | **52** | +2 |
| NSR 2 - Hawthorne House, Chapel Lane | 43 | 39 | 36 | 41 | 45 | +4 |
| NSR 3 - Keadby Village (slightly different locations) | 41 | 37 | 36 | 40 | 43 | +3 |
| NSR 4 - Mariners Arms Flats | 38 | 31 | 36 | 37 | 41 | +4 |
| NSR 5 - Trent Side | 36 | 33 | 36 | 38 | 40 | +2 |
| NSR 6 - 9 Queens Crescent (slightly different locations) | 36 | 33 | 36 | 38 | 40 | +2 |
| NSR 7 - Keadby Grange | 43 | 33* | 36** | 38 | 44 | +6 |
| NSR 8 - North Pilfrey Farm | 39 | 28* | 36** | 37 | 41 | +4 |

| **Receptor** | **Proposed Development predicted operational *specific sound level* ($L_{Aeq,T}$ dB)** | **Keadby 2 Power Station ES - predicted Keadby 2 operational *specific sound level* ($L_{Aeq,T}$ dB)** | **Night-time *ambient sound level* measured before Keadby 2 and the Proposed Development ($L_{Aeq,8h}$ dB)** | **Night-time future *ambient sound level* predicted with Keadby 2 Power Station in operation ($L_{Aeq,8h}$ dB)** | **Night-time future *ambient sound level* predicted with the Proposed Development in operation ($L_{Aeq,8h}$ dB)** | **Change in Night-time future *ambient sound level* due to the Proposed Development (dB)** |
|---|---|---|---|---|---|---|
| NSR 9 - Ealand Poultry Farm | 35 | 24* | 36** | 36 | 39 | +3 |
| NSR 10 - North Moor Farm | 45 | 35* | 36** | 39 | **46** | +7 |

Those above BS8233:2014 external criteria of 45 dB $L_{Aeq,8h}$ are in bold.

*For NSR 7-10 no prediction of Keadby 2 Power Station sound levels are available in the Keadby 2 Power Station ES, so predicted values from the re-creation of Keadby 2 Power Station in-situ have been used.

**NSR 7-10 were not used for the Keadby 2 Power Station ES so the lowest ambient data measured have been used.

9.8.14 As shown in Table 9-8 at NSR 2 to NSR 9, whilst ambient sound levels are predicted to increase due to the predicted levels from the Proposed Development, they are all at or below the BS8233:2014/WHO external criterion, this would give ambient sound levels at or below the guideline internal values with windows open at night.

9.8.15 At NSR 1 and NSR 1A, predicted ambient levels with Keadby 2 Power Station in operation are above the guideline external value. Noise from the Proposed Development will result in a minor increase in ambient sound levels (+2 dB for both NSR). This is below the level of change in sound level that would be just perceptible under normal environmental conditions. At NSR 1 the *specific sound level* predicted for the Proposed Development is 3 dB lower than for Keadby 2 Power Station and is 2 dB lower for NSR 1A. The sound from the Proposed Development is therefore likely to be less disturbing than the sound from the consented Keadby 2 Power Station at NSR 1 and NSR 1A. For NSR 10, sound from the Proposed Development will result in ambient sound levels above the BS8233:2014/WHO external criterion by 1 dB. This excess of the criterion would be below the level of change that is just perceptible under normal environmental conditions. With windows closed, internal noise levels would be below the recommended internal criterion at all NSR, with respect to noise from the existing ambient sound levels, Keadby 2 Power Station and the Proposed Development combined.

9.8.16 It is noted from consultation with North Lincolnshire Council (NLC) prior to submission of the Application that they 'usually require that operational noise (*rating levels*) do not exceed the *background sound level* by more than +3 dB'. This typical requirement is not met by the initial (numerical) outcomes of the BS 4142 indicative predictions, although the further assessment presented in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**] and above demonstrates that, with context, the effects are likely to be lower than the initial BS 4142 (numerical) outcomes might suggest.

9.8.17 Overall, effects of noise and vibration effects as presented in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**] have either been reduced or are unchanged as a result of Proposed Development Change 3.

9.8.18 On the basis of the above and the potential desire to reduce noise levels to NLC's criteria (no greater than +3 dB excess of *rating level* over *background sound level*) or below, potential mitigation options to reduce sound levels have been considered and those required to achieve NLC's criteria as discussed in Section 9.7 (Mitigation and Enhancement Measures) **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**] remain unchanged.

9.8.19 Overall, there is no change to the conclusions of the noise and vibration effects of the Proposed Development being not significant, as presented in **Chapter 9:**

Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**].

Decommissioning

*Proposed Development Change 3*

9.8.20 No changes to the submitted ES. As such, the effects at NSR are not significant.

## 9.9 Additional Mitigation, Monitoring and Enhancement Measures

9.9.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Additional Information/ Proposed Development Change, above those stated in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**].

## 9.10 Limitation or Difficulties of Additional Assessment

9.10.1 The limitations and/ or difficulties related to this chapter of the ES Addendum are consistent with those reported in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**].

## 9.11 Summary of Updated Likely Significant Residual Effects

9.11.1 There are no changes to the likely residual effects identified in **Chapter 9**: Noise and Vibration of ES Volume I (Application Document Ref. 6.2.9) [**APP-052**], as a result of the Additional Information/ Proposed Development Change. The residual effects would remain as reported within Section 9.9 of **Chapter 9**: Noise and Vibration (i.e. not significant) on the basis that mitigation is employed such that the BS 5228 ABC noise limits are met, and the Section 9.5 mitigation guidance is followed.

## 9.12 References

BEIS (2021*) Planning for new energy infrastructure: review of energy National Policy Statements*.

HMSO (2021) *Environment Act 2021*

Ministry of Housing, Communities and Local Government (2021). *National Planning Policy Framework*.

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# TABLES

# 10.0 ES ADDENDUM: TRAFFIC AND TRANSPORTATION

## 10.1 Introduction

10.1.1 This Chapter provides an addendum to the traffic and transportation assessment included with the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application:

- **Chapter 10:** Traffic and Transportation (Application Document Ref. 6.2.10) [**APP-053**]; and
- **Appendix 10A:** Transport Assessment (Application Document Ref. 6.3.10) [**APP-074**].

10.1.2 This assessment considers the Traffic and Transportation effects arising from the relevant Additional Information and Proposed Development Changes, as summarised in sections below.

10.1.3 This Addendum only considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

10.1.4 There are no figures accompanying this chapter of the ES Addendum.

10.1.5 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 10.2 Changes in Legislation, Planning Policy and Guidance

10.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets on air quality/ water quality, biodiversity, and resource efficiency and waste reduction.

10.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

10.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021 after submission of the Application.

Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback prior to finalising the revised NPS. Until the reviewed NPS is finalised, the extant NPS remains in place. Based on the NPS changes consulted upon by BEIS, it is considered likely that the Proposed Development will remain in accordance with the approach to be set out in the revised NPS.

10.2.4 The emerging NPS EN-1 and EN-2 do not feature any notable changes to the policy.

10.2.5 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG 2021). With regard to traffic and transportation, whilst the policy paragraphs have been renumbered, the policy text remains largely unchanged from that reported in **Chapter 10**: Traffic and Transportation of the ES Volume I (Application Document Ref. 6.2.10) [**APP-053**].

## 10.3 Proposed Development Changes

10.3.1 Section 2 of ES Addendum Volume I (**Application Document Ref. 6.2.1-6.2.7 - Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require assessment in this chapter.

10.3.2 The following Proposed Development Change has therefore been considered within the revised assessment for traffic and transportation at the Proposed Development Site:

- Proposed Development Change 5 - Increase in proposed soil import volumes.

10.3.3 This Proposed Development Change is relevant to the assessment of potential construction impacts and effects on traffic and transport. All other Proposed Development Changes described in ES Addendum Volume I, would not alter the assessment of traffic and transportation effects and, therefore, have not been considered further.

## 10.4 Relevant Additional Information

10.4.1 No Additional Information has been developed or gathered since submission of the Application, that is relevant to the assessment of traffic and transportation. The Applicant provided clarification on the likely HGV movements associated with removal of piling waste from the Proposed Development Site in its responses to the ExA Further Written Questions (Q2.11.3 of **REP6-016**) and therefore for completeness, this Addendum matches the information recently submitted into examination in relation to these HGV movements.

## 10.5 Consultation

10.5.1 Consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1- 6.2.7 - Rev 03**).

10.5.2 A summary of comments raised via the consultation and other technical engagement, is summarised in Table 10-1.

**Table 10-1: Consultation responses on Proposed Development Changes**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| North Lincolnshire Council (NLC) | 24 March 2022. Reply via letter. | NLC state that with regards to the proposal to increase the volume of imported soils by up to 50,000 cubic tonnes the Local Highway Authority would like to see further clarification around vehicle movements assumed within the Rochdale Envelope assessment provided in the ES. As it stands, it is not clear that this additional increase in vehicle movements has been allowed for. The proposed increase in importation of soils could represent a significant increase in vehicle movements over and above the original assumptions. | Noted. Section 10.8 of this Chapter provides an updated assessment in relation to the heavy goods vehicle (HGV) associated with Proposed Change 5 and also includes, for completeness, a breakdown of HGV associated with potential spoil waste arisings during the enabling works that have previously been assessed in the Applicant's Waste Technical Note (**OD-003**) submitted in July 2021, as explained in the Applicant's response to Further Written Questions (Q2.11.3 of **REP6-016**). |
| National Highways | 28 February 2022. Email reply. | National Highways do not have any land ownership close to the redline indicated on your maps, but you might like to consult North Lincolnshire Council about the A18. | Noted. Consultation has been undertaken with North Lincolnshire Council. |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | In relation to the Proposed Changes:<br>1. Inclusion of riverbed within the Waterborne Transport Offloading Area (Railway Wharf) - National Highways have no interests or assets in the riverbed, and therefore no comments to make.<br>2. Changes to the Additional Abnormal Indivisible Load Route, largely within SSE land. National Highways have no interests within the SSE land. Routes for AILs will be considered individually at a time nearer to the actual movements, and by application.<br>3. Increase to the maximum heights of the carbon dioxide absorbers/ stacks, if two are installed. National Highways have no interests in the carbon dioxide absorbers/ stacks, and therefore no comments to make.<br>4. Increase to the maximum heights of the carbon dioxide stripper | Noted.<br><br>Noted. Change 2 has since been withdrawn by the Applicant from the material change application.<br><br>Noted.<br><br>Noted. |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | column. National Highways have no interests in the carbon dioxide stripper column, and therefore no comments to make.<br>5. Increase in proposed soil import volumes to create a suitable development platform. National Highways only has an interest in the volume of soil import in regard to the amount of HGV journeys and the route these will take. | Noted. This assessment is provided in Section 10.8 of this chapter. |
| Network Rail | 18 March 2022.<br>Email reply. | Confirmation that Network Rail has no comment to make in respect of these changes and do not anticipate they will impact on the railway. Comments made previously to the overall scheme remain applicable. | Noted. |

## 10.6 Updated Baseline Conditions

Existing Baseline

10.6.1 The Proposed Development Changes do not alter the existing baseline conditions for Traffic and Transport as described in **Chapter 10:** Traffic and Transportation of ES Volume I (Application Document Ref. 6.2.10) [**APP-053**].

Future Baseline

10.6.2 No changes to the submitted ES.

## 10.7 Development Design and Impact Avoidance

Construction

10.7.1 No further design and impact avoidance measures during construction are proposed as a result of the Proposed Development Changes, above those stated in **Chapter 10**: Traffic and Transportation of ES Volume I (Document Ref. 6.2.10) [**APP-053**].

## 10.8 Likely Impacts and Effects

Construction

*Proposed Development Change 5*

10.8.1 The Proposed Development Change will allow the importation of up to an additional 50,000m$^3$ of soils during the enabling works phase. These materials would be removed from/ delivered to the Proposed Development Site via HGV using the access from the A18. As noted in the Applicant's Response to the S51 Advice - Waste Technical Note (**OD-003**), it may also be necessary to remove up to 13,795m$^3$ of spoil waste during piling in the enabling works phase.

10.8.2 Assuming as a worst-case that the material movements would take place over a two month period during the initial 6 month Site Enabling and Preparation phase of construction once Mabey Bridge has been replaced, Proposed Development Change 5 would increase the number of HGV during this phase to 784 two way (392 in and 392 out) per day; an increase of 160 two way per day. When combined with the HGV movements related to potential spoil waste removal, the volume of HGV associated with construction of the Proposed Development on the network is predicted to be at its maximum of 828 daily two-way vehicle movements (414 in and 414 out) for 2 months during the initial 6 month Site Enabling and Preparation phase of construction. Proposed Development Change 5 would therefore not alter the peak months of construction traffic (Months 26 and 27) on which impacts and effects are

assessed within the **Chapter 10**: Traffic and Transport of the submitted ES and when 1,236 two-way vehicle movements are anticipated (1,116 two-way car / van movements and 120 two-way HGV movements per day).

10.8.3 Therefore, based on the Rochdale Envelope assessed, there are no new or different significant effects to traffic and transportation during construction as a result of the Proposed Development Change, in comparison with **Chapter 10**: Traffic and Transportation of ES Volume I (Application Document Ref. 6.2.10) [**APP-053**].

10.8.4 As a result of Proposed Development Change 5 there are no changes to the predicted impacts and effects in relation to the following aspects assessed:

- Severance;
- Pedestrian Amenity;
- Fear and Intimidation;
- Highway Safety;
- Driver Delay; and
- Effects on the Strategic Road Network.

Decommissioning

10.8.5 There are no changes to the decommissioning effects as a result of the Proposed Development Change 5.

## 10.9 Additional Mitigation, Monitoring and Enhancement Measures

10.9.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Proposed Development Changes, above those stated in **Chapter 10**: Traffic and Transportation of ES Volume I (Application Document Ref. 6.2.10) [**APP-053**].

## 10.10 Limitation or Difficulties of Additional Assessment

10.10.1 The limitations related to this chapter of the ES Addendum are consistent with those reported in **Chapter 10**: Traffic and Transportation of ES Volume I (Application Document Ref. 6.2.10) [**APP-053**].

## 10.11 Summary of Updated Likely Significant Residual Effects

10.11.1 There are no changes to the likely residual effects identified in **Chapter 10**: Traffic and Transportation of ES Volume I (Document Ref. 6.2.10) [**APP-053**], as a result of the Proposed Development Changes. The residual effects would remain as reported within Section 10.9 of **Chapter 10**: Traffic and Transportation (i.e. not significant).

## 10.12 References

BEIS (2021) *Planning for new energy infrastructure: review of energy National Policy Statements*.

HMSO (2021) *Environment Act 2021*

Ministry of Housing, Communities and Local Government (2021). *National Planning Policy Framework*.

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# 11.0 ES ADDENDUM: BIODIVERSITY AND NATURE CONSERVATION

## 11.1 Introduction

11.1.1 This Chapter provides an addendum to the biodiversity and nature conservation assessment included with the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application:

- **Chapter 11:** Biodiversity and Nature Conservation of the ES Volume I (Application Document Ref. 6.2.11) [**APP-054**];
- **Appendix 11A:** Biodiversity and Nature Conservation Legislation and Planning Policy (Application Document Ref. 6.3.12) [**APP-076**];
- **Appendix 11B:** Ecological Impact Assessment Methods (Application Document Ref. 6.3.13) [**APP-077**];
- **Appendix 11C:** Preliminary Ecological Appraisal Report (Application Document Ref. 6.3.14) [**APP-078**];
- **Appendix 11D:** Badger Survey Report (Application Document Ref. 6.3.15) [**APP-079**];
- **Appendix 11E**: Bat Survey Report (Application Document Ref. 6.3.16) [**APP-080**];
- **Appendix 11F:** Riparian Mammal Survey Report (Application Document Ref. 6.3.17) [**APP-081**];
- **Appendix 11G:** Aquatic Ecology Survey Report (Application Document Ref. 6.3.18) [**APP-082**]; and
- **Appendix 11H:** Underwater Sound Effects on Fish (Application Document Ref. 6.3.19) [**APP-083**].

11.1.2 This assessment considers the biodiversity and nature conservation effects arising from the relevant Proposed Development Change summarised in sections below.

11.1.3 This Addendum only considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

11.1.4 No new figures have been prepared to accompany this chapter of the ES Addendum, other than those incorporated into the above baseline survey report addenda.

11.1.5 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 11.2 Changes in Legislation, Planning Policy and Guidance

11.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets to improve air and water quality, biodiversity, and resource efficiency and waste reduction.

11.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

11.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021 after submission of the Application. Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback. prior to finalising the revised NPS. Until the reviewed NPS is finalised, the extant NPS remains in place. Based on the NPS changes consulted upon by BEIS, it is considered likely that the Proposed Development will remain in accordance with the approach to be set out in the revised NPS.

11.2.4 EN-1 retains the focus on mitigation measures for biodiversity but expands the scope for which protective measures must be considered and demonstrated.

11.2.5 Paragraph 5.5.4 adds that the design process should include nature inclusive design. Development Proposals should consider the ambitions of the 25 Year Environment Plan and contribute to Biodiversity Net Gain. Energy Infrastructure Projects have opportunities to additional environmental benefits beyond Biodiversity Net Gain.

11.2.6 Paragraph 5.4.8 has been updated to provide more specific guidance to protect and enhance biodiversity and geological conservation interests: "*The Habitats Regulations set out sites for which an HRA will assess the implications of a plan or project, including Special Areas of Conservation and Special Protection Areas. As a matter of policy, the following should be given the same protection as sites covered by the Habitat's Regulations: potential Special Protection Areas and possible Special Areas of Conservation; listed*

*or proposed Ramsar sites; and sites identified, or required, as compensatory measures for adverse effects on other HRA sites*."

11.2.7 Paragraph 5.4.13 retains protective measures for Ancient and Veteran Trees but removes the advice for the Secretary of State to refuse consent based on the loss of Ancient Woodland. The policy has been altered to state that Applicants must provide a suitable compensation strategy where development would result in the loss or deterioration of an ancient woodland or veteran trees.

11.2.8 Paragraph 5.4.18 specifies changes in mitigation requirements for birds. The Applicant should now demonstrate that the timing of construction has been planned to avoid/minimise disturbance to birds during breeding season. Furthermore, mitigation measures should look to enhance existing habitats rather than replace them.

11.2.9 Paragraph 5.4.20 goes on to state: "*There should also be specific measures to minimise impact to fish and aquatic biota by entrainment and impingement or by excessive heat or biocidal chemicals from discharges to receiving waters*."

11.2.10 Paragraph 5.4.22 adds: "General guidance suggests that any habitat creation or enhancement delivered for biodiversity net gain should be maintained for at least 30 years".

11.2.11 Taking into account the changes to EN-1, the assessment of the Proposed Development in respect to biodiversity and nature conservation is unchanged.

11.2.12 EN-4 considers the long-term potential impact of gas pipelines on biodiversity to be limited. The focus of EN-4 has remained the same with the addition of the below policy.

11.2.13 The changes to EN-4 with respect to biodiversity are not relevant to the operations of the Proposed Development. Accordingly, the assessment of the Proposed Development remains unchanged.

11.2.14 EN-5 maintains its focus on the impact of electricity networks on wildlife and biodiversity, particularly the potential negative impacts on birds. However, the changes to EN-5 with respect to biodiversity are not relevant to the operations of the Proposed Development The assessed impacts of the Proposed Development on biodiversity and nature conservation remain unchanged.

11.2.15 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG, 2021). With regard to biodiversity and nature conservation, whilst the policy paragraphs have been renumbered, the policy text remains largely unchanged from that reported in **Chapter 11**: Biodiversity and Nature Conservation of the ES Volume I (Application Document Ref. 6.2.11) [**APP-054**].

11.2.16 The above changes to legislation and planning policy do not alter the scope, approach or conclusions of the biodiversity and nature conservation assessment as described in **Chapter 11** of the ES Volume I (Application Document Ref. 6.2.11) [**APP-054**].

## 11.3 Proposed Development Changes

11.3.1 Section 2 of ES Addendum Volume I (**Application Document Ref. 6.2.1 – 6.2.7 – Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require re-assessment in this chapter.

11.3.2 The following Proposed Development Change has therefore been considered within the revised assessment for biodiversity and nature conservation at the Proposed Development Site:

- Proposed Development Change 3 - Increase to the maximum parameters (height) for up to two absorbers/ stacks. This change is relevant to the assessment of potential operational air quality impacts and effects on biodiversity and nature conservation.

11.3.3 None of the other Proposed Development Changes described in ES Addendum Volume I have potential to alter the assessment of biodiversity and nature conservation effects and, therefore, have not been considered further.

## 11.4 Relevant Additional Information

11.4.1 Additional Information was gathered by the Applicant to inform the assessment of Proposed Development Change 2 which has subsequently been withdrawn. Therefore no Additional Information accompanies this chapter of the ES Addendum .

## 11.5 Consultation

11.5.1 Consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1 – 6.2.7 – Rev 03**).

11.5.2 A summary of comments raised via consultation and other technical engagement is summarised in Table 11-1.

**Table 11-1: Consultation responses on Proposed Development Changes**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| Environment Agency | 14 March 2022. Letter response. | Regarding Change 1, inclusion of riverbed within the Waterborne Transport Offloading Area, the Environment Agency has no specific comments as the change does not appear to include any construction works within the River Trent. However, if any permanent features are proposed with this change, the Environment Agency would request additional details and would need to assess if any potential construction impacts on migratory fish species can be mitigated. | As described in ES Addendum Volume I – Proposed Development Change 1 involves no construction works or permanent works of development and is only required for the construction phase of the Proposed Development. |
| Natural England | 14 March 2022. Letter response. | The Habitats Regulations Assessment (HRA) which was previously produced for this development should be updated to reflect the change to the proposed plans, as there may be potential for additional impacts to designated sites.<br><br>As the new plans detail that larger transport vessels will be utilised for the development, and these will rest on the riverbed, potential | Noted. **Document Ref. 5.12**: **HRA Appropriate Assessment – Rev 04** is submitted with the material change application.<br><br>The type and maximum size of vessels proposed is consistent with the vessels that were used for the AIL deliveries during |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | damage to designated habitat should be considered. Also, if there is construction planned within the boundary of the designated site to accommodate these vessels, the assessment must consider the potential for impacts due to loss of habitat. Also, it should be clarified whether the offloading area will only be required during the construction phase, or if it will be used during the operation phase of the development.<br><br>The assessment must also include consideration of the potential for additional disturbance impacts due to movements of the large vessels throughout the designated site. | construction of Keadby 2 Power Station i.e., the largest vessels are predicted to be 82m length, 11.5m beam as reported in the submitted ES. Given the above, it is considered that Change 1 does not trigger any specific requirement for updates to this chapter or the HRA Appropriate Assessment. Use of Railway Wharf is only required for the construction phase of the Proposed Development.<br><br>Change 1 does not change the number or type of vessels proposed to use the Wharf from those already assessed in the Application. Use of the Wharf will only take place during the construction period and use will be consistent with typical and recent (Keadby 2 Power Station) operational port related activity by vessels. As an active port, a small number of vessels do rest on the riverbed when moored and the proposed use (and any related disturbance effects) is |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | | considered routine and entirely consistent with current practices at the Wharf as a commercial port facility. |
| | | There should be assessment of changes to air quality impacts which may arise to the designated sites due to the proposed modifications. This should be considered for both the vessel movements, and for the increase in heights of the carbon dioxide absorbers and carbon dioxide stripper column. | Section 11.8 of this Chapter provides an updated assessment. As reported in the Application, 35 – 40 vessels is significantly lower than the threshold for screening of air quality effects and therefore the assessment of emissions from vessels was screened out of the Application. Change 1 does not change the number or type of vessels proposed to use the Wharf from those already assessed in the Application and this aspect has therefore not been considered further. |
| North Lincolnshire Council | 24 March 2022. Letter response. | The inclusion of riverbed within the Waterborne Transport Offloading Area will need to be addressed in the Habitats Regulations Assessment. | Noted. **Document Ref. 5.12**: **HRA Appropriate Assessment – Rev 04** is submitted with the material change application although as noted above, use will be consistent with typical and recent (Keadby 2 Power Station) operational port related activity by vessels. As an active port, a small number of vessels do rest on the riverbed |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | | when moored and the proposed use (and any related disturbance effects) is considered routine and entirely consistent with current practices at the Wharf as a commercial port facility. |

## 11.6 Updated Baseline Conditions

Existing Baseline

11.6.1 The Proposed Development Change do not alter the existing baseline conditions for biodiversity and nature conservation as described in Section 11.4 of **Chapter 11** of ES **Volume I** (Application Document Ref. 6.2.11) [**APP-054**]. Specifically, the previously defined study areas remain worst-case and are not affected by the amendment to the Order Limits.

Future Baseline

11.6.2 The future baseline conditions have not changed as a result of the Proposed Development Change.

## 11.7 Changes to Development Design and Impact Avoidance

Construction

11.7.1 No further design and impact avoidance measures during construction are proposed as a result of the Proposed Development Change, above those stated in **Chapter 11**: Biodiversity and Nature Conservation of ES Volume I (Application Document Ref. 6.2.11) [**APP-054**].

Operation

11.7.2 No changes as a result of the Proposed Development Changes, above those stated in **Chapter 11:** Biodiversity and Nature Conservation of the ES Volume I (Document Ref. 6.2.11) [**APP-054**].

## 11.8 Likely Impacts and Effects

*Proposed Development Change 3*

Statutory and Non-Statutory Nature Conservation Designations

11.8.1 An assessment of emissions resulting from the revised maximum parameters for up to two absorbers/ stacks has been undertaken. The results are presented in **Appendix 8B**: Air Quality Operational Phase of ES Addendum Volume II (**Application Document Ref. 6.3.6 – Rev 03**).

11.8.2 At nature conservation designations (including consideration of the open mosaic habitats of the former Keadby Ash Tip), the results from the modelling of up to two absorber units/ stacks presented in Section 5.2 of **Appendix 8B** of ES Addendum Volume II (**Application Document Ref. 6.3.6 – Rev 03**) indicate that the concentrations of NOx and ammonia, and the related deposition of nutrient nitrogen, are very slightly higher. However, the overall

level of impact from these pollutants remains comparable to that presented within **Chapter 8**: Air Quality of ES Volume I (Document Ref. 6.2.8) [**APP-051**].

11.8.3 As a result of the re-modelling for Proposed Development Change 3, the annual contribution of the Proposed Development to NOx (in terms of the process contribution (PC)) is predicted to exceed 1% of the critical level at the Humber Estuary Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC) and Ramsar site, and at four local wildlife sites (LWS) (Stainforth and Keadby Canal Corridor LWS, Keadby Wetland LWS, Keadby Wet Grassland LWS and Three Rivers LWS). However, the predicted environmental concentration (PEC) (i.e. the existing baseline plus the Proposed Development emissions) would not exceed, and otherwise remains well below (<50% in all cases), the critical level set for a potential adverse impact on vegetation. Given this, the potential impact from NOx is negligible (**not significant**) at all of the aforementioned nature conservation sites.

11.8.4 In relation to ammonia, the re-modelling for Proposed Development Change 3 indicates that ammonia would exceed 1% of the critical level at the Humber Estuary SSSI, SAC and Ramsar site. However, the qualifying habitats receiving ammonia levels above the 1% critical level are the mudflats and estuary habitats, and these do not support vegetation sensitive to ammonia. Given this, the potential impact from ammonia is negligible (**not significant**) at the Humber Estuary SSSI, SAC and Ramsar site.

11.8.5 In relation to nitrogen deposition, the re-modelling for Proposed Development Change 3 indicates that the nitrogen dose would exceed 1% of the critical level at the Humber Estuary SSSI, SAC and Ramsar site, and at the Keadby Wetland LWS. At the Humber Estuary, the PEC of nitrogen is predicted to be 102% of the critical load. However, the qualifying mudflat and estuary habitats present in the affected area are not sensitive to nitrogen deposition as they do not support vegetation. Accordingly, the potential impact from nitrogen deposition is negligible and **not significant** at the Humber Estuary SSSI, SAC and Ramsar site.

11.8.6 In the case of Keadby Wetland LWS, while the dose is higher than previously reported in Section 11.6 of **Chapter 11** of the ES Volume I (Application Document Ref. 6.2.11) [**APP-054**] the impact assessment rationale remains applicable. Therefore, the predicted effect is negligible (**not significant**).

11.8.7 Overall, there is no change to the conclusions of the biodiversity and nature conservation effects of the Proposed Development being not significant, as presented in **Chapter 11**: Biodiversity and Nature Conservation of ES Volume I (Application Document Ref. 6.2.8) [**APP-051**].

Decommissioning

11.8.8 No changes to the submitted ES.

## 11.9 Additional Mitigation, Monitoring and Enhancement Measures

11.9.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Proposed Development Change, above those stated in Section 11.7 of **Chapter 11**: Biodiversity and Nature Conservation of ES Volume I (Document Ref. 6.2.11) [**APP-054**].

## 11.10 Limitation or Difficulties of Additional Assessment

11.10.1 No changes to the submitted ES.

## 11.11 Summary of Updated Likely Significant Residual Effects

11.11.1 There are no changes to the likely residual effects identified in Section 11.9 of **Chapter 11**: Biodiversity and Nature Conservation of ES Volume I (Document Ref. 6.2.11) [**APP-054**], as a result of the Proposed Development Change. Therefore the residual effects remain as previously reported i.e. not significant.

## 11.12 References

BEIS (2021) *Planning for new energy infrastructure: review of energy National Policy Statements*.

HMSO (2021) *Environment Act 2021*

Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.

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# TABLES

# 13.0 ES ADDENDUM: GEOLOGY, HYDROGEOLOGY AND LAND CONTAMINATION

## 13.1 Introduction

13.1.1 This Chapter provides an addendum to the geology, hydrogeology and land contamination assessment submitted with the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application:

- **Chapter 13:** Geology, Hydrogeology and Land Contamination of the ES Volume I (Application Document Ref. 6.2.13) [**APP-056**];
- **Appendix 13A:** Phase 1 Desk Based Assessment (Application Document Ref. 6.3.23) [**APP-087**];
- **Appendix 13B:** Land Contamination Methodology Table (Application Document Ref. 6.3.24) [**APP-088**]; and
- **Appendix 13C:** Potential Areas of Contamination Further Risk and Impact Assessment (Application Document Ref. 6.3.25) [**APP-089**].

13.1.2 This assessment considers the effects in relation to geology, hydrogeology and land contamination arising from the relevant Proposed Development Changes, as summarised in the sections below.

13.1.3 This Addendum only considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

13.1.4 There are no figures accompanying this chapter of the ES Addendum.

13.1.5 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 13.2 Changes in Legislation, Planning Policy and Guidance

13.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets on water quality, biodiversity, resource efficiency and waste reduction, and regulation of chemicals.

13.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed

Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

13.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021 after submission of the Application. Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback prior to finalising the revised NPS. Until the reviewed NPS is finalised, the extant NPS remains in place. Based on the NPS changes consulted upon by BEIS, it is considered likely that the Proposed Development will remain in accordance with the approach to be set out in the revised.

13.2.4 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG, 2021). With regard to geology, hydrogeology and land contamination, whilst the policy paragraphs have been renumbered, the policy text remains largely unchanged from that reported in **Chapter 13**: Geology, Hydrogeology and Land Contamination of the ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

## 13.3 Proposed Development Changes

13.3.1 Section 2.2 of ES Addendum Volume I (**Application Document Ref. 6.2.1 - 6.2.7 – Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require assessment in this chapter.

13.3.2 The following Proposed Development Change has therefore been considered within the revised assessment for geology, hydrogeology and land contamination at the Proposed Development Site:

13.3.3 Proposed Development Change 1 - Extension of Waterborne Transport Offloading Area to incorporate Keadby Wharf. This Proposed Development Change is relevant to the assessment of potential construction impacts and effects. The Proposed Development Change 1 has been considered within the revised assessment as it is an extension to the Order Limits. Where the Order Limits have been extended, it is necessary to determine whether any additional potential sources of contamination or receptors within the 250m study area need to be scoped into the assessment.

13.3.4 All other Proposed Development Changes described in ES Addendum Volume I would not alter the assessment of geology, hydrogeology and land contamination effects and, therefore, have not been considered further.

## 13.4 Relevant Additional Information

13.4.1 No additional information has been sourced since submission of the Application, that is relevant to the assessment of geology, hydrogeology and land contamination.

## 13.5 Consultation

13.5.1 Consultation on the Proposed Development changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1 - 6.2.7 – Rev 03**).

13.5.2 A summary of comments raised via the consultation and other technical engagement, is summarised in Table 13-1.

**Table 13-1: Consultation responses on Proposed Development Changes**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| North Lincolnshire Council | 24 March 2022.<br>Letter reply | Originally it was anticipated that 65,000m$^3$ of soils may need to be removed and up to 130,000m$^3$ of soils imported to provide a suitable platform for foundations and buildings/ equipment across the site. This has now increased to 180,000m$^3$ of soil to be imported.<br>The re-use of excavated materials during construction will be governed by either a Materials Management Plan developed in accordance with relevant guidance including 'The Definition of Waste: Development Industry Code of Practice' (CL:AIRE, 2011), an environmental permit or a relevant exemption. Any imported soil will also need to be suitable for use at the proposed development site. | Noted. Sourcing and importing soil will take into consideration the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Department for Environment, Food & Rural Affairs, 2018) as set out within **Application Document Ref. 7.1**: Framework Construction Environmental Management Plan; the most recent version of this (Revision 03 clean and tracked changes versions) are submitted at Deadline 6 [**REP6-003 and REP6-004**]. |

## 13.6 Updated Baseline Conditions

Existing Baseline

13.6.1 The existing baseline conditions have been reviewed, particularly whether any potential sources of contamination or receptors are scoped in as a result of the new extension to the study area around Proposed Development Change 1.

13.6.2 Change 1 comprises land within the River Trent, including the river bed on which the largest vessels will temporarily rest, during mooring over a full tide-cycle. Given that this activity is associated with normal use as a port, there are no changes to the baseline conditions as a result of inclusion of this area in the Order Limits. Furthermore, there are no additional potential sources of contamination or receptors identified within the 250m study area.

13.6.3 The Proposed Development Change 1 does not alter the existing baseline conditions for Geology, Hydrogeology and Land Contamination as described in **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

Future Baseline

13.6.4 The future baseline conditions have not changed as a result of the Proposed Development Change.

## 13.7 Changes to Development Design and Impact Avoidance

Construction

13.7.1 No changes as a result of the Proposed Development Change, above those stated in **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

Operation

13.7.2 No changes as a result of the Proposed Development Change, above those stated in **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

## 13.8 Likely Impacts and Effects

Construction Effects

*Proposed Development Change 1*

13.8.1 The Proposed Development Change does not change the assessment of geology, hydrogeology and land contamination effects arising during construction as presented in **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**]. As such, the effects on human health, controlled waters, property and ecological receptors identified within **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**] are **not significant** with the embedded mitigation in place.

Operation effects

*Proposed Development Change 1*

13.8.2 No changes from the submitted ES. As such, the effect on human health, controlled waters, property and ecological receptors identified within **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**] is not significant with the embedded mitigation in place.

13.8.3 Overall, there is no change to the conclusions of the effects in relation to geology, hydrogeology and land contamination related to the Proposed Development being **not significant**, as presented in **Chapter 13:** Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

Decommissioning

*Proposed Development Change 1*

13.8.4 No changes from the submitted ES. As such, the effect on human health, controlled waters, property and ecological receptors identified within **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**] is **not significant** with the embedded mitigation in place.

Summary

13.8.5 Overall, there is no change to the conclusion to the assessment of geology, hydrogeology and land contamination effects being not significant, as presented in **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

## 13.9 Additional Mitigation, Monitoring and Enhancement Measures

13.9.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Proposed Development Change, above those stated in

**Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

## 13.10 Limitation or Difficulties of Additional Assessment

13.10.1 The limitations and/ or difficulties related to this chapter of the ES Addendum are consistent with those reported in **Chapter 13**: Geology, Hydrogeology and Land Contamination of ES Volume I (Application Document Ref. 6.2.13) [**APP-056**].

## 13.11 Summary of Updated Likely Significant Residual Effects

13.11.1 There are no changes to the likely residual effects identified in **Chapter 13**: Geology, Hydrogeology and Land Contamination (Application Document Ref. 6.2.13) [**APP-056**], as a result of the Proposed Development Change. The residual effects would remain as reported within Section 13.9 of **Chapter 13**: Geology, Hydrogeology and Land Contamination (i.e. **not significant**).

## 13.12 References

BEIS (2021) *Planning for new energy infrastructure: review of energy National Policy Statements*.

HMSO (2021) *Environment Act 2021.*

Ministry of Housing, Communities and Local Government (2021). *National Planning Policy Framework*.

# CONTENTS



# TABLES

# 14.0 ES ADDENDUM: LANDSCAPE AND VISUAL AMENITY

## 14.1 Introduction

14.1.1 This Chapter provides an addendum to the landscape and visual amenity assessment submitted with the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application:

- **Chapter 14:** Landscape and Visual Amenity of the ES Volume I (Application Document Ref. 6.2.14) [**APP-057**];
- **Appendix 14A:** Landscape and Visual Impact Assessment Methodology (Application Document Ref. 6.3.26) [**APP-090**];
- **Appendix 14B:** - Potential Viewpoints (Application Document Ref. 6.3.27) [**APP-091**]; and
- **Appendix 14C:** - Landscape Character (Application Document Ref. 6.3.28) [**APP-092**].

14.1.2 This assessment considers the effects on landscape and visual amenity arising from the relevant Additional Information and Proposed Development Changes, as summarised in sections below.

14.1.3 This Addendum only considers changes in legislation, baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in the submitted ES.

14.1.4 Figures accompanying this chapter of the ES Addendum that are referenced within are presented in ES Addendum Volume III and include:

- **Figures 14.1 - 14.5** (**Application Document Ref. 14.4.32 – 14.4.36 – Rev 03**) which provide the landscape context in the light of the Order Limits; and
- to facilitate the reader's interpretation of the Proposed Development Change 3 (increased height of up to two absorbers columns/ stacks) and Change 4 (increased height of $CO_2$ stripper) new wireline imagery illustrating the Proposed Development is provided as **Figures 14.19 – 14.24** (**Application Document Ref 14.50 – 14.50 – Rev 02**).

14.1.5 An indicative site layout for both the single large absorber (**Figure 4.1a**) and up to two absorbers (**Figure 4.1b**) is provided in **Application Document Ref 6.4.7 – Rev 02** and has been used to inform this ES Addendum Chapter.

14.1.6 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 14.2 Changes in Legislation, Planning Policy and Guidance

14.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets on tree felling, air quality/ water quality, biodiversity, and resource efficiency and waste reduction.

14.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

14.2.3 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021 after submission of the Application. Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback, prior to finalising the revised NPS. Until the reviewed NPS is finalised, the extant NPS remains in place. Based on the NPS changes consulted upon by BEIS, it is considered likely that the Proposed Development will remain in accordance with the approach to be set out in the revised NPS.

14.2.4 There are no notable changes or additions to NPS EN-1, EN-4 or EN-5 with regard to landscape and visual amenity impacts of relevance to the Proposed Development.

14.2.5 Paragraph 2.11.14 adds more guidance to undergrounding of power lines. In the case of undergrounding, to mitigate the potential detrimental effects of undergrounding works on any relevant agricultural land and soils, particularly regarding Best and Most Versatile land. Such a commitment must guarantee appropriate handling of soil, backfilling, and return of the land to the baseline Agricultural Land Classification (ALC), thus ensuring no loss or degradation of agricultural land.

14.2.6 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG, 2021). With regard to landscape and visual amenity, whilst the policy paragraphs have been renumbered, the policy text remains largely unchanged from that reported in **Chapter 14**: Landscape and Visual Amenity of the ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

## 14.3 Proposed Development Changes

14.3.1 Section 2 of ES Addendum Volume I (**Application Document Ref. 6.2.1 – 6.2.7 – Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require re-assessment in this chapter.

14.3.2 The following Proposed Development Changes have therefore been considered within the revised assessment for landscape and visual amenity at the Proposed Development Site:

- Proposed Development Change 3 - Increase to the maximum parameters (height) for up to two absorbers/ stacks; and
- Proposed Development Change 4 - Increase to the maximum parameters (height) for carbon dioxide stripper column.

14.3.3 All other Proposed Development Changes described in ES Addendum Volume I, would not alter the assessment of landscape and visual amenity effects and, therefore, have not been considered further.

## 14.4 Relevant Additional Information

14.4.1 Additional information has been gathered by the Applicant, and where relevant, this is presented in this chapter including:

- Updated narrative on the viewpoint photography to describe the amendments to the judgements presented regarding the scale of visual impacts and effects arising from the Proposed Development Changes; and
- the production of updated operation phase wirelines and photomontages referenced within.

## 14.5 Consultation

14.5.1 Consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1 – 6.2.7**).

14.5.2 A summary of comments raised via the consultation and other technical engagement, is summarised in Table 14-1.

**Table 14-1: Consultation responses on Proposed Development Changes**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| North Lincolnshire Council (NLC) | 24 March 2022. Response to consultation via letter. | NLC stated that the increase to the maximum heights of the carbon dioxide absorbers/ stacks, if two are installed, and the increase to the maximum heights of the carbon dioxide stripper column will need to be addressed in the Landscape and Visual Impact Assessment. | These represent Proposed Development Changes 3 and 4 which have been addressed within this ES Addendum chapter. |

## 14.6 Updated Baseline Conditions

Existing Baseline

14.6.1 The Proposed Development Changes do not alter the existing baseline conditions for landscape and visual amenity as described in **Chapter 14** of ES Volume I [**APP-057**].

Future Baseline

14.6.2 The future baseline conditions have not changed as a result of the Additional Information.

## 14.7 Changes to Development Design and Impact Avoidance

Construction

14.7.1 No further design and impact avoidance measures during construction are proposed as a result of the Proposed Development Changes, above those stated in **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

Operation

14.7.2 No further design and impact avoidance measures during operational are proposed as a result of the Proposed Development Changes, above those stated in **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

## 14.8 Likely Impacts and Effects

Landscape and visual amenity effects

*Proposed Development Change 3*

Construction

14.8.1 Construction activities including use of cranes and mobile plant associated with the Proposed Development Change would be of a similar scale and nature to the works assessed within the submitted ES and would not change the assessment of construction effects on identified landscape receptors, visual receptors and dynamic views reported in **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP–057**].

14.8.2 There would be no new significant construction effects on landscape and visual amenity receptors as a result of the Proposed Development Change,

in comparison with **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

Operation

14.8.3 The Proposed Development Change would result in an increase of up to 22m in height if the twin absorbers columns/ stacks option was selected and maximum parameters were applied, resulting in a maximum height of up to 98.3m Above Ordnance Datum (AOD).

14.8.4 With reference to **Figure 14.19 - Figure 14.24** which present updated wirelines and photomontages for the twin absorbers, it is judged that the Proposed Development Change would result in a marginal increase in massing of tall structures with no change in the overall nature of views for identified representative viewpoints. It is judged that there would be no increase in the level of impact on receptors in comparison to the single absorber column/ stack (assessed as worst-case scenario) within **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

14.8.5 There would be no change to the level of significance during the operation phase on landscape receptors, visual receptors and dynamic views as a result of the Proposed Development Change in comparison with **Chapter 14:** Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

Visible Plumes

14.8.6 It is anticipated that the visibility of the plumes for the twin absorbers columns/ stacks would be similar to the single plume assessed within **Chapter 14:** Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**] with reference to **Appendix 8B:** Air Quality Operational Phase of ES Volume II (Application Document Ref. 6.3.6) [**APP-070**]. An average plume length of less than 4m would be predicted to be visible for up to 3% of the time. Occasional longer plumes are predicted (up to 632m) predicted to occur for less than 1% of the time.

*Proposed Development Change 4*

Construction

14.8.7 Construction operations including plant and activity associated with the Proposed Development Change would be of a similar scale and nature and would not change the assessment of construction effects on identified landscape receptors, visual receptors and dynamic views reported in **Chapter 14:** Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP–057**].

14.8.8 There would be no new significant construction effects on landscape and visual amenity receptors as a result of the Proposed Development Change, in comparison with **Chapter 14:** Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

Operation

14.8.9 The Proposed Development Change would result in an increase of up to 10m in height to the carbon dioxide stripper column resulting in a maximum height for the stripper of up to 65.8m AOD.

14.8.10 Whilst the Proposed Development Change would result in the marginal increase in visibility of this structure, it is judged that the Proposed Development Change would not increase the level of impact on receptors in comparison to the that assessed within **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**], since the stripper is not the largest structure within the Proposed Development.

14.8.11 There would be no change to the level of significance during the operation phase on landscape receptors, visual receptors and dynamic views as a result of the Proposed Development Change in comparison with **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

Decommissioning

*Proposed Development Change 3*

14.8.12 There are no changes from the submitted ES. As such there are no significant effects as a result of Proposed Development Change 3 during decommissioning.

*Proposed Development Change 4*

14.8.13 There are no changes from the submitted ES. As such there are no significant effects as a result of Proposed Development Change 4 during decommissioning.

## 14.9 Additional Mitigation, Monitoring and Enhancement Measures

14.9.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Proposed Development Changes, above those stated in **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

## 14.10 Limitation or Difficulties of Additional Assessment

14.10.1 The limitations and/ or difficulties related to this chapter of the ES Addendum are consistent with those reported in **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**].

## 14.11 Summary of Updated Likely Significant Residual Effects

14.11.1 There are no changes to the likely residual effects identified in **Chapter 14**: Landscape and Visual Amenity of ES Volume I (Application Document Ref. 6.2.14) [**APP-057**], as a result of the Additional Information/ Proposed Development Changes. The residual effects would remain as reported within Section 14.9 of **Chapter 14**: Landscape and Visual Amenity (i.e. significant effects at the assessed viewpoints - Viewpoint 1 (Chapel Lane West, Keadby), Viewpoint 2 (Gate Keepers Residence, Vazon Bridge, Keadby) and Viewpoint 4 (PRoW (KEAD9, KEAD10) north of Keadby). In addition, in the future baseline operation assessment (Scenario 2) with Keadby 1 Power Station structures removed significant effects at Viewpoint 6 (Trunk Road, Keadby) would occur as a result of the close distance to the Proposed Development Site and lack of intervening vegetation).

## 14.12 References

BEIS (2021) *Planning for new energy infrastructure: review of energy National Policy Statements*.

HMSO (2021) *Environment Act 2021.*

Ministry of Housing, Communities and Local Government (2021). *National Planning Policy Framework.*

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# TABLES

# 15.0 ES ADDENDUM: CULTURAL HERITAGE

## 15.1 Introduction

15.1.1 This Chapter provides an addendum to the cultural heritage assessment (archaeology) included within the submitted Environmental Statement (ES) and should be read in conjunction with the following documents submitted with the Development Consent Order (DCO) Application and subsequently, during examination:

- **Chapter 15:** Cultural Heritage of the ES Volume I (Application Document Ref. 6.2.15) [**APP-058**];
- **Appendix 15A:** Cultural Heritage Desk Based Assessment (Application Document Ref. 6.3.29) [**APP-093**];
- **Appendix 15B:** Geoarchaeological Hand Auger Survey Fieldwork Report (Application Document Ref. 6.3.30) [**APP-094**]; and
- **Appendix 15C:** Geophysical Survey Fieldwork Report (Application Document Ref. 6.3.31) [**APP-095**].
- **Appendix 15D:** Interim Report on Archaeological Investigation and Recording (**Application Document Ref. 10.8**).

15.1.2 This assessment considers the cultural heritage effects arising from the relevant Additional Information and Proposed Development Changes as summarised in sections below.

15.1.3 This Addendum only considers changes in baseline conditions or potential effects since the submitted ES was prepared; if no change is listed then conditions are the same as those presented in these documents.

15.1.4 The Chapter is accompanied by a new Appendix comprising the interim results of archaeological trial trenching and geoarchaeological assessment undertaken under an agreed Written Scheme of Investigation (WSI) during March/ April 2022. This is referred to herein as **Appendix 15D**: Interim Report on Archaeological Investigation and Recording, to preserve numbering of the original ES Appendices.

15.1.5 No updated figures accompany this chapter of the ES Addendum. Other figures are referenced within including new wireline imagery illustrating the Proposed Development Change 3 (increased height of up to two absorbers columns/ stacks) and Change 4 (increased height of $CO_2$ stripper) – these are provided as **Figures 14.19 – 14.24** (**Application Document Ref 6.4.50 – 6.4.55 – Rev 03**).

15.1.6 An indicative site layout for both the single large absorber (**Figure 4.1a**) and up to two absorbers (**Figure 4.1b**) is provided in **Application Document Ref 6.4.7 – Rev 02** and has been used to inform this ES Addendum Chapter.

15.1.7 A glossary of terms and list of abbreviations used in this ES Addendum is provided within **Application Document Ref. 10.8**.

## 15.2 Changes in Legislation, Planning Policy and Guidance

15.2.1 The Environment Act 2021 ('The Act') (Her Majesty's Stationary Office (HMSO) 2021) was given Royal Assent after the submission of the Application and sets out legislation to provide a post-Brexit environmental framework for the United Kingdom. In summary, The Act includes new legislation such as: binding targets on water quality, biodiversity, resource efficiency and waste reduction, and regulation of chemicals.

15.2.2 The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

15.2.3 Part 7 of the Act provides for the creation of conservation covenants through a conservation covenant agreement between a landowner and a responsible body. No such covenants exist in respect of the Proposed Development. The majority of The Act is not yet in force. The Office for Environmental Protection (OEP) has been brought into effect but is yet to receive its enforcement powers in England that would apply to the Proposed Development. The Applicant will continue to monitor implementation of The Act throughout the course of Examination and will consider the need for changes where they apply to policy or plans and their implementation, during the course of Examination. Until any changes are made, extant legislation and policies remain in force.

15.2.4 Draft revised National Policy Statements (NPS) for energy infrastructure were published by the Department for Business, Energy and Industrial Strategy (BEIS) on 6 September 2021, after submission of the Application. Consultation closed on 29 November 2021 and BEIS is now considering consultation feedback prior to finalising the revised NPS. These do not constitute the relevant NPS (i.e., they do not have effect under Section 104(1) of the 2008 Act) but may potentially be important or relevant matters for consideration, pursuant to Section 104(2)(d). Until the reviewed NPS is finalised, the extant NPS remains in place.

15.2.5 NPS EN-1 maintains the majority of its guidance on the Historic Environment. Paragraph 5.9.13 adds that when assessing cultural heritage, studies will be

required to assess the impact of noise, vibration, light as well as indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected.

15.2.6 The National Planning Policy Framework (NPPF) was updated in July 2021 (MHCLG 2021). With regard to cultural heritage, whilst the policy paragraphs have been renumbered, the policy text remains largely unchanged from that reported in **Chapter 15:** Cultural Heritage of the ES Volume I (Application Document Ref. 6.2.15) [**APP-058**]. One additional paragraph was added, paragraph 198; this considers applications to remove or alter historic statues, plaques and memorials. It is not of relevance to this assessment.

15.2.7 The guidance document 'Principles of Cultural Heritage Impact Assessment in the UK' was published in 2021. It is a guide to good practice in cultural heritage impact assessment published jointly by the Institute of Environmental Management and Assessment (IEMA), the Institute of Historic Building Conservation (IHBC) and the Chartered Institute for Archaeologists (CIfA). The document provides guidance on understanding cultural heritage assets and evaluating the consequences of change. It provides a structured methodology for assessing impacts to cultural heritage. Understanding cultural heritage assets is split into three stages: Description, Significance and Importance, and the process of evaluating the consequences of change is also split into three stages: Understanding change, Assessing impact and Weighting the effect. The methodology described aligns with the methodology used in **Chapter 15:** Cultural Heritage of the ES Volume I (Application Document Ref. 6.2.15) [**APP-058**] and no changes are required as a result of this new guidance.

## 15.3 Proposed Development Changes

15.3.1 Section 2.2 of ES Addendum Volume I (**Application Document Ref. 6.2.4 – Rev 03**) provides an overview of the Proposed Development Changes. Section 4.0, Table 4 of ES Addendum Volume I provides a scoping assessment of the Proposed Development Changes including the rationale for those Proposed Development Changes that are considered to require re-assessment in this chapter.

15.3.2 The following Proposed Development Change has been considered within the revised assessment for cultural heritage at the Proposed Development Site:

- Proposed Development Change 3 - Increase to the maximum parameters (height) for up to two absorbers/ stacks.

15.3.3 All other Proposed Development Changes described in ES Addendum Volume I would not alter the assessment of cultural heritage effects and, therefore, have not been considered further.

## 15.4 Relevant Additional Information

15.4.1 The Applicant has completed further on-site archaeological evaluation, in the form of archaeological trial trenching and geoarchaeological assessment, agreed through a WSI with the North Lincolnshire Council (NLC) Historic Environment Officer (HEO). The findings of this work are considered Additional Information for the purposes of this ES Addendum and described herein and in **Appendix 15D:** Interim Report on Archaeological Investigation and Recording which accompanies this chapter.

## 15.5 Consultation

15.5.1 Consultation on the Additional Information has been undertaken since publication of the ExA Rule 17 letter in January 2022. In addition, consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1-6.2.7 – Rev 03**).

15.5.2 A summary of comments raised via the consultation and other technical engagement, is summarised in Table 15-1.

**Table 15.1: Consultation responses on the Additional Information**

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| North Lincolnshire Council (NLC) (Archaeology) | March 2022 (Technical Engagement for ES Addendum) | Change 2, change to the AIL route, has the potential to impact previously unrecorded archaeological remains of prehistoric to Roman date. NLC advise further archaeological field evaluation is required to assess the heritage significance of the proposed change area; this could be done through adding Change 2 to the scope of the upcoming archaeological trial trenching under the Rule 17 Response for Heritage. | NLC's comments were noted by the Applicant and NLC subsequently responded (to additional information provided by AECOM which comprised information on previous ground disturbance and the proposed construction methodology related to Proposed Development Change 2 to the Additional AIL Route. NLC confirmed (04 April 2022 - Additional Technical Engagement for ES Addendum) that they are satisfied that no archaeological work is required in relation to Proposed Development Change 2.<br><br>Change 2 has since been withdrawn by the Applicant from the material change application. |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | January 2022 – May 2022 (Technical Engagement to agree approach Rule 17 letter) | A meeting was held with NLC HEO to agree the approach to the Rule 17 response. Subsequently, technical engagement has continued between the Applicant's archaeological representative and NLC HEO regarding agreement of the WSI, progress of the field evaluation through to completion and to agree the strategy for further work and updates to Application documents required. | Additional information gathered as a result of the field evaluation is summarised in Section 15.6 of this ES Addendum and the findings of the field evaluation are presented in the accompanying **Appendix 15D**. An updated Document 7.4 - Outline Written Scheme of Investigation (OWSI) has been produced to outline the agreed mitigation strategies. |
| Historic England | | Seek to confirm that regarding Change 1, there will be no increased erosive processes from wash and hence no likely increased or new archaeological impacts in channel or bankside.<br>No impacts upon designated heritage assets are anticipated as a result of Change 3 or 4. | Proposed Development Change 1 does not involve any works of development including any construction work in the river that would result in any change to the bankside which is an existing structure with piled foundations to bedrock. |

| Consultee or Organisation | Date and Nature of Consultation | Summary of Response | How Comments have been addressed in this Chapter of the ES Addendum |
|---|---|---|---|
| | | Change 5 could potentially increase impacts on designated heritage assets if new borrow pits are required or if storage areas/footprints of platforms increase, however neither of these are indicated in the documents. | As an active port, small numbers of vessels do rest on the riverbed when moored and the proposed use is considered routine and entirely consistent with current practices at the Wharf as a commercial port facility. |

## 15.6 Updated Baseline Conditions

Existing Baseline

15.6.1 The Proposed Development Changes do not alter the existing baseline conditions for Cultural Heritage as described in **Chapter 15** of ES Volume I [**APP-058**].

15.6.2 The Additional Information alters the existing baseline conditions for Cultural Heritage as described in **Chapter 15** of ES Volume I [**APP-058**].

15.6.3 Table 15.7 in **Chapter 15** of ES Volume I [**APP-058**] lists the known non-designated below ground heritage assets located within the Proposed Development Site. At the time of writing, the table was based on the Historic Environment Record (HER) data and the results of the geophysical survey and hand-auger survey. As a result of the Additional Information, the interpretation/ description of some of these assets has changed. Table 15.2 below lists the assets that have changed, with their previous interpretation and their updated interpretation/ description detailed.

**Table 15.2: Known Non-Designated Below Ground Heritage Assets Located Within the Proposed Development Site**

| HER Reference | | Name | Type | Period | |
|---|---|---|---|---|---|
| AECOM3333 | Possible partial enclosure | Post-medieval warping drain | Land improvement drain | Post-medieval | Post-medieval warping drain identified during the archaeological trial trenching and geoarchaeological assessment (**Appendix 15D**) |
| AECOM3334 | Possible partial enclosure | N/A | N/A | N/A | Feature not identified during the archaeological trial trenching and geoarchaeological assessment (**Appendix 15D**) |

| HER Reference | | Name | Type | Period | |
|---|---|---|---|---|---|
| AECOM3339 | Possible post-medieval warping drains | Post-medieval warping drains | Land improvement drain | Post-medieval | Post-medieval warping drains identified during the archaeological trial trenching and geoarchaeological assessment (**Appendix 15D**) |
| AECOM3342 | Former field boundaries | Modern land drain | Land improvement drain | Modern | Modern land drain identified during the archaeological trial trenching and geoarchaeological assessment (**Appendix 15D**) |
| AECOM3341 | Undetermined linear feature | N/A | N/A | N/A | Feature not identified during the archaeological trial trenching and geoarchaeological assessment (**Appendix 15D**) |
| AECOM3338 | Undetermined linear feature | Modern land drain | Land improvement drain | Modern | Modern land drain identified during the archaeological trial trenching and geoarchaeological assessment (**Appendix 15D**) |

Future Baseline

15.6.4 The future baseline conditions have not changed as a result of the Proposed Development Change or Additional Information.

## 15.7 Changes to Development Design and Impact Avoidance

Below Ground Archaeological Remains

15.7.1 No further design and impact avoidance measures during construction and operation are proposed above those stated in **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**].

Built Heritage

15.7.2 No further design and impact avoidance measures during construction and operation as a result of the Proposed Development Change, above those stated in **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**] are considered necessary.

## 15.8 Likely Impacts and Effects

Construction

*Additional Information*

Below Ground Archaeological Remains

15.8.1 The Additional Information has the potential to change the assessment of below ground archaeological remains, as reported in **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**].

15.8.2 As a result of the Additional Information, the assessment of the value of asset [AECOM3333], and the resulting magnitude of impact and significance of effect as reported in **Chapter 15** has changed. Asset [AECOM3333] was confirmed to be a warping drain of post-medieval date. The value of this asset derives from its archaeological interest and potential to enhance archaeological recording of warping systems and processes which could contribute to local research. The asset is assessed to be of low value using the criteria for determining the value of heritage assets provided in Table 15.4 of **Chapter 15**: Cultural Heritage (**APP-058**).

15.8.3 The Proposed Development in this area comprises the Proposed PCC Site which will result in permanent ground disturbance due to ground levelling, piling and installation of below ground structures and pipework. The asset forms part of a larger landscape of warping systems and the ground disturbance is likely to result in the removal of a small proportion of the asset. This would result in a

slight change to the asset but would not reduce its value. This would constitute a low magnitude of impact (using the criteria for determining the magnitude of impact on heritage assets provided in Table 15.5 of **Chapter 15 - APP-058**). In accordance with the matrix for classifying the significance of effects provided in Table 15.6 of **Chapter 15**: Cultural Heritage (**APP-058**), this would result in a minor adverse effect, which is **not significant**.

15.8.4 As a result of the Additional Information, asset [AECOM3334] was not identified and it was established this feature doesn't exist and is therefore removed from the assessment.

15.8.5 As a result of the Additional Information, asset [AECOM3339] was confirmed to be a post-medieval warping drain, therefore there is no change to the assessment as reported in **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**].

15.8.6 As a result of the Additional Information, the assessment of the value of asset [AECOM3342], and the resulting magnitude of impact and significance of effect as reported in **Chapter 15** has changed. Asset [AECOM3342] was confirmed to be a modern land drain. The asset has no archaeological value and is therefore removed from the assessment.

15.8.7 As a result of the Additional Information, asset [AECOM3341] was not identified and it was established this feature does not exist and is therefore removed from the assessment.

15.8.8 As a result of the Additional Information, the assessment of the value of asset [AECOM3338], and the resulting magnitude of impact and significance of effect as reported in **Chapter 15** has changed. Asset [AECOM3338] was confirmed to be a modern land drain. The asset has no archaeological value and is therefore removed from the assessment.

Built Heritage

15.8.9 There will be no change to the assessment of built heritage during construction as a result of the Additional Information.

*Proposed Development Changes*

Below Ground Archaeological Remains

15.8.10 There will be no change to the assessment of below ground archaeological remains during construction as a result of the Proposed Development Changes.

Built Heritage

15.8.11 The Proposed Development Changes increases the maximum parameters (height) assessed in **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**] for the option of up to two absorbers/ stacks.

15.8.12 The Proposed Development Change therefore has the potential to affect built heritage assets in the following ways:

- Change to the setting of designated and non-designated heritage assets.

15.8.13 The Proposed Development Change has the potential to change the assessed magnitude of impact to built heritage assets. Section 15.3 of **Chapter 15**: Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**] defined the Rochdale Envelope used as the basis for assessment. This identified the single absorber and stack option as the worst-case for Cultural Heritage due to its maximum height parameter, which was the greatest of all options considered. Considering the Proposed Development Change, although the single absorber option maximum height parameter is still greater than the maximum height parameter of the option of up to two absorbers/ stacks, the difference between the two parameters is now much reduced. Considering this, alongside the greater width and massing of the option of two absorbers and stacks, the twin absorber option is now considered to represent the assessment worst-case for Cultural Heritage in relation to the potential for impact to designated and non-designated heritage assets through change to their settings.

15.8.14 A review of the impact assessment for all assets within **Chapter 15**: Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**] has been undertaken. Updated photomontages have also been produced to demonstrate the Proposed Development Change and these are available as **Figures 14.19 – 14.24** – **Rev 02** in ES Addendum Volume III. No new significant effects to designated and non-designated built heritage assets have been identified as a result of the Proposed Development Change, as no change has been identified to any of the assessed magnitudes of impact as a result of the Proposed Development Change.

15.8.15 The only significant effect identified in **Chapter 15**: Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**] as a result of setting, was to the Isle of Axholme Area of Special Historic Landscape Interest (locally designated), asset of high value where a **moderate adverse** effect was identified. This was due to the presence of the Proposed Development in views from within the landscape and through the erection of a permanent security gatehouse and associated parking area off the A18. **Figure 14.25 – Rev 02** in ES Addendum Volume III presents a photomontage demonstrating the Proposed Development Change. The change is considered to be no worse than the worst-case single absorber option that was assessed in the submitted ES. As **Figure 14.25 – Rev 02** demonstrates, the increased massing of up to two absorbers is

not as apparent at distance, and in the context of other similar developments in the same view. Therefore, the assessed **moderate adverse** effect in the submitted ES remains, in the absence of mitigation.

Operation

*Additional Information*

15.8.16 There will be no change to the assessment of below ground archaeological remains and built heritage assets during operation as a result of the Additional Information.

*Proposed Development Changes*

15.8.17 There will be no change to the assessment of below ground archaeological remains during operation as a result of the Proposed Development Change.

15.8.18 There are no new or different significant operational effects to built heritage as a result of the Proposed Development Changes, in comparison with **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**]. This includes the two future baseline scenarios of; 1) the operation of the Proposed Development in the context of the presence of Keadby 1 and Power Station and Keadby 2 Power Station, and 2) the operation of the Proposed Development in the context of the presence of Keadby 2 Power Station only.

15.8.19 Overall, there is no change to the conclusions of the assessment of effects on built heritage of the Proposed Development being not significant, as presented in **Chapter 15**: Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**].

15.8.20 Decommissioning There will be no change to the assessment of below ground archaeological remains and built heritage during decommissioning as a result of the Additional Information and the Proposed Development Change.

## 15.9 Additional Mitigation, Monitoring and Enhancement Measures

*Additional Information*

15.9.1 As a result of the Additional Information, the OWSI (**Application Document Ref: 7.4**) has been updated to reflect the current status of the archaeological works.

15.9.2 The OWSI has also been updated to outline the strategy on reporting for the archaeological evaluation works and sets out the potential mitigation strategies that may be required following the results of the final report (York Archaeology, 2022). The OWSI has been subject to review, comment and agreement by NLC HEO prior to submission into examination at Deadline 6a.No additional

mitigation measures are required for built heritage as a result of the Additional Information.

*Proposed Development Change*

15.9.3 No additional mitigation measures are required for below ground archaeological remains as a result of the Proposed Development Change.

15.9.4 No additional mitigation measures are required for built heritage as a result of the Proposed Development Change, above those stated in **Chapter 15:** Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**]. This set out that matters including 'siting, layout, scale and external appearance, including the colour, materials and surface finishes of all new permanent buildings and structures' are proposed to be secured by a requirement of the draft DCO (Application Document Ref. 2.1). It is further noted that the maximum parameters for the gatehouse have been reduced to 4m (Table 3 – ES Addendum Volume I) reflected in the updated elevations plans (Application Document Ref. 4.14) submitted at Deadline 5 – taken together. it is therefore considered that appropriate mitigation measures will be devised to minimise harm to built heritage assets through development within their settings through detailed design.

## 15.10 Limitation or Difficulties of Additional Assessment

15.10.1 During the archaeological trial trenching and geoarchaeological assessment, a total of 50 trenches were proposed, of which four were unable to be excavated due to poor ground conditions. In addition, several trenches were realigned/ moved due to modern land drains.

## 15.11 Summary of Updated Likely Significant Residual Effects

15.11.1 As a result of the Additional Information, the assessment of effects on below ground archaeological remains has changed, resulting in no new or additional significant adverse effects. Therefore, there are no likely significant residual effects.

15.11.2 There are no changes to the conclusions of the assessment of likely significant residual effects on built heritage, as presented in **Chapter 15**: Cultural Heritage of ES Volume I (Application Document Ref. 6.2.15) [**APP-058**].

## 15.12 References

Department for Business, Energy and Industrial Strategy (BEIS) (2021). Draft revised National Policy Statements.

Her Majesty's Government. (2021) The Environment Act 2021.

Institute of Environmental Management and Assessment (IEMA) (2021) *Principles of Cultural Heritage Impact Assessment. Institute of Environmental Management and Assessment.*

*York Archaeology (2022) Final Report on Archaeological Investigation and Recording. Report forthcoming.*

# CONTENTS



# TABLES

# 19.0 CUMULATIVE AND COMBINED EFFECTS

## 19.1 Introduction

19.1.1 This chapter provides an addendum to the Cumulative and Combined Effects assessment submitted with the DCO Environmental Statement (ES) and should be read in conjunction with the **Chapter 19:** Cumulative and Combined Effects of the Environmental Statement (ES) Volume I (Application Document Ref. 6.2.19) [**APP-062**] submitted with the Development Consent Order (DCO) application. The scope and methodology applied within this assessment is consistent with that presented within **Chapter 19** ES Volume I (Application Document Ref. 6.2.19) [**APP-062**].

19.1.2 The chapter firstly presents an updated cumulative effects assessment as a result of a review of any new planning or other development consent applications for relevant proposed projects since submission of the submitted **Chapter 19** ES Volume I (Application Document Ref 6.2) [**APP-062**]. It then presents an update to the cumulative and combined effects assessment as a result of the Proposed Development Changes to Keadby 3 Carbon Capture Power Station; such changes are detailed in **Chapter 4**: The Proposed Development (ES Addendum – **Application Document Ref. 6.2.4 – Rev 03)**.

19.1.3 A review of the Proposed Development Changes has been undertaken by Environmental Impact Assessment (EIA) specialists across all technical assessments presented in Volume I of the ES Addendum. The subsequent sections of this chapter provide an update to the cumulative and combined effects, from these updated assessments and any new planning or other development consent applications, as relevant.

19.1.4 Cumulative and combined effects are defined as follows:

- **Cumulative effects**: these occur when the environmental impacts and effects of the Proposed Development interact with those associated with other planned projects and developments located within a realistic geographical scope where environmental impacts could act together to result in a greater significance of effect on environmental resources and/or receptors; and
- **Combined effects**: these are effects resulting from a single development i.e., of the Proposed Development on any one receptor that may collectively cause and effect /effects of greater significance, on environmental resources and/or receptors.

19.1.5 A summary of the Proposed Development Changes is presented within **Volume 1** of this ES Addendum **(Document Ref 6.2.1 – Rev 03)**.

19.1.6 The following sections detail how new planning and other development consent applications submitted and the Proposed Design Changes have been considered within each part of the cumulative and combined effects assessment and where they have introduced the potential for new or different likely significant effects from those described within **Chapter 19:** Cumulative and Combined Effects (Document Ref 6.2.19) [**APP-062**].

## 19.2 Changes in Legislation, Planning Policy and Guidance

19.2.1 There have been no changes to legislation, planning policy or other guidance that are considered relevant to this chapter since the submitted ES.

## 19.3 Assessment methodology

Assessment of Combined Effects

19.3.1 No changes have been made to the methodology used in the submitted ES.

Assessment of Cumulative effects

19.3.2 No changes have been made to the methodology used in the submitted ES.

Study Area

19.3.3 Minor changes to the study areas for some topics have been made to those used within the submitted ES to take into account the extent of the updated Order Limits. However, the zones of influence (ZOI) used within the submitted ES for relevant technical disciplines have been unchanged. It was analysed whether the ZOI for air quality and visual effects would need to be altered due to the proposed changes to the twin absorbers however it was assessed that this was not required.

Consultation

19.3.4 Consultation on the Proposed Development Changes has been undertaken as described in Section 5 of ES Addendum Volume I (**Application Document Ref. 6.2.1-6.2.7 – Rev 03**). No additional comments from stakeholders regarding cumulative and combined effects have been received.

## 19.4 Additional 'Other Developments' Cumulative Effects Assessment

19.4.1 In this section, the staged methodology advocated in the PINS Advice Note Seventeen (PINS, 2019a) has been applied as the basis of the approach for considering updates to the list of developments presented in the submitted ES **Chapter 19** (Application Document Ref 6.2.19) [**APP-062**].

19.4.2 Since submission of ES **Chapter 19** (Document Ref 6.2) [**APP-062**], a screening exercise (Stage 1 of the cumulative effects assessment (CEA)) was

revisited to identify any further potential major and other developments and plans within a 15km radius of the Proposed Development Site to create an updated 'initial long list' for consideration within the CEA.

19.4.3 Searches included applications within both the terrestrial and marine environment (applying a 15km study area downstream and upstream). Available information on the new additional schemes identified in the terrestrial environment was obtained; details on these are provided in Table 19-1. The 'Explore marine plans' marine services government website was consulted on 30/03/2022 to search for new marine licensable activities, however no relevant activities were noted that required consideration.

**Table 19-1: Identification of additional 'Other Development' for the CEA (Stage 1 updated final long list)**

| Additional 'Other development' details | | | | | | Stage 1 (long list) | |
|---|---|---|---|---|---|---|---|
| **ID** | **Application reference** | **Applicant for 'other development' and a brief description** | **Distance from the Proposed PCC Site (measured from red line boundary to red line boundary)** | **Status (updated 29.03.22)** | **Tier** | **Within ZOI** | **Progress to Stage 2?** |
| 24 | Solar Farm PA/SCR/2021/7 | Sirius Planning.<br>Planning permission for a proposed 49.9MW Solar Photovoltaic (PV) Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure (ancillary equipment includes mounting frames, inverters and transformers, embedded substations, deer fencing, set down area, internal service roads and site access). | 0.7km west | North Lincolnshire Council planning application.<br>EIA Screening Opinion decision undetermined. | Tier 3 | Falls within ZOI for majority of topics scoped into ES. | Yes |

| Additional 'Other development' details | | | | | | Stage 1 (long list) | |
|---|---|---|---|---|---|---|---|
| **ID** | **Application reference** | **Applicant for 'other development' and a brief description** | **Distance from the Proposed PCC Site (measured from red line boundary to red line boundary)** | **Status (updated 29.03.22)** | **Tier** | **Within ZOI** | **Progress to Stage 2?** |
| 25 | Solar Farm PA/SCR/2021/8 | Kingdom Energy and Sirius Planning. **Planning permission for a proposed 49.9MW Solar PV Farm on c.76 hectares of agricultural land** north of Chapel Lane with associated infrastructure (ancillary equipment includes mounting frames, inverters and transformers, embedded substations, deer fencing, set down area, internal service roads and site access). | 0.15km north | North Lincolnshire Council planning application. EIA Screening Opinion decision undetermined. | Tier 3 | **Falls within ZOI for majority of topics scoped into ES.** | Yes |

| Additional 'Other development' details | | | | | | Stage 1 (long list) | |
|---|---|---|---|---|---|---|---|
| **ID** | **Application reference** | **Applicant for 'other development' and a brief description** | **Distance from the Proposed PCC Site (measured from red line boundary to red line boundary)** | **Status (updated 29.03.22)** | **Tier** | **Within ZOI** | **Progress to Stage 2?** |
| 26 | Modular Visitor Centre Road PA/2022/276 | Siemens Energy Limited.<br>Planning permission for a temporary (up to ten years) modular visitor centre building. | 0.9 km south-east | Application undetermined. | Tier 3 | Falls within ZoI for all topics scoped into ES. | No. Scale (0.1ha) and temporary nature of development within existing overflow carpark. |

| Additional 'Other development' details | | | | | | Stage 1 (long list) | |
|---|---|---|---|---|---|---|---|
| **ID** | **Application reference** | **Applicant for 'other development' and a brief description** | **Distance from the Proposed PCC Site (measured from red line boundary to red line boundary)** | **Status (updated 29.03.22)** | **Tier** | **Within ZOI** | **Progress to Stage 2?** |
| 27 | Road services PA/2022/116 | Sumner SSAS.<br>Planning permission for roadside services including PFS and Electric Forecourt and ancillary retail, food and drink with access from highway to the west. | 3.6km south-west | Application undetermined. | Tier 3 | Falls within ZoI for some of topics scoped into ES. | No. The scale of development and distance from Proposed Development Site, no cumulative impacts anticipated. |

| Additional 'Other development' details | | | | | | Stage 1 (long list) | |
|---|---|---|---|---|---|---|---|
| **ID** | **Application reference** | **Applicant for 'other development' and a brief description** | **Distance from the Proposed PCC Site (measured from red line boundary to red line boundary)** | **Status (updated 29.03.22)** | **Tier** | **Within ZOI** | **Progress to Stage 2?** |
| 28 | 28 residential dwellings | Mr. Webster (WFW Developments Ltd.)<br>Planning permission to erect 28 residential dwellings with associated access. | 1.8km south-east | North Lincolnshire Council planning application. Undetermined. | Tier 3 | Falls within ZOI for some of topics scoped into ES. | No. The scale of development and distance from Proposed Development Site, no cumulative impacts anticipated. |

| Additional 'Other development' details | | | | | | Stage 1 (long list) | |
|---|---|---|---|---|---|---|---|
| **ID** | **Application reference** | **Applicant for 'other development' and a brief description** | **Distance from the Proposed PCC Site (measured from red line boundary to red line boundary)** | **Status (updated 29.03.22)** | **Tier** | **Within ZOI** | **Progress to Stage 2?** |
| 29 | Industrial warehouse building PA/2020/1510. New internal access road and drainage basin PA/2022/83 (addendum to PA/2020/1510) | Groveport Logistics Ltd. Planning permission to erect an industrial warehouse building for Class B8 Use and addendum to this application for planning permission to create a new internal access road and drainage basin. | 2.8km north-east | North Lincolnshire Council planning application. Industrial warehouse building approved 11/03/2021. Addendum to application is undetermined. | Tier 3 | Falls within ZOI for some of topics scoped into ES. | No. No significant effects anticipated. |

## Stage 2: Identify Short List of 'Other Development' for the CEA

19.4.4 Following Stage 1, PINS Advice Note Seventeen (PINS, 2019a) advises that the Applicant should identify, from the long list, a short list of other developments for assessment.

19.4.5 The Stage 1 long list in Table 19-2 showing the additional developments identified since ES **Chapter 19** [**APP-062**] submission has therefore been re-screened based on the ZoI for each of the technical disciplines considered within this ES.

19.4.6 In addition to the ZoI threshold criteria, the geographical and temporal scope of the 'other development' has been considered in relation to the geographical and temporal scope of the Proposed Development (incorporating its Proposed Development Changes), and professional judgement applied to identify the short list of development to be considered further for the CEA (Stage 3 and 4). Information on the 'other developments' within the short list is detailed in Table 19-2.

**Table 19-2: Identification of Additional 'Other Development' for the CEA (Stage 2 short list)**

| ID | Name | Screening for detailed CEA | | | |
|---|---|---|---|---|---|
| | | Overlap in temporal scope? | Scale and nature of development likely to have a significant effect? | Other factors | Progress to Stage 3/4? |
| 24 | Solar farm<br>PA/SCR/2021/7 | Possible – application for planning permission not yet submitted as pending EIA screening opinion request. Potential for overlap in construction periods. | Likely as solar farm located approximately 0.7km from the Proposed Development Site. The development is located beyond the ZOI of most environmental topics, with the exception of Landscape and Visual Amenity and Biodiversity and Nature Conservation in relation to potential air quality effects on statutory designated ecological sites (i.e. within 15km). Although anticipated to be a large-scale development, planning permission has not yet been sought, or granted. | n/a | Yes |

| ID | Name | Screening for detailed CEA | | | |
|---|---|---|---|---|---|
| | | **Overlap in temporal scope?** | **Scale and nature of development likely to have a significant effect?** | **Other factors** | **Progress to Stage 3/4?** |
| 25 | Solar farm PA/SCR/2021/8 | Possible – application for planning permission not yet submitted or determined. Potential for overlap in construction periods. | Likely due to distance from the Proposed Development Site (0.2km). The development is located within the ZOI of most environmental topics. Although anticipated to be a large-scale development, planning permission has not yet been sought or granted. | n/a | Yes |

19.4.7 On the basis of the above short list, both of the developments identified in Table 19-2 are considered to have the potential to generate significant cumulative effects when considered alongside the Proposed Development (with Proposed Development Changes), by virtue of their nature, proximity to the Proposed Development Site and/ or temporal scope (i.e. the planned timescales for construction and operation):

- ID24 – Solar Farm PA/SCR/2021/7
- ID25 - Solar Farm PA/SCR/2021/8

19.4.8 The locations of the shortlisted developments in relation to the Proposed Development are shown on **Figure 19.2** (ES Addendum Volume III – **Application Document Ref. 6.4.60 – Rev 03**).

19.4.9 These developments have therefore been progressed to Stage 3 and 4 of the CEA and have been assessed in relation to each environmental topic included in the submitted ES (ES Volume I – Application Document Ref. 6.2.19) [**APP-062**], providing that the developments lie within the topic's ZoI, with the exception of Climate Change and Sustainability and Major Accidents and Disasters. The decision to exclude these environmental topics is explained in the submitted ES (ES Volume I – Application Document Ref. 6.2.19) [**APP-062**], noting that the Proposed Development Changes do not affect this decision.

Stage 3: Information Gathering

19.4.10 Following an initial information search on the additional shortlisted developments at Stage 2, a search for more detailed information on such developments was conducted. In line with PINS Advice Note Seventeen (PINS, 2019a), this included searching for and noting the following information, where available:

- development design and location information;
- construction, operation and decommissioning information; and
- any accompanying environmental assessment information detailing baseline data and effects arising from other development.

19.4.11 As discussed in Section 19.4, the information gathered at this stage was wholly using information from the public domain (North Lincolnshire Council website).

19.4.12 Information available for each of the schemes carried forward for CEA is described below:

- ID24 Solar farm (PA/SCR/2021/7) and ID25 Solar farm (PA/SCR/2021/8):
  - As both of these proposals are at very early stages in their development, limited information is available. Their assessments have

been based on the information available on North Lincolnshire Council planning applications portal website (screening opinion requests, site location drawings and traffic and transport technical notes have been uploaded for both developments) and from knowledge of similar schemes.

## Cumulative Effects Assessment (Stage 4)

19.4.13 This section presents the results from the detailed CEA conducted for the two additional developments scoped into the CEA (both Tier 3 developments). Section 19.6 considers in turn each 'scoped in' environmental discipline and assesses whether effects associated with each shortlisted development would be able to interact with the effects associated with the Proposed Development (incorporating its Proposed Development Changes) in a manner that has the ability to generate potentially significant cumulative effects.

**Table 19-3: Cumulative Effects Assessment**

Air Quality

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Air Quality** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | This scheme is located approximately 0.7km from the Proposed Development Site. It is at an early stage (EIA screening request received).<br>The screening request notes that the 'anticipated construction programme is expected to take 8 months to complete' whilst the traffic and transport technical notes suggests this may be up to 12 months. The documents submitted do not provide a | Other than the mitigation measures already proposed (refer to **Chapter 8**: Air Quality (ES Volume I – Application Document Ref. 6.2.8) and **Chapter 8**: Air Quality (ES Addendum – **Application Document Ref. 6.2.8 – Rev 03**), no further mitigation measures to reduce potential cumulative air quality effects are required within this Application. It will be for the solar farm | No significant residual effects are anticipated, as reported in **Chapter 8**: Air Quality (ES Volume I – Application Document Ref. 6.2.8) and **Chapter 8**: Air Quality (ES Addendum– **Application Document Ref. 6.2.8 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development.<br>The EIA screening request notes that 'construction and operational phases do not include any complex or hazardous works or operations' which 'will not lead to any potential adverse environmental effects', therefore reducing this risk of cumulative air quality effects.<br>Operationally, the screening request suggests the solar farm will 'produce zero emissions when in | development to consider the need for additional construction phase mitigation should that be required, but given the likely works involved in the construction of the solar farm, no significant air quality effects are envisaged. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | operation' therefore there is no reasonable likelihood of cumulative air quality effects with the Proposed Development during its operational stage.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative air quality effects of the projects will be considered in the cumulative assessment for the solar farm. | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 hectares of agricultural land north of Chapel Lane with associated infrastructure. | This scheme is located 0.2km north of the Proposed Development Site. It is at an early stage (EIA screening request received). The screening request notes that the 'anticipated construction programme is expected to take 8 months to complete' whilst the traffic and transport technical notes suggests this may be up to 12 months. The documents submitted do not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap | Other than the mitigation measures already proposed (refer to **Chapter 8**: Air Quality (ES Volume I – Application Document Ref. 6.2.8) and **Chapter 8**: Air Quality (ES Addendum – **Application Document Ref. 6.2.8 – Rev 03**), no further mitigation measures to reduce potential cumulative air quality effects are required within this Application. It will be for the solar farm development to consider the need for additional construction phase mitigation should that be required but given the likely works involved in | No significant residual effects are anticipated, as reported in **Chapter 8**: Air Quality (ES Volume I – **Application Document Ref. 6.2.8**) and **Chapter 8**: Air Quality (ES Addendum – **Application Document Ref. 6.2.8 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | with the construction of the Proposed Development.<br>The EIA screening request notes that 'construction and operational phases do not include any complex or hazardous works or operations' which 'will not lead to any potential adverse environmental effects', therefore reducing this risk of cumulative air quality effects.<br>Operationally, the screening request suggests the solar farm will 'produce zero emissions when in operation' therefore there is no reasonable likelihood of cumulative air quality effects with the Proposed | the construction of the solar farm, no significant air quality effects are envisaged. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Development during its operational stage.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative air quality effects of the projects will be considered in the cumulative assessment for the solar farm. | | |

Noise and Vibration

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Noise and Vibration** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development; however, applying a precautionary approach, if an overlap of construction phases were to occur, it would have the potential for significant noise and vibration cumulative effects at local noise sensitive receptors (NSR) which are common to both the | Considering the information available on the potential construction of the solar farm and the residual noise and vibration effects at NSR8 presented in **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9), including **Chapter 9** of this ES Addendum (**Application Document Ref. 6.2.9 – Rev 03**), (up to minor adverse (not significant) on the basis that mitigation is employed such that the | No significant residual effects are anticipated, as reported in **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9) and **Chapter 9**: Noise and Vibration (ES Addendum – **Application Document Ref. 6.2.9 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | scheme and the Proposed Development, in particular, NSR8 – North Pilfrey Farm.<br>It is noted that a noise assessment is proposed to accompany the planning application for the solar farm, and it is further noted that NLC Environmental Protection has recommended that<br>A) A Construction Environmental Management Plan be produced to control environmental effects including noise; and<br>B) construction and site clearance operations shall be limited to the | BS 5228 ABC noise limits are met, and the Section 9.5 mitigation guidance is followed),<br>Other than the mitigation measures already proposed that are applicable to NSR8 – North Pilfrey Farm (refer to **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9) and **Chapter 9**: Noise and Vibration (ES Addendum – **Application Document Ref. 6.2.9 – Rev 03**), no further mitigation measures to reduce potential cumulative noise and vibration | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | following days and hours:<br>• 08:00 to 18:00hrs Monday to Friday.<br>• 08:00 to 13:00hrs Saturday.<br>• No construction, demolition or site clearance operations on Sundays or public holidays.<br>The EIA screening request suggests that 'construction and operational phases do not include any complex or hazardous works or operations' which 'will not lead to any potential adverse environmental effects'. This reduces the risk of cumulative noise and | effects are required within this Application.<br>It will be for the solar farm development to consider the need for additional mitigation should that be required, in particular for NSR8 – North Pilfrey Farm. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | vibration effects with the Proposed Development.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative noise and vibration effects of the projects will be considered in the cumulative assessment for the solar farm. | | |
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 | The documents submitted do not provide a start date for construction, meaning it | Considering the information available on the potential construction | No significant residual effects are anticipated, as |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | hectares of agricultural land north of Chapel Lane with associated infrastructure. | is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development, however, applying a precautionary approach, if an overlap of construction phases were to occur, it would have the potential for significant noise and vibration cumulative effects at local NSR which are common to both the scheme and the Proposed Development; in particular, NSR10 – North Moor Farm. It is noted that a noise assessment is proposed to accompany the planning application for the solar farm, and it is further noted | of the solar farm and the residual noise and vibration effects at NSR10 presented in **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9), including **Chapter 9** of this ES Addendum (**Application Document Ref. 6.2.9 – Rev 03**), (up to minor adverse (not significant) on the basis that mitigation is employed such that the BS 5228 ABC noise limits are met, and the Section 9.5 mitigation guidance is followed), Other than the mitigation measures already | reported in **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9) and **Chapter 9**: Noise and Vibration (ES Addendum – **Application Document Ref. 6.2.9 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | that NLC Environmental Protection has recommended that<br>C) A Construction Environmental Management Plan be produced to control environmental effects including noise; and<br>D) construction and site clearance operations shall be limited to the following days and hours:<br>• 08:00 to 18:00hrs Monday to Friday.<br>• 08:00 to 13:00hrs Saturday.<br>• No construction, demolition or site clearance operations | proposed that are applicable to NSR10 – North Moor Farm (refer to **Chapter 9**: Noise and Vibration (ES Volume I – Application Document Ref. 6.2.9) and **Chapter 9**: Noise and Vibration (ES Addendum – **Application Document Ref. 6.2.9 – Rev 03**), no further mitigation measures to reduce potential cumulative noise and vibration effects are required within this Application.<br>It will be for the solar farm development to consider the need for additional mitigation should that be required in | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | on Sundays or public holidays.<br>The EIA screening request suggests that 'construction and operational phases do not include any complex or hazardous works or operations' which 'will not lead to any potential adverse environmental effects'. This reduces the risk of cumulative noise and vibration effects with the Proposed Development.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this | particular for NSR10 – North Moor Farm. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | application considers the Proposed Development. Consequently, the cumulative noise and vibration effects of the projects will be considered in the cumulative assessment for the solar farm. | | |

Traffic and Transportation

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Traffic and Transportation** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | Although the EIA screening request notes that 'construction and operational phases do not include any complex or hazardous works or operations' which 'will not lead to any potential adverse environmental effects', the request anticipates that 'operational and construction access would be to the east of the site', which is in closer proximity to the Proposed Development | Other than the mitigation measures already proposed (refer to **Chapter 10**: Traffic and Transportation (ES Volume I – Application Document Ref. 6.2.10) and **Chapter 10:** Traffic and Transportation (ES Addendum – **Application Document Ref. 6.2.10 – Rev 03**), no further mitigation measures to reduce potential cumulative traffic and transport effects are required within this | No significant residual effects are anticipated, as reported in **Chapter 10**: Traffic and Transport (ES Volume I – Application Document Ref. 6.2.10) and **Chapter 10**: Traffic and Transport (ES Addendum – **Application Document Ref. 6.2.10 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | than the west of the site. There is therefore potential for traffic and transport cumulative effects with the Proposed Development as a result of vehicles moving to and from the solar farm site during construction and operation. This cannot however be confirmed as the screening request does not clarify anticipated dates for construction and operation of this scheme.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO | Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | application. It is therefore a requirement that this application considers the Proposed Development, and, in this respect, it is noted that NLC has requested that if a planning application is to be submitted, they would expect it to be accompanied by a Transport Statement, which includes a draft Construction Phase Traffic Management Plan and to be engaged with regarding routing, prior to submission of the application. Consequently, the cumulative traffic and | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | transport effects of the projects will be considered in the cumulative transport assessment for the solar farm. | | |
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 hectares of agricultural land north of Chapel Lane with associated infrastructure. | The documents submitted including Traffic and Transport Note anticipates that 'operational and construction access would be shared with North Moor Farm, which connects with the B1392'. The construction and operation of the Proposed Development does not intend to use this road as an access | Other than the mitigation measures already proposed (refer to **Chapter 10**: Traffic and Transportation (ES Volume I – Application Document Ref. 6.2.10) and **Chapter 10**: Traffic and Transportation (ES Addendum – **Application Document Ref. 6.2.10 – Rev 03**), no further mitigation measures to reduce potential | No significant residual effects are anticipated, as reported in **Chapter 10**: Traffic and Transport (ES Volume I – Application Document Ref. 6.2.10) and **Chapter 10**: Traffic and Transport (ES Addendum – **Application Document Ref. 6.2.10 – Rev 03**). No |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | route, therefore reducing the risk of cumulative traffic and transport effects here. The screening request also suggests 'construction and operational phases do not include any complex or hazardous works or operations' which 'will not lead to any potential adverse environmental effects', therefore further reducing the risk of cumulative transport and traffic effects. This cannot however be confirmed as construction details for the solar farm development are not | cumulative traffic and transport effects are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | confirmed given that it is at EIA screening request stage.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development, and, in this respect, it is noted that NLC has requested that if a planning application is to be submitted, they would expect it to be accompanied by a Transport Statement, which includes a draft | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | Construction Phase Traffic Management Plan. Consequently, the cumulative traffic and transport effects of the projects will be considered in the cumulative assessment for the solar farm. | | |

Biodiversity and Nature Conservation

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Biodiversity and Nature Conservation** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development; such overlap would have potentially significant cumulative effects on biodiversity and nature conservation.<br>The Proposed Development Site has been chosen to minimise the potential for impacts and effects on notable habitats and species, therefore it is unlikely there will be any | Other than the mitigation measures already proposed (refer to **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – Application Document Ref. 6.2.11) and **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum – **Application Document Ref. 6.2.11 – Rev 03**), no further mitigation measures to reduce potential cumulative biodiversity | No significant residual effects are anticipated, as reported in **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – Application Document Ref. 6.2.11) and **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum – **Application Document Ref. 6.2.11 – Rev 03**).<br>No cumulative effects are |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | significant cumulative effects on habitats and species due to the Proposed Development alongside this proposed solar farm.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative effects on biodiversity and nature conservation of the projects will be considered in the cumulative assessment for the solar farm. In this respect, it is noted that NLC Ecology Officer considers that an EIA is likely to be required from (a | and nature conservation effects are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. The EIA screening opinion request notes that a 'comprehensive scheme of mitigation' including 'landscaping and biodiversity enhancements' will be applied. | anticipated, though more information on the design of the solar farm development is required to confirm this. However, the absence of likely pathways for a cumulative environmental effect (e.g., noise or air quality, see above) makes it unlikely that there would pathways for a cumulative biodiversity effect. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | landscape and) an ecological perspective in view of the potential for significant effects related to the Humber Estuary SPA and Ramsar site and the potential displacement of passage and wintering waterbirds from "functionally linked land". It is also noted by the Ecology Officer that the proposal and EIA screening should be considered cumulatively with PA/SCR/2021/8. Natural England similarly considers, on the basis of the material supplied, that there are potential likely significant effects on statutorily designated nature conservation sites and further assessment is required. | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 hectares of agricultural land north of Chapel Lane with associated infrastructure. | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development; such overlap would have potentially significant cumulative effects on biodiversity and nature conservation.<br>Keadby Warping Drain lies roughly 0.26km north of the Proposed Development Site (south of the proposed solar farm). This means there is potential for cumulative effects on these LWS as a result of the two developments. | **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – Application Document Ref. 6.2.11) and **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum – **Application Document Ref. 6.2.11 – Rev 03**), no further mitigation measures to reduce potential cumulative biodiversity and nature conservation effects are required within this Application. It will be for the solar farm development to consider the need for | No significant residual effects are anticipated, as reported in **Chapter 11**: Biodiversity and Nature Conservation (ES Volume I – Application Document Ref. 6.2.11) and **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum – **Application Document Ref. 6.2.11 – Rev 03**).<br>No cumulative effects are anticipated, though more information on the design of the |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | The Proposed Development has considered LWS and the site has been chosen to minimise the potential for impacts and effects on notable habitats and species. It is therefore unlikely there will be significant cumulative effects on particular habitats and species due to the Proposed Development alongside this proposed solar farm.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative effects on biodiversity and | additional mitigation should that be required. The EIA screening opinion request notes that a 'comprehensive scheme of mitigation' including 'landscaping and biodiversity enhancements' will be applied. | solar farm development is required to confirm this. However, the absence of likely pathways for a cumulative environmental effect (e.g., noise or air quality, see above) makes it unlikely that there would pathways for a cumulative biodiversity effect. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | nature conservation of the projects will be considered in the cumulative assessment for the solar farm. In this respect, it is noted that NLC Ecology Officer considers that an EIA is likely to be required from (a landscape and) an ecological perspective in view of the potential for significant effects related to the Humber Estuary SPA and Ramsar site and the potential displacement of passage and wintering waterbirds from "functionally linked land". It is also noted by the Ecology Officer that the proposal and EIA screening should be considered cumulatively with PA/SCR/2021/7. Natural England similarly considers, on | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | the basis of the material supplied, that there are potential likely significant effects on statutorily designated nature conservation sites and further assessment is required. | | |

Water Environment and Flood Risk

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Water Environment and Flood Risk** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development; such overlap would have potentially significant cumulative effects on water environment and flood risk.<br>The Proposed Development Site has been chosen to minimise | Other than the mitigation measures already proposed (refer to **Chapter 12**: Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) and **Chapter 12:** Water Environment and Flood Risk (ES Addendum – **Application Document Ref. 6.2.12 – Rev 03**), no further mitigation measures to reduce potential cumulative water and flood risk effects are | No significant residual effects are anticipated, as reported in **Chapter 12**: Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) and **Chapter 12**: Water Environment and Flood Risk (ES Addendum – **Application Document ref. 6.2.12 – Rev 03**). No cumulative effects are anticipated, though more information on the design of the solar |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | the potential for impacts and effects on the water environment and flood risk of the area, therefore it is unlikely there will be any significant cumulative effects on water environment and flood risk due to the Proposed Development alongside this proposed solar farm. It is also suggested by NLC that an EIA for this solar farm, on the grounds on Pluvial flood risk and/or SuDS, is not warranted, suggesting the likelihood of the solar farm having significant effects on | required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | farm development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | water environment and flood risk is likely low.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. In this respect, NLC have requested that if a planning application is to be submitted, it should be accompanied by a Flood Risk Assessment and a Drainage Strategy, which should focus on the higher flood risk areas and avoid locating | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | infrastructure at these locations unless mitigation is in place. Consequently, the cumulative water environment and flood risk effects of the solar farm in conjunction with the Proposed Development will be considered in these assessments. | | |
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 hectares of agricultural land north of Chapel Lane with | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the | Other than the mitigation measures already proposed (refer to **Chapter 12**: Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) and **Chapter** | No significant residual effects are anticipated, as reported in **Chapter 12**: Water Environment and Flood Risk (ES Volume I – Application Document Ref. 6.2.12) and **Chapter 12**: Water |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | associated infrastructure. | Proposed Development; such overlap would have potentially significant cumulative effects on water environment and flood risk.<br>The Proposed Development Site has been chosen to minimise the potential for impacts and effects on the water environment and flood risk of the area, therefore it is unlikely there will be any significant cumulative effects on water environment and flood risk due to the Proposed Development alongside this proposed solar farm. It is also | **12**: Water Environment and Flood Risk (ES Addendum – **Application Document Ref. 6.2.12 – Rev 02**), no further mitigation measures to reduce potential cumulative water and flood risk effects are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | Environment and Flood Risk (ES Addendum – **Application Document Ref. 6.2.12 – Rev 02**). No cumulative effects are anticipated, though more information on the design of the solar farm development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | suggested by NLC that an EIA for this solar farm, on the grounds on Pluvial flood risk and/or SuDS, is not warranted, suggesting the likelihood of the solar farm having significant effects on water environment and flood risk is likely low.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. In this respect, NLC have requested that if a | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
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| | | | | planning application is to be submitted, it should be accompanied by a Flood Risk Assessment and a Drainage Strategy, which should focus on the higher flood risk areas and avoid locating infrastructure at these locations unless mitigation is in place.<br>Consequently, the cumulative water environment and flood risk effects of the projects will be considered in the cumulative assessment for the solar farm. | | |

Geology, Hydrogeology and Land Contamination

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Geology, Hydrogeology and Land Contamination** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development; such overlap would have potentially significant cumulative effects on geology, hydrogeology and land contamination. The Proposed Development Site has been chosen to minimise | Other than the mitigation measures already proposed (refer to **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2.13) and **Chapter 13:** Geology, Hydrogeology and Land Contamination (ES Addendum – **Application Document Ref. 6.2.13 – Rev 03**), no further mitigation measures to reduce potential cumulative | No significant residual effects are anticipated, as reported in **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2.13) and **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Addendum – **Application Document Ref. 6.2.13 – Rev 03**). No cumulative effects are anticipated, though |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | the potential for impacts and effects on the geology, hydrogeology and land contamination in the area, therefore it is unlikely there will be any significant cumulative effects on geology, hydrogeology and land contamination due to the Proposed Development alongside this proposed solar farm.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application | effects on geology, hydrogeology and land contamination are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | more information on the design of the solar farm development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | considers the Proposed Development. In this respect, NLC have requested that a Phase 1 land contamination assessment should be submitted as a minimum when considering potentially significant effects of the solar farm Consequently, the cumulative effects of the solar farm in conjunction with the Proposed Development upon geology, hydrogeology and land contamination will be considered in these assessments. | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 hectares of agricultural land north of Chapel Lane with associated infrastructure. | The screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development; such overlap would have potentially significant cumulative effects on geology, hydrogeology and land contamination in the area.<br>The EIA screening request suggests that 'construction and operational phases do | Other than the mitigation measures already proposed (refer to **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2.13) and **Chapter 13:** Geology, Hydrogeology and Land Contamination (ES Addendum – **Application Document Ref. 6.2.13 – Rev 03**), no further mitigation measures to reduce potential cumulative effects on geology, hydrogeology and land contamination are required within this | No significant residual effects are anticipated, as reported in **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2.13) and **Chapter 13**: Geology, Hydrogeology and Land Contamination (ES Addendum – **Application Document Ref. 6.2.13 – Rev 03**). No cumulative effects are anticipated, though more information on the design of the solar farm |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | not include any complex or hazardous works or Operations' which 'will not lead to any potential adverse environmental effects'. This reduces the risk of cumulative effects on geology, hydrogeology and land contamination with the Proposed Development.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed | Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Development. In this respect, NLC have requested that a Phase 1 land contamination assessment should be submitted as a minimum when considering potentially significant effects of the solar farm Consequently, the cumulative effects on geology, hydrogeology and land contamination of the projects will be considered in the cumulative assessment for the solar farm. | | |

Landscape and Visual Amenity

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Landscape and Visual Amenity** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar Photovoltaic (PV) Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | Given the proximity of this solar farm to the Proposed Development Site cumulative landscape and visual effects are likely<br>The potential for cumulative effects is most likely to be felt at landscape and visual receptors towards the west of the Proposed Development Site, such as viewpoints 7 and 12 as described in Figure 14.5 of ES **Chapter 14:** Landscape and Visual | Other than the mitigation measures already proposed (refer to **Chapter 14:** Landscape and Visual Amenity (ES Volume I – Application Document Ref. 6.2.14) and **Chapter 14:** Landscape and Visual Amenity (ES Addendum **– Application Document Ref. 6.2.14 – Rev 03**), no further mitigation measures to reduce potential cumulative landscape and visual effects are | It is likely that significant cumulative effects on landscape and visual receptors including PRoW and residential receptors to the north of the Proposed Development Site will be felt as a result of the two solar farm developments themselves, though more information on the design of the solar farm development is required to confirm this. However, no significant |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Amenity. NLC Place Planning & Housing officer notes that the solar farm would be 'highly visible' from PRoW, including the Stainforth-Keadby Canal walking and cycle track. The Public Rights of Way Officer also notes that Public Bridleway 11 passes through the solar farm meaning views from there will likely be altered. Given that the site is surrounded by relatively flat land, it is also anticipated that the Proposed Development (stated in the ES) alongside the solar farm | required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required, in particular, to mitigate the potential cumulative landscape and visual impact at viewpoints 7 and 12 and PRoW Stainforth-Keadby Canal walking and cycle track and Public Bridleway 11. | cumulative effects with the Proposed Development are expected. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | will impact the general character of the surrounding landscape. Natural England also note that an EIA is likely to be required for the solar farm from a landscape perspective given that it may have 'environmental impacts' on the 'local landscape character'.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Development. In this respect, NLC suggest that if a planning application is to be submitted, landscape and visual impacts and strategy need to be considered in terms of the Landscape Assessment and Guidelines and the Countryside Design Summary, Core Strategy Spatial Objective 10, policies CS5 and CS16, Saved Local Plan Policies LC7 and RD2 and Adopted Landscape Assessment and Guidelines document (SPG5). Consequently, | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | cumulative landscape and visual amenity effects will be considered in these assessments for the proposed solar farm. | | |
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar Photovoltaic (PV) Farm on c.76 hectares of agricultural land north of Chapel Lane with associated infrastructure. | Given the proximity of this solar farm to the Proposed Development Site cumulative landscape and visual effects are likely during both construction and operation.<br>The potential for cumulative effects is most likely to be felt at landscape and visual receptors towards the north of the Proposed Development Site, such | Other than the mitigation measures already proposed (refer to **Chapter 14:** Landscape and Visual Amenity (ES Volume I – Application Document Ref. 6.2.14) and **Chapter 14:** Landscape and Visual Amenity (ES Addendum – **Application Document Ref. 6.2.14 – Rev 03**), no further mitigation measures to reduce potential cumulative landscape | There is potential for significant cumulative landscape and visual effects on residential and PRoW receptors as a result of the solar farm and Proposed Development (incorporating design changes), though more information on the design of the solar farm development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | as viewpoints 1, 4, 5, 7 and 10 as described in Figure 14,5 of ES **Chapter 14**: Landscape and Visual Amenity. NLC Place Planning & Housing officer notes that the solar farm would be 'highly visible' from some PRoW. The Public Rights of Way Officer also notes that Public Footpath 9 and Public Bridleway 10, which are both 'strategically important' to the path network in North Lincolnshire, pass through the middle of the site meaning views from them will likely be | and visual effects are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required, in particular, to mitigate the potential cumulative landscape and visual impact at viewpoints 1, 4, 5, 7 and 10 and PRoW. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | altered. Given that the site is surrounded by relatively flat land, it is also anticipated that the Proposed Development alongside the solar farm will impact the general character of the surrounding landscape. Natural England note that an EIA is likely to be required for the solar farm from a landscape perspective given that it may have 'environmental impacts' on the 'local landscape character'.<br>The planning application for this proposed scheme has not progressed as far as the | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Proposed Development's DCO application. It is therefore a requirement that this application considers the cumulative effects with the Proposed Development. In this respect, NLC suggest that if a planning application is to be submitted, landscape and visual impacts and strategy need to be considered in terms of the Landscape Assessment and Guidelines and the Countryside Design Summary, Core Strategy Spatial Objective 10, policies CS5 and CS16, | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Saved Local Plan Policies LC7 and RD2 and Adopted Landscape Assessment and Guidelines document (SPG5). Consequently, cumulative landscape and visual amenity effects will be considered in these assessments for the proposed solar farm. | | |

Cultural Heritage

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Cultural Heritage** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | NLC note that the solar farm has the 'potential for physical and indirect impacts on heritage assets', they do not think an EIA is warranted on these grounds. There are no buildings (including designated and non-designated assets) on the solar farm site. Although the site falls within the ZOI for the Proposed Development, the Scheduled Monument of interest within this ZOI is Keadby Lock which is | Other than the mitigation measures already proposed (refer to **Chapter 15:** Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) and **Chapter 15**: Cultural Heritage (ES Addendum – **Application Document Ref. 6.2.15 – Rev 03**), no further mitigation measures to reduce potential cumulative effects on cultural heritage are required within this | No significant residual effects are anticipated on below ground assets, as reported in **Chapter 15**: Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) and **Chapter 15**: Cultural Heritage (ES Addendum – **Application Document Ref. 6.2.15 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | 2.5km away from the solar farm site meaning there is unlikely to be any cumulative cultural heritage effects on this designated asset.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. In this respect, it is noted that NLC Historic Environment Record Officer has requested that if a planning application is to be submitted, they | Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | would expect it to be accompanied by a Statement of Heritage Significance, in accordance with NPPF policy 194 and local planning policies, irrespective of whether an EIA is carried out. Consequently, the cumulative effects on cultural heritage of the projects will be considered in the cumulative assessment for the solar farm. | | |
| 25 | 3 | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 | NLC note that the solar farm, has the 'potential for physical and indirect impacts on heritage | Other than the mitigation measures already proposed (refer to **Chapter 15:** Cultural Heritage (ES Volume I – | No significant residual effects are anticipated on below ground assets, as reported in |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | hectares of agricultural land north of Chapel Lane with associated infrastructure. | assets', they do not think an EIA is warranted on these grounds. There are no buildings (including designated and non-designated assets) on the solar farm site. Although the site falls within the ZOI for the Proposed Development, the Scheduled Monument of interest within this ZOI is Keadby Lock which is 1km away from the solar farm site meaning there is unlikely to be any cumulative cultural heritage effects on this designated asset as a result of the two developments. | Application Document Ref. 6.2.15) and **Chapter 15**: Cultural Heritage (ES Addendum – **Application Document Ref. 6.2.15 – Rev 03**), no further mitigation measures to reduce potential cumulative effects on cultural heritage are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | **Chapter 15**: Cultural Heritage (ES Volume I – Application Document Ref. 6.2.15) and **Chapter 15**: Cultural Heritage (ES Addendum – **Application Document Ref. 6.2.15 – Rev 03**). No cumulative effects are anticipated. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. In this respect, it is noted that NLC Historic Environment Record Officer has requested that if a planning application is to be submitted, they would expect it to be accompanied by a Statement of Heritage Significance, in accordance with NPPF policy 194 and local | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | planning policies, irrespective of whether an EIA is carried out. Consequently, the cumulative effects on cultural heritage of the projects will be considered in the cumulative assessment for the solar farm. | | |

Socio-economics

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| **Socio-economics** | | | | | | |
| 24 | 3 | Solar farm PA/SCR/2021/7 | Application is for a 49.9MW Solar PV Farm on c.89 hectares of agricultural land north-west of Scunthorpe with associated infrastructure. | Though the screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development, the solar farm is unlikely to have cumulative socio-economic effects with the Proposed Development. The solar farm's EIA screening request notes 'whilst the | Other than the mitigation measures already proposed (refer to **Chapter 16:** Socio-Economics (ES Volume I – Application Document Ref. 6.2.16), no further mitigation measures to reduce potential cumulative socio-economic effects are required within this Application. It will be for the solar farm development to consider the need for additional | No significant adverse residual effects are anticipated on, as reported in **Chapter 16**: Socio-economics (ES Volume I – Application Document Ref. 6.2.16) and no cumulative effects are anticipated, though more information on the scope of the solar farm development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | site will measure c.89ha, the construction of and the operational nature of a solar farm is unlikely to significantly affect an area of population due to its remote location' and the scheme is 'for a temporary use' meaning 'such agricultural farming practices will be able to continue following the 40-year operational period'. The request also suggests that 'once operational the solar farm will require only limited maintenance, therefore limited or negligible impacts are anticipated'. This reduces the risk of | mitigation should that be required. | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | detracting from any maintenance the Proposed Development may require.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative effects on socio-economics of the projects will be considered in the cumulative assessment for the solar farm. | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| 25 | | Solar farm PA/SCR/2021/8 | Application is for a 49.9MW Solar PV Farm on c.76 hectares of agricultural land north of Chapel Lane with associated infrastructure. | Though the screening request does not provide a start date for construction, meaning it is not possible to determine the likelihood of temporal scope overlap with the construction of the Proposed Development, the solar farm is unlikely to have cumulative socio-economic effects with the Proposed Development the solar farm's EIA screening request notes 'whilst the site will measure c.76ha, the construction of and the operational nature of a solar farm is unlikely to | Other than the mitigation measures already proposed (refer to **Chapter 16:** Socio-Economics (ES Volume I – Application Document Ref. 6.2.16), no further mitigation measures to reduce potential cumulative socio-economic effects are required within this Application. It will be for the solar farm development to consider the need for additional mitigation should that be required. | No significant adverse residual effects are anticipated on, as reported in **Chapter 16**: Socio-economics (ES Volume I – Application Document Ref. 6.2.16) and no cumulative effects are anticipated, though more information on the temporal and spatial scope of the solar farm development is required to confirm this. |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | significantly affect an area of population due to its remote location' and the scheme is 'for a temporary use' meaning 'such agricultural farming practices will be able to continue following the 40 year operational period'.<br>The request also suggests that 'once operational the solar farm will require only limited maintenance, therefore limited or negligible impacts are anticipated'. This reduces the risk of detracting from any maintenance the | | |

| ID | Tier | Application Reference | Applicant for 'other development' and brief description | Assessment of cumulative effect with the Proposed Development (incorporating the design changes) | Proposed mitigation applicable to NSIP including any apportionment | Residual cumulative effect |
|---|---|---|---|---|---|---|
| | | | | Proposed Development may require.<br>The planning application for this proposed scheme has not progressed as far as the Proposed Development's DCO application. It is therefore a requirement that this application considers the Proposed Development. Consequently, the cumulative effects on socio-economics of the projects will be considered in the cumulative assessment for the solar farm. | | |

## 19.5 Updated Cumulative Effects Assessment

19.5.1 The Proposed Development Changes do not change the cumulative schemes to be considered nor whether they are taken further into the appraisal. Therefore, an updated CEA including only the shortlisted developments from the submitted **Chapter 19:** Cumulative and Combined Effects (ES Volume I – Application Document Ref. 6.2.19) [**APP-062**] is not required.

## 19.6 Impact of all Proposed Development Changes

19.6.1 None of the Proposed Development Changes have produced a significant change to the assessment of cumulative effects included within the submitted ES **Chapter 19**: Cumulative and Combined Effects (ES Volume I – Application Document Ref. 6.2.19) [**APP-062**].

## 19.7 Updated Combined Effects Assessment

19.7.1 This combined effects assessment looks at those effects that may arise when several different impacts resulting from the Proposed Development Changes have the potential to affect a single receptor.

19.7.2 The submitted ES taken together with the ES Addendum Volume II chapters has identified effects which may occur as result of the Proposed Development Changes, ranging from negligible or minor (**not significant**) to moderate and major (**significant**). Multiple effects upon one or more common receptors could theoretically interact or combine, to result in a combined effect which is more or less significant than the effects individually.

19.7.3 As described in Section 19.3, relevant technical assessments have already considered effects that result from the combination or interaction of different types of impacts on individual receptors. For example, the potential for multiple effects to affect the Humber Estuary SSSI, SAC and Ramsar sites is considered within **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum – **Application Document Ref. 6.2.11 – Rev 03**). Any effects arising from the interaction of impacts on individual receptors which have already been assessed within the technical assessments are not repeated here. This section considers only those combined effects which have not been identified elsewhere within the technical assessments. As such, this chapter considers only the potential combined effects on human receptors. Socio-economics was included within the combined effects study within the submitted ES and has since been scoped out of the ES addendum. The effects from the submitted **Chapter 16**: Socio-economics (Application Document Ref. 6.2.16) [**APP-059**] have therefore been considered within the combined effects study in this ES addendum chapter.

19.7.4 When considering combined effects, the mitigation measures as set out in **Chapters 8 – 11** and **13 - 15** (ES Addendum Volume I – **Application**

**Document Ref.6.2.8 – 6.2.15 – Rev 03**) (including embedded mitigation measures built into the Proposed Development's design and measures embedded in the Framework CEMP (Application Document Ref. 7.1)) must be taken into account. Therefore, only residual effects (post-mitigation) are considered. In assessing potential combined effects, human receptors experiencing effects of minor or greater magnitude have been considered. The types of impacts that could be experienced by these receptors and which may interact are noise, air quality, traffic and transport, visual and socio-economic effects, during construction noise, air quality, visual and socio-economic effects during operation.

19.7.5 Mitigation of any combined effects identified is best achieved through management and control measures employed to prevent or reduce the individual effects in the first instance, thereby reducing the likelihood of the effects interacting and combining.

19.7.6 The following sections provide a qualitative assessment of the potential for combined effects of the Proposed Development Changes to arise during construction and operation, following a review of **Chapters 8 – 11 and 13 – 15** (ES Addendum Volume I – **Application Document Ref 6.2.6 – Rev 03**). Common receptors have been identified.

## 19.8 Receptors considered for combined effects

**Table 19-4 Receptors assessed for potential for Significant Combined Effects for all Proposed Development Changes (Construction and Operation)**

| Receptor | Receptor | Value/ sensitivity |
|---|---|---|
| **NSR1**<br>**Viewpoint 2**<br>**CDR1** | Vazon Bridge | High |
| **NSR1A** | Roe Farm | High |
| **NSR2**<br>**Viewpoint 1**<br>**CDR2** | Hawthorne House | High |
| **NSR3** | Keadby Village | High |
| **NSR4**<br>**CDR10 (Trentside Keadby)** | Mariners Arms Flats<br>Blacksmiths Cottage | High |
| **NSR5** | Trent Side | High |
| **NSR6** | Queens Crescent | High |
| **NSR7** | Keadby Grange | High |
| **NSR8**<br>**CDR15** | North Pilfrey Farm | High |

| Receptor | Receptor | Value/ sensitivity |
|---|---|---|
| **NSR9**<br>**Viewpoint 7** | Ealand Poultry Farm | High |
| **NSR10** | North Moor Farm | High |
| **NSR11**<br>**CDR11** | South Pilfrey Farm | High |

## 19.9 Impact of all Proposed Development Changes

19.9.1 No changes have been identified that alter the combined effects of the Proposed Development assessed within the submitted ES as a result of the addition of any of the Proposed Design Changes.

## 19.10 Limitations or Difficulties

19.10.1 The addendum to the cumulative assessment is based on information available at the time of the assessment regarding the environmental effects of the other potential or committed schemes in the vicinity of the Proposed Development Site, and the Proposed Development Changes, that have been scoped into the assessment.

19.10.2 Any new limitations that were encountered during the individual technical assessments are detailed within **Chapters 8 – 11** and **13 - 15** of ES Addendum Volume II.

## 19.11 Summary of Likely Significant Residual Effects

19.11.1 The assessment of combined effects has considered the potential for the effects of minor significance and identified within each of the technical assessments reported within **Chapters 8 to 18** (ES Volume I – **Application Document Ref. 6.2**), to interact and combine to affect common receptors, and has concluded that there would be no new significant combined effects during either construction or operation as a result of the Proposed Development Changes. If all of the Proposed Development Changes (or either option for single or twin absorbers) were to be implemented the effects would remain the same.

19.11.2 The assessment of cumulative effects has considered other developments within 15 km of the Proposed PCC Site where planning applications have been put in since submission of ES **Chapter 19** (Application Document Ref 6.2) [**APP-062**] (identifying 2 developments for consideration at Stage 1 in the long list with both of these progressing to the shortlist of developments). Both developments were shortlisted given their large scale and their close proximity to the Proposed Development Site.

19.11.3 Both schemes were then taken forward into assessment at Stages 3 and 4; and the potential for cumulative effects to arise, from one or both of these developments in combination with the Proposed Development (incorporating its design changes) has been assessed qualitatively using information available in the public domain.

19.11.4 The assessment has concluded that based on the currently available information, there is likely potential for significant cumulative landscape and visual effects, but not likely potential for significant cumulative effects with the remaining ES topics. However, available information is limited at this early stage of the development of these other projects. As such, the onus will be on the other respective schemes to consider any potentially significant combined effects with this Proposed Development (and associated design changes), taking into account information in this ES which will be in the public domain.

19.11.5 The assessment of cumulative effects then went on to consider whether there would be any significant changes to the cumulative effects discussed in the submitted ES **Chapter 19** between the Proposed Development and the shortlisted developments, given the Proposed Development Changes. The assessment has concluded that based on the currently available information significant cumulative effects are still considered unlikely notwithstanding the Proposed Development Changes. However, available information is limited at this early stage of the development of these other projects. As such, the onus will be on the other respective projects to consider any potentially significant combined effects with this Proposed Development, taking into account information in this ES which will be in the public domain.

# CONTENTS

# 20.0 ES ADDENDUM: SUMMARY OF LIKELY SIGNIFICANT RESIDUAL EFFECTS

## 20.1 Introduction

20.1.1 This Chapter provides an addendum to the Summary of Likely Significant Residual Effects assessment included with the submitted Environmental Statement (ES) (**Chapter 20:** Summary of Likely Significant Residual Effects (Application Document Ref. 6.2.20) [**APP-063**]). The chapter draws upon Chapters 8 - 11, 13 - 15 and Chapter 19 of this ES Addendum which have considered the potential environmental impacts and effects of the Proposed Development Changes set out in ES Addendum Volume I (**Application Document Ref. 6.2.1 – 6.2.7 – Rev 03**).

20.1.2 The likely significant residual environmental effects of the Proposed Development, including Proposed Development Changes, have been identified following implementation of the embedded mitigation or impact avoidance measures included in the design of the Proposed Development (as detailed in Chapters 8 to 19 (ES Volume I - Application Document Ref. 6.2), where relevant) and referenced within Chapters 8 – - 11, 13 – 15 and 19 of this ES Addendum.

20.1.3 This chapter provides a summary of any new adverse and beneficial environmental effects that are considered to be significant (i.e. moderate and major effects) that change the findings in the submitted ES. As outlined in **Chapter 2**: Assessment Methodology (ES Volume I - **Application Document Ref. 6.2.2** – **Rev 03**), for the purposes of this EIA Addendum and the submitted ES, an effect is considered to be 'significant' if it is assessed to be moderate (adverse or beneficial) or major (adverse or beneficial).

20.1.4 This Chapter accompanies, and should be read in conjunction with the following Appendix of the submitted ES, which is unchanged by the findings of the ES Addendum:

- **Appendix 20A:** Schedule of Commitments (Application Document Ref. 6.3.34) [**APP-098**].

## 20.2 Likely Significant Residual Effects

Construction, Operation and Decommissioning Effects

20.2.1 The Proposed Development Changes do not change the likely significant residual effects identified in the following chapters/ or where otherwise identified in Application documents. In each case, the likely significant residual effects reported within Table 20.1 of **Chapter 20:** Summary of Likely

Significant Residual Effects (Application Document Ref. 6.2.20) remain unchanged (i.e. **not significant**):

- **Chapter 8**: Air Quality (Application Document Ref. 6.2.8) [**APP-051**];
- **Chapter 9**: Noise and Vibration (Application Document Ref. 6.2.9) [**APP-052**];
- **Chapter 10**: Traffic and Transportation (Application Document Ref. 6.2.10) [**APP-053**];
- **Chapter 11**: Biodiversity and Nature Conservation (Application Document Ref. 6.2.11) [**APP-054**];
- **Chapter 12**: Water Environment and Flood Risk (Application Document Ref. 6.2.12) [**APP-055**];
- **Chapter 13**: Geology, Hydrogeology and Land Contamination (Application Document Ref. 6.2.13) [**APP-056**];
- **Chapter 15**: Cultural Heritage (Application Document Ref. 6.2.15 [**APP-058**];
- **Chapter 17**: Climate Change and Sustainability (Application Document Ref. 6.2.17) [**APP-060**];
- **Chapter 18**: Major Accidents and Disasters (Application Document Ref. 6.2.18) [**APP-061**];
- **Chapter 19**: Cumulative and Combined Effects (Application Document Ref. 6.2.19) [**APP-062**]; and
- **OD-003**: Waste Technical Note - Pending formal acceptance by the Examining Authority once appointed.

20.2.2 The Proposed Development Changes do not change the likely significant residual effects identified in the following chapters and in each case, the likely significant residual effects would remain as reported within Table 20.1 of **Chapter 20:** Summary of Likely Significant Residual Effects (Application Document Ref. 6.2.20) (i.e., **significant** where reported):

- **Chapter 14**: Landscape and Visual Amenity of the submitted ES (Application Document Ref. 6.2.14) [**APP-057**] – adverse visual amenity effects for residents at Viewpoint 1 (Chapel Lane West, Keadby), Viewpoint 2 (Gate Keepers Residence, Vazon Bridge, Keadby) and users of the canal and towpath at viewpoint 2 and users at viewpoint 4 (PRoW KEAD9, KEAD10 north of Keadby) during construction/ decommissioning, opening and operation activities (Scenario 1 and 2) and at viewpoint 6 (Trunk Road, Keadby) Operation (scenario 2 - with Keadby 1 Power Structures removed); and

- **Chapter 16**: Socio-economics (Application Document Ref. 6.2.16) [**APP-059**] – major beneficial effect of direct, indirect and induced employment created by the construction phase of the Proposed Development on the Scunthorpe Travel to Work Area (TTWA) and associated economy.

## 20.3 Additional Mitigation, Monitoring and Enhancement Measures

20.3.1 No additional mitigation/ monitoring or enhancement measures are required as a result of the Additional Information/ Proposed Development Changes, above those stated in submitted ES **Chapter 20**: Summary of Likely Significant Residual Effects (Application Document Ref. 6.2.20) [**APP-063**] and set out in **Appendix 20A:** Schedule of Commitments (Application Document Ref. 6.3.34) [**APP-098**].

KEADBY 3
CARBON CAPTURE
POWER STATION

A collaboration between SSE Thermal and Equinor

**Document Ref: 6.3.6**

**Planning Inspectorate Ref: EN010114**

**The Keadby 3 (Carbon Capture Equipped Gas Fired Generating Station) Order**

**Land at and in the vicinity of the Keadby Power Station site, Trentside, Keadby, North Lincolnshire**

# Environmental Statement Addendum Volume II – Appendix 8B: Air Quality Operational Phase

**The Planning Act 2008**

**The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017**

**Applicant: Keadby Generation Limited**

**Date: May 2022**

## DOCUMENT HISTORY

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## GLOSSARY

| Abbreviation | Description |
|---|---|
| ADMS | Atmospheric Dispersion Modelling System |
| AOD | Above Ordnance Datum |
| AQAL | Air Quality Assessment Levels |
| BAT | Best Available Techniques |
| BAT-AEL | Best Available Techniques |
| CCGT | Combined Cycle Gas Turbine |
| HRA | Habitats Regulations Assessment |
| IED | Industrial Emissions Directive |
| LCP | Large Combustion Plant |
| LWS | Local Wildlife Site |
| SAC | Special Area of Conservation |
| SPA | Special Protection Area |
| SSSI | Site of Special Scientific Interest |

# CONTENTS



# TABLES

# 1.0 INTRODUCTION

## 1.1 Overview

1.1.1 This Technical Appendix supports **Chapter 8**: Air Quality (ES Addendum Volume II – **Application Document Ref. 6.2.8 – Rev 02**) and describes the additional details for the dispersion modelling carried out as a result of Proposed Development Change 3 and considers the relevant Additional Information, detailed in **Chapter 8**.

1.1.2 The dispersion modelling assessment of the emissions from the up to two absorbers/ stacks option has been revised to ensure that the worst-case impacts have been assessed and considered in this ES Addendum.

1.1.3 The general dispersion modelling methodology, the receptors and the baseline conditions (except the baseline at receptor OE1-5) remain as described in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**], and therefore have not been detailed in this appendix.

# 2.0 SCOPE

## 2.1 Combustion plant and carbon capture emissions

2.1.1 The assessment has considered the impact of the process emissions from Proposed Development Change 3 (increased maximum parameters for up to two absorbers/ stacks) on local air quality, under normal operating conditions, as described in the **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (**Document Ref. 6.3.6**) [**APP-070**]. The up to two absorbers/ stacks have been remodelled based on revised design data provided by the relevant licensor.

2.1.2 In terms of the air quality impacts, the worst-case model inputs are associated with the minimum absorber and stack heights, as the lowest stack heights result in the poorest dispersion of the emission, and therefore higher predicted process contributions (PC).

## 2.2 Combined and Cumulative Impacts and Effects

2.2.1 The assessment presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (**Document Ref. 6.3.6**) considered the cumulative impacts of the operation of North Lincolnshire Green Energy Park (PINS Ref. EN010116), however at the time of writing there was no information available on the emissions from the Energy Park, and it was concluded that the cumulative effects of the Proposed Development would need to be considered in the cumulative assessment for North Lincolnshire Green Energy Park. The DCO application for the Energy Park was submitted to the Planning Inspectorate on 21 March 2022 and is at acceptance stage, although no application documents are published at the time of writing. As such, it remains the case that the Energy Park should consider emissions from the Proposed Development in its cumulative assessment, and as such no cumulative impact assessment has been carried out for this ES Addendum in relation to the Energy Park.

## 2.3 Sources of information

2.3.1 The information that has been used within this assessment includes:

- **Chapter 4**: Proposed Development (ES Addendum Volume I – **Application Document Ref. 6.2.1 – 6.2.7 – Rev 02**);
- data on emissions to atmosphere from the process, taken from Industrial Emissions Directive (IED) 2010/75/EU limits, BAT-associated emission **levels (**BAT-AEL) values and data provided by the relevant carbon capture plant (CCP) licensor;
- details on the Proposed Development Site layout;
- Ordnance Survey mapping;
- baseline air quality data from the Additional Information; and

- meteorological data supplied by ADM Ltd.

# 3.0 METHODOLOGY

## 3.1 Dispersion model selection

3.1.1 The assessment of emissions resulting from Proposed Development Change 3 has been undertaken using the advanced dispersion model ADMS (version V5.2.2), supplied by Cambridge Environmental Research Consultants Limited (CERC).

## 3.2 Modelled scenarios

3.2.1 The dispersion modelling undertaken for the assessment of emissions from the operational Proposed Development incorporating Proposed Development Change 3 includes modelling of maximum ground-level impacts at the lowest release heights for an alternative licensor's twin stack option for the Proposed Development's main CCP absorber units (with two absorbers of 65.3m above ordnance datum (mAOD) and two stacks of 77mAOD).

3.2.2 It is understood that these are the minimum heights that could be built for up to two absorber towers/ stacks, and it is considered that should the height of the absorber towers be greater than assessed, the stack heights would be increased proportionately, so as to ensure that the downwash effects of the absorber buildings would not be increased. A similar, or lower level of predicted impact would therefore be achieved for higher absorbers/ stacks to those presented in this assessment.

## 3.3 Model inputs

3.3.1 The general model conditions used in the assessment are as reported in the **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**]. Any changes to the inputs for the ES Addendum are summarised in Table 1.

**Table 1: General ADMS 5 model inputs**

| Variable | Input |
|---|---|
| Sources | 2 x CCP Absorber Stacks for the Proposed Development |
| Buildings that may cause building downwash effects | Proposed Development two CCP absorber towers. |

## 3.4 Emissions data

3.4.1 The main reported emissions for the Proposed Development Change 3 have been modelled based on two CCP absorber stacks. The stacks have been modelled at a height of 77mAOD. It is considered that 77mAOD is the appropriate stack height that would result in not significant effects at human

health receptors and would limit the potential for significant effects reported at ecological receptors, based on an absorber height of 65.3mAOD. The physical properties of the assessed emission sources are shown in Table 2.

**Table 2: Emissions inventory**

| Parameter | Unit | Proposed Development CCP absorber stacks (each stack) |
|---|---|---|
| Stack position | (NGR) m | 482104, 412084[1]<br>481820, 412158<br>481799, 411884<br>482213, 411884 |
| Stack release height (AGL) | m | 75 |
| Effective internal stack diameter | m | 5.4 |
| Flue temperature | °C | 64 |
| Flue $H_2O$ content | % | 7.7 |
| Flue $O_2$ content (dry) | % | 11.1 |
| Stack gas exit velocity | m/s | 20.6 |
| Stack flow (actual) | $Am^3/s$ | 526.9 |
| Stack flow at reference conditions (STP, dry, 15% $O_2$) | $Nm^3/s$ | 471.6 |

[1] In line with the Rochdale Envelope approach, the layout is subject to change and therefore the modelling carried out has considered a range of stack locations within the Main Site (Proposed PCC Site), with the worst-case results being reported.

3.4.2 The modelled pollutant emission rates (in grams per second (g/s)) have been calculated by multiplying the emission concentration by the volumetric flow rate at normalised reference conditions. The emission limits assumed to apply to the Proposed Development are shown in Table 3.

**Table 3: Emission concentrations and the assessed emission rates**

| Pollutant | Proposed Development CCP absorber stacks (per stack) | |
|---|---|---|
| | Emission concentration ($mg/Nm^3$) | Emission rate (g/s) |
| Oxides of Nitrogen ($NO_x$ (as $NO_2$)) (annual average) | 30 | 15.8 |
| Oxides of Nitrogen ($NO_x$ (as $NO_2$)) (daily average) | 40 | 21.1 |
| Carbon Monoxide (CO) | 100 | 52.7 |

| Pollutant | Proposed Development CCP absorber stacks (per stack) | |
|---|---|---|
| | Emission concentration ($mg/Nm^3$) | Emission rate (g/s) |
| Ammonia ($NH_3$) | 1.0 | 0.53 |
| Amines | 0.4 | 0.21 |
| Acetaldehyde | 4.0 | 2.1 |
| Formaldehyde | 2.0 | 1.1 |
| Ketones | 5.0 | 2.6 |

## 3.5 Building downwash effects

3.5.1 The absorber buildings associated with Proposed Development Change 3 are circular, rather than the rectangular single large absorber that was assessed in **Chapter 8**: Air Quality (ES Volume I – **Application Document Ref. 6.2.8**).

3.5.2 The modelled locations are shown in Table 4 and a plan showing the building layout used in the ADMS simulation is illustrated in **Figure 8.1** (ES Addendum Volume III – **Application Document Ref. 6.4.9**).

**Table 4: Changes to the Buildings incorporated into the ADMS model**

| Building | Building centre grid reference (x, y) | Height (m) | Diameter (m) |
|---|---|---|---|
| Proposed Development Absorber 1 | 481967, 411900 | 63.3 | 19.0 |
| Proposed Development Absorber 2 | 481967, 411950 | 63.3 | 19.0 |

# 4.0 BASELINE AIR QUALITY

## 4.1 Additional Information

4.1.1 The additional information detailed in the Keadby 2 – Ambient NOx, $NO_2$ and $NH_3$ Monitoring Report (ERM 2021) changes the baseline conditions for Air Quality described in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

4.1.2 The monitoring carried out on behalf of the Applicant during 2020 – 2021 has been reviewed. Monitoring was carried out at several locations within the vicinity of the Proposed Development, with location DT1 being representative of the Humber Estuary ecological receptor (OE1-5). The monitoring indicated slightly higher concentrations for background NOx and $NH_3$ at this location, than were described in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

4.1.3 The background concentrations used in **Appendix 8B** ES Volume II (Document Ref. 6.3.6) [**APP-070**] and the baseline concentrations provided by the additional information are compared in Table 5. The modelled PC from the Keadby 2 Power Station (shown in parenthesis) have been added to the new baseline concentrations from the Additional Information, to provide modified background concentrations in line with the methodology described in **Appendix 8B** ES Volume II (Document Ref. 6.3.6) [**APP-070**].

**Table 5: Comparison of Baseline Data at Humber Estuary – Receptor OE1-5**

| Pollutant | Original Baseline, (includes contribution from Keadby 2 Power Station) (µg/m³) | Additional Information Baseline at DT1 (µg/m³) | Additional Information Baseline with contribution from Keadby 2 Power Station |
|---|---|---|---|
| Annual average NOx | 13.7 | 13.1 | (0.7) 13.8 |
| Annual average $NH_3$ | 2.4 | 3.1 | (0.08) 3.2 |

4.1.4 The background concentrations at all other ecological receptors remain unchanged as a result of the Additional Information.

# 5.0 OPERATIONAL EMISSIONS MODELLING RESULTS

## 5.1 Human Health Receptor Results

5.1.1 The human health results were presented in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**] as the maximum impacts that occurred anywhere, regardless of whether this was at a discrete receptor location. The assessment results were based on the large single absorber layout, as this led to the highest maximum predicted PC.

5.1.2 The larger size of the single absorber building leads to greater downwash of the plume, resulting in higher ground level concentrations of pollutants closer to the stack, and hence the maximum predicted PC. The Proposed Development Change 3 (up to two absorbers/ stacks) assessed have reduced downwash, due to their smaller dimensions and circular shape, and therefore the maximum impacts from the twin absorber scenario are lower than those that were reported in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**].

5.1.3 The outcome of the assessment presented in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**] concluded that impacts of all pollutant species released from the operational Proposed Development were **not significant** at the maximum location, and therefore subsequently, at all receptors within the study area.

5.1.4 As such, the maximum worst-case results at human health receptors do not change from those reported in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**] as a result of the up to two absorbers/ stacks option.

## 5.2 Ecological Receptor Results

5.2.1 Due to the reduced downwash of the Proposed Development Change 3 absorbers, the entrained pollutants within the plumes travel further from the stacks than for the single large absorber scenario. Impacts at the ecological receptors (which are further from the stacks), therefore show a slight increase over those presented in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**] and **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

5.2.2 The results of the dispersion modelling of predicted impacts on sensitive ecological receptors are presented in Table 6 to Table 9. The tables set out the predicted PC compared to the atmospheric concentrations of $NO_x$ and $NH_3$ and also nutrient nitrogen and acid deposition.

5.2.3 The background data for OE1-5 uses the new baseline data from the Additional Information for NOx and $NH_3$, as discussed in Table 5 above.

Oxides of nitrogen emissions – Critical Levels

5.2.4 The Proposed Development Change 3 results show that the predicted annual average and daily average $NO_x$ impacts slightly increase at the majority of receptors, although results at some receptors remain unchanged.

5.2.5 At most sites where an increase occurs, the annual average PC increase is limited to only 0.01 – 0.03µg/m$^3$, however the largest increase is seen at receptor OE1-5, with an increase in the annual average PC of 0.49µg/m$^3$. This equates to a 1.6% increase in the PC compared to the annual average critical level at this site. That said, the predicted environmental concentration (PEC) remains well below the 70% critical level threshold (at 49%) and therefore the impacts remain insignificant.

5.2.6 The PEC at all other sites are also less than 70% of the critical level threshold for insignificance, for annual average NOx, in line with the results presented in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**] and **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

5.2.7 No exceedances of the annual critical level are predicted.

5.2.8 Again, the daily critical level shows slight increases at the majority of sites, however the PC remain below the 10% screening threshold for insignificance at all the statutory designated sites, except for the Humber Estuary (OE1-5), as the results presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

5.2.9 In combination with the background concentration at the Humber Estuary, the impacts are 43%, an increase of 2.4% of the daily critical level from the results presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**]. The PEC of 43% indicates that no exceedance of the daily critical level is predicted.

5.2.10 Similar to the results presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**], four of the local wildlife sites (LWS) have impacts over the 10% daily critical level, however again with the background concentrations taken into account, the impacts are well below the daily critical level at all these sites, and therefore no exceedance of the daily critical level is predicted at any non-statutory nature conservation site.

5.2.11 The conclusions of the assessment presented in in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**] with regards to NOx Critical Levels remain unchanged.

**Table 6: NOx Dispersion modelling results for ecological receptors**

| Receptor | | Annual average (µg/m$^3$) | | | | | | Daily average (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL |
| OE1-5 | Humber Estuary Ramsar/ SAC/ SSSI | 30 | 0.95 | 3.2% | 13.8 | 14.75 | 49% | 75 | 11.7 | 16% | 20.7 | 32.38 | 43% |
| OE6 | Crowle Borrow Pits SSSI | | 0.14 | 0.5% | 13.3 | 13.40 | 45% | | 7.2 | 10% | 19.9 | 27.08 | 36% |
| OE7 | Hatfield Chase Ditches SSSI | | 0.11 | 0.4% | 13.3 | 13.37 | 45% | | 5.8 | 8% | 19.9 | 25.72 | 34% |
| OE8 | Eastoft Meadow SSSI | | 0.11 | 0.4% | 11.0 | 11.15 | 37% | | 3.1 | 4% | 16.6 | 19.68 | 26% |
| OE9 | Belshaw SSSI | | 0.06 | 0.2% | 10.9 | 10.93 | 36% | | 1.6 | 2% | 16.3 | 17.9 | 24% |
| OE10 | Thorne Moor SAC | | 0.06 | 0.2% | 11.2 | 11.27 | 38% | | 2.2 | 3% | 16.8 | 19.0 | 25% |
| OE11 | Epworth Turbary SSSI | | 0.05 | 0.2% | 10.7 | 10.73 | 36% | | 1.2 | 2% | 16.0 | 17.2 | 23% |
| OE12 | Risby Warren SSSI | | 0.13 | 0.4% | 14.8 | 14.95 | 50% | | 1.3 | 2% | 22.2 | 23.6 | 31% |

| Receptor | | Annual average (µg/m$^3$) | | | | | | Daily average (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL |
| OE13 | Hatfield Moor SAC | | 0.04 | 0.1% | 11.7 | 11.79 | 39% | | 1.9 | 3% | 17.6 | 19.6 | 26% |
| OE14 | Messingham Heath SSSI | | 0.08 | 0.3% | 11.1 | 11.13 | 37% | | 1.9 | 3% | 16.6 | 18.5 | 25% |
| OE15 | Tuetoes Hills SSSI | | 0.09 | 0.3% | 10.4 | 10.48 | 35% | | 2.4 | 3% | 15.6 | 18.0 | 24% |
| OE16 | Haxey Turbary SSSI | | 0.04 | 0.1% | 10.6 | 10.63 | 35% | | 1.0 | 1% | 15.9 | 16.9 | 23% |
| OE17 | Rush Furlong SSSI | | 0.05 | 0.2% | 10.4 | 10.42 | 35% | | 1.4 | 2% | 15.6 | 17.0 | 23% |
| OE18 | Hewsons Field SSSI | | 0.05 | 0.2% | 10.5 | 10.58 | 35% | | 1.1 | 1% | 15.8 | 16.9 | 22% |
| OE19 | Messingham Sand Quarry SSSI | | 0.06 | 0.2% | 12.3 | 12.39 | 41% | | 1.2 | 2% | 18.5 | 19.7 | 26% |
| OE20 | Manton and Twigmoor SSSI | | 0.08 | 0.3% | 12.1 | 12.13 | 40% | | 2.4 | 3% | 18.1 | 20.5 | 27% |
| OE21 | Scotton and Laughton | | 0.09 | 0.3% | 10.6 | 10.66 | 36% | | 3.2 | 4% | 15.9 | 19.0 | 25% |

| Receptor | | Annual average (µg/m$^3$) | | | | | | Daily average (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL |
| | Forest Ponds SSSI | | | | | | | | | | | | |
| OE22 | Broughton Far Wood SSSI | | 0.12 | 0.4% | 13.5 | 13.63 | 45% | | 1.2 | 2% | 20.3 | 21.4 | 29% |
| OE23 | Broughton Alder Wood SSSI | | 0.12 | 0.4% | 13.6 | 13.70 | 46% | | 1.1 | 1% | 20.4 | 21.4 | 29% |
| OE24 | Scotton Beck Fields SSSI | | 0.07 | 0.2% | 11.0 | 11.12 | 37% | | 1.2 | 2% | 16.6 | 17.7 | 24% |
| OE25 | Scotton Common SSSI | | 0.08 | 0.3% | 11.0 | 11.10 | 37% | | 2.4 | 3% | 16.5 | 19.0 | 25% |
| OE26 | Laughton Common SSSI | | 0.06 | 0.2% | 10.3 | 10.35 | 35% | | 1.4 | 2% | 15.4 | 16.9 | 22% |
| OE27 | Stainforth and Keadby Canal Corridor LWS | | 0.42 | 1.4% | 13.5 | 13.91 | 46% | | 15.7 | 21% | 20.2 | 35.9 | 48% |
| OE28 | Keadby Wetland LWS | | 0.58 | 1.9% | 13.5 | 14.11 | 47% | | 16.8 | 22% | 20.3 | 37.1 | 49% |

| Receptor | | Annual average (µg/m$^3$) | | | | | | Daily average (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL |
| OE29 | Keadby Wet Grassland LWS | | 0.50 | 1.7% | 13.5 | 14.00 | 47% | | 17.7 | 24% | 20.2 | 38.0 | 51% |
| OE30 | Three Rivers LWS | | 0.40 | 1.3% | 13.3 | 13.67 | 46% | | 10.1 | 13% | 19.9 | 30.0 | 40% |
| OE31 | Ash tip | | 0.03 | 0.1% | 13.2 | 13.20 | 44% | | 3.7 | 5% | 19.8 | 23.5 | 31% |
| OE32 | Humber Estuary (at Blacktoft Sands) Ramsar, SAC, SPA and SSSI | | 0.15 | 0.5% | 13.1 | 13.21 | 44% | | 1.6 | 2% | 19.6 | 21.1 | 28% |
| CL = Critical Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration | | | | | | | | | | | | | |

Ammonia emissions – Critical Levels

5.2.12 Similar to the results presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**], the PC of ammonia are extremely small. Again, at the majority of receptors, the Proposed Development Change 3 results in slight increased PC, although for ammonia these are largely increases of only 0.001µg/m$^3$, which do not result in increases in the predicted PEC overall.

5.2.13 At all but receptor OE1-5, the predicted annual average $NH_3$ impacts remain below the criteria for insignificance (<1% of the critical level) and therefore can be considered insignificant.

5.2.14 The new background concentration for OE1-5 from the Additional Information in itself represents an exceedance of the $NH_3$ critical level (at 107%). The PC is 1.1% of the critical level, and therefore only slightly over the 1% threshold for insignificance at the worst impacts point of the receptor (OE1), and at the other receptor points OE2 -5, it remains below the 1% threshold. Further interpretation of the significance of these results is provided in **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum Volume II – **Application Document Ref. 6.2.11 – Rev 02**).

**Table 7: Dispersion modelling results for ecological receptors – $NH_3$**

| Receptor | | Annual Average (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL |
| OE1-5 | Humber Estuary SSSI, SAC, Ramsar | 3 | 0.03 | 1.1% | 3.2 | 3.23 | 108% |
| OE6 | Crowle Borrow Pits SSSI | 3 | 0.005 | 0.2% | 2.60 | 2.60 | 87% |
| OE7 | Hatfield Chase Ditches SSSI | No features listed | | | | | |
| OE8 | Eastoft Meadow SSSI | 3 | 0.004 | 0.1% | 2.60 | 2.60 | 87% |
| OE9 | Belshaw SSSI | 3 | 0.002 | 0.1% | 2.64 | 2.64 | 88% |
| OE10 | Thorne Moor SAC | 1 | 0.002 | 0.2% | 2.60 | 2.60 | 260% |
| OE11 | Epworth Turbary SSSI | 1 | 0.002 | 0.2% | 2.19 | 2.20 | 220% |
| OE12 | Risby Warren SSSI | 1 | 0.004 | 0.4% | 3.23 | 3.24 | 324% |
| OE13 | Hatfield Moor SAC | 1 | 0.001 | 0.1% | 2.39 | 2.40 | 240% |
| OE14 | Messingham Heath SSSI | 1 | 0.003 | 0.3% | 3.27 | 3.27 | 327% |
| OE15 | Tuetoes Hills SSSI | 1 | 0.003 | 0.3% | 2.41 | 2.41 | 241% |

| Receptor | | Annual Average (µg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|---|
| | | CL | PC | PC % of CL | Modified BC | PEC | PEC % of CL |
| OE16 | Haxey Turbary SSSI | 1 | 0.001 | 0.1% | 2.19 | 2.20 | 220% |
| OE17 | Rush Furlong SSSI | 3 | 0.002 | 0.1% | 2.20 | 2.20 | 73% |
| OE18 | Hewsons Field SSSI | 3 | 0.002 | 0.1% | 2.24 | 2.24 | 75% |
| OE19 | Messingham Sand Quarry SSSI | 1 | 0.002 | 0.2% | 2.78 | 2.78 | 278% |
| OE20 | Manton and Twigmoor SSSI | 1 | 0.003 | 0.3% | 2.69 | 2.69 | 269% |
| OE21 | Scotton and Laughton Forest Ponds SSSI | 1 | 0.003 | 0.3% | 2.58 | 2.58 | 258% |
| OE22 | Broughton Far Wood SSSI | 3 | 0.004 | 0.1% | 3.02 | 3.03 | 101% |
| OE23 | Broughton Alder Wood SSSI | 3 | 0.004 | 0.1% | 4.17 | 4.18 | 139% |
| OE24 | Scotton Beck Fields SSSI | 1 | 0.003 | 0.2% | 2.58 | 2.58 | 258% |
| OE25 | Scotton Common SSSI | 1 | 0.003 | 0.3% | 2.58 | 2.58 | 258% |
| OE26 | Laughton Common SSSI | 1 | 0.002 | 0.2% | 1.97 | 1.97 | 197% |
| OE27 | Stainforth and Keadby Canal Corridor LWS | 3 | 0.014 | 0.5% | 2.28 | 2.29 | 76% |
| OE28 | Keadby Wetland LWS | 3 | 0.020 | 0.7% | 2.28 | 2.30 | 77% |
| OE29 | Keadby Wet Grassland LWS | 3 | 0.017 | 0.6% | 2.28 | 2.30 | 77% |
| OE30 | Three Rivers LWS | 3 | 0.013 | 0.4% | 2.31 | 2.32 | 77% |
| OE31 | Ash tip | 1 | 0.001 | 0.1% | 2.29 | 2.29 | 229% |
| OE32 | Humber Estuary (at Blacktoft Sands) Ramsar, SPA, SAC and SSSI | 3 | 0.005 | 0.2% | 1.89 | 1.91 | 64% |

CL = Critical Level, PC = Process Contribution, BC = Background Concentration, PEC = Predicted Environmental Concentration

Nitrogen Deposition – Critical Loads

5.2.1 The Environment Agency and Natural England have agreed that depositional impacts that are below 1% of the relevant critical load for a site can be regarded as insignificant. Guidance from the Institute of Air Quality Management (IAQM)

clarifies that the 1% threshold is not intended to be precise to a set number of decimal places but to the nearest whole number (paragraph 5.5.2.6 of IAQM) (2020).

5.2.2 Although again, the Proposed Development Change 3 results in small increases to the PC, the majority of sites have impacts that can be screened as being insignificant as they remain less than 1% of the critical load, or where this is not the case, the PC together with the background concentration do not exceed the critical load. This is consistent with the results presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

5.2.3 The only receptor where this is no longer the case is OE1-5, where the maximum N-deposition represents 1.3% of the critical load at the worst-case point (OE1), at all other points with the receptor however (OE2-5) the PC remains less than 1% of the critical load.

5.2.4 Further interpretation of the significance of these results is provided in **Chapter 11**: Biodiversity and Nature Conservation (ES Addendum Volume II – **Application Document Ref. 6.2.11 – Rev 02**).

**Table 8: Dispersion modelling results for ecological receptors – Nutrient nitrogen deposition (Kg N/Ha/Yr)**

| Receptor | | Modified Background nitrogen deposition (kg N/ha/yr) | Most stringent Critical Load class applicable for the site | Lower value of applicable Critical Load range | PC (kg N/ha/yr) | PC % Critical Load | PEC (kg N/ha/yr) | PEC % Critical Load |
|---|---|---|---|---|---|---|---|---|
| OE1-5 | Humber Estuary Ramsar, SSSI, SAC | 20.2 | Pioneer, Low-mid, mid-upper saltmarshes | 20 | 0.26 | 1.3% | 20.4 | 102% |
| OE6 | Crowle Borrow Pits SSSI | 36.6 | Broad-leaved, mixed and yew woodland | 10 | 0.06 | 0.6% | 36.7 | 367% |
| OE7 | Hatfield Chase Ditches SSSI | No features listed in APIS | | | | | | |
| OE8 | Eastoft Meadow SSSI | 21.3 | Neutral grassland | 20 | 0.03 | 0.% | 21.4 | 107% |
| OE9 | Belshaw SSSI | No critical loads assigned for the features present | | | | | | |
| OE10 | Thorne Moor SAC | 21.3 | Degraded Raised Bogs | 5 | 0.02 | 0.3% | 21.3 | 427% |
| OE11 | Epworth Turbary SSSI | 18.9 | Raised and blanket bogs | 5 | 0.01 | 0.3% | 18.9 | 379% |
| OE12 | Risby Warren SSSI | 26.1 | Acid Grassland | 8 | 0.04 | 0.4% | 26.2 | 327% |
| OE13 | Hatfield Moor SSSI | 20.9 | Raised and blanket bogs | 5 | 0.01 | 0.2% | 20.9 | 418% |

| Receptor | | Modified Background nitrogen deposition (kg N/ha/yr) | Most stringent Critical Load class applicable for the site | Lower value of applicable Critical Load range | PC (kg N/ha/yr) | PC % Critical Load | PEC (kg N/ha/yr) | PEC % Critical Load |
|---|---|---|---|---|---|---|---|---|
| OE14 | Messingham Heath SSSI | 24.6 | Acid Grassland | 8 | 0.02 | 0.3% | 24.6 | 307% |
| OE15 | Tuetoes Hills SSSI | 19.8 | Acid Grassland | 8 | 0.03 | 0.3% | 19.8 | 248% |
| OE16 | Haxey Turbary SSSI | 18.9 | Raised and blanket bogs | 5 | 0.01 | 0.2% | 18.9 | 379% |
| OE17 | Rush Furlong SSSI | 18.9 | Neutral Grassland | 20 | 0.01 | 0.1% | 18.9 | 95% |
| OE18 | Hewsons Field SSSI | 18.5 | Neutral Grassland | 20 | 0.01 | 0.1% | 18.5 | 93% |
| OE19 | Messingham Sand Quarry SSSI | 38.4 | Broadleaved deciduous woodland | 10 | 0.03 | 0.3% | 38.4 | 384% |
| OE20 | Manton and Twigmoor SSSI | 22.7 | Acid Grassland | 8 | 0.02 | 0.3% | 22.8 | 284% |
| OE21 | Scotton and Laughton Forest Ponds SSSI | 21.2 | Fen, Marsh and Swamp (assumed) | 10 | 0.02 | 0.2% | 21.2 | 212% |
| OE22 | Broughton Far Wood SSSI | 41.9 | Broad-leaved, mixed and yew woodland | 15 | 0.05 | 0.4% | 42.0 | 280% |

| Receptor | | Modified Background nitrogen deposition (kg N/ha/yr) | Most stringent Critical Load class applicable for the site | Lower value of applicable Critical Load range | PC (kg N/ha/yr) | PC % Critical Load | PEC (kg N/ha/yr) | PEC % Critical Load |
|---|---|---|---|---|---|---|---|---|
| OE23 | Broughton Alder Wood SSSI | Broad-leafed, mixed and yew woodland – Not sensitive to nitrogen deposition | | | | | | |
| OE24 | Scotton Beck Fields SSSI | 21.2 | Acid Grassland | 10 | 0.02 | 0.2% | 21.2 | 212% |
| OE25 | Scotton Common SSSI | 21.2 | Dwarf Shrub Heath | 10 | 0.02 | 0.2% | 21.2 | 212% |
| OE26 | Laughton Common SSSI | 17.7 | Acid grasslands | 8 | 0.02 | 0.2% | 17.7 | 221% |
| OE27 | Stainforth and Keadby Canal Corridor LWS | 19.7 | Neutral grassland | 20 | 0.12 | 0.6% | 19.9 | 99% |
| OE28 | Keadby Wetland LWS | 33.8 | Broadleaved deciduous woodland | 10 | 0.27 | 2.7% | 34.1 | 341% |
| OE29 | Keadby Wet Grassland LWS | 19.7 | Coastal and floodplain grazing marsh | 20 | 0.14 | 0.7% | 19.8 | 99% |
| OE30 | Three Rivers LWS | 19.9 | Coastal and floodplain grazing marsh | 20 | 0.11 | 0.5% | 20.0 | 100% |

| Receptor | | Modified Background nitrogen deposition (kg N/ha/yr) | Most stringent Critical Load class applicable for the site | Lower value of applicable Critical Load range | PC (kg N/ha/yr) | PC % Critical Load | PEC (kg N/ha/yr) | PEC % Critical Load |
|---|---|---|---|---|---|---|---|---|
| OE31 | Ash tip | 19.8 | Acid grassland | 10 | 0.01 | 0.1% | 19.8 | 198% |
| OE32 | Humber Estuary at Blacktoft Sands (Ramsar, SAC, SPA and SSSI) | 18.2 | Rich Fens | 15 | 0.04 | 0.3% | 18.2 | 122% |

Acid Deposition – Critical Loads

5.2.5 Although the Proposed Development Change 3 results in small increases to the PC, all sites have impacts that can still be screened as being insignificant as they remain less than 1% of the critical load. This is consistent with the results presented in **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**], therefore there is no change to the conclusions of the assessment as a result of the Proposed Development Change 3.

**Table 9: Dispersion modelling results for ecological receptors – Acid deposition (Keq/Ha/Yr)**

| Receptor ID Site name | | Acid deposition | | | | PC acid deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|---|
| | | Critical Load (keq/ha/yr) | Modified Baseline (keq/ha/yr) | Lowest Critical Load class applicable | Modified Baseline % of Critical Load | PC | PC % of Critical Load | PEC% of Critical Load |
| OE1-5 | Humber Estuary Ramsar/ SAC/ SSSI | Fen, marsh and swamp – not sensitive to acidity | | | | | | |
| OE6 | Crowle Borrow Pits SSSI | Min CL Min N: 0.142<br>Min CL Max N: 2.694<br>Min CL Max S: 2.337 | N: 2.6<br>S: 0.25 | Unmanaged Broadleaved/ Coniferous Woodland | 106% | 0.019 | 0.7% | 107% |
| OE7 | Hatfield Chase Ditches SSSI | No features listed in APIS | | | | | | |
| OE8 | Eastoft Meadow SSSI | Min CL Min N: 0.438<br>Min CL Max N: 2.008<br>Min CL Max S: 1.57 | N: 1.5<br>S: 0.2 | Acid grassland | 85% | 0.002 | 0.0% | 85% |
| OE9 | Belshaw SSSI | No critical loads assigned for the features present | | | | | | |
| OE10 | Thorne Moor SAC | Min CL Min N: 0.321<br>Min CL Max N: 0.462<br>Min CL Max S: 0.141 | N: 1.5<br>S: 0.2 | Bogs | 368% | 0.001 | 0.0% | 368% |

| Receptor ID<br>Site name | | Acid deposition | | | | PC acid deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|---|
| | | Critical Load (keq/ha/yr) | Modified Baseline (keq/ha/yr) | Lowest Critical Load class applicable | Modified Baseline % of Critical Load | PC | PC % of Critical Load | PEC% of Critical Load |
| OE11 | Epworth Turbary SSSI | Min CL Min N: 0.321<br>Min CL Max N: 0.478<br>Min CL Max S: 0.157 | N: 1.4<br>S: 0.2 | Bogs | 335% | 0.001 | 0.0% | 335% |
| OE12 | Risby Warren SSSI | Min CL Min N: 0.223<br>Min CL Max N: 0.858<br>Min CL Max S: 0.42 | N: 1.9<br>S: 0.4 | Acid grassland | 268% | 0.003 | 0.0% | 268% |
| OE13 | Hatfield Moor SAC | Min CL Min N: 0.321<br>Min CL Max N: 0.475<br>Min CL Max S: 0.154 | N: 1.5<br>S: 0.2 | Bogs | 358% | 0.001 | 0.0% | 358% |
| OE14 | Messingham Heath SSSI | Min CL Min N: 0.366<br>Min CL Max N: 0.556<br>Min CL Max S: 0.19 | N: 1.8<br>S: 0.2 | Acid grassland | 360% | 0.001 | 0.0% | 360% |
| OE15 | Tuetoes Hills SSSI | Min CL Min N: 0.366<br>Min CL Max N: 0.556<br>Min CL Max S: 0.20 | N: 1.4<br>S: 0.2 | Acid grassland | 288% | 0.002 | 0.0% | 288% |
| OE16 | Haxey Turbary SSSI | Min CL Min N: 0.321<br>Min CL Max N: 0.477<br>Min CL Max S: 0.156 | N: 1.4<br>S: 0.2 | Bogs | 335% | 0.001 | 0.0% | 335% |

| Receptor ID<br>Site name | | Acid deposition | | | | PC acid deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|---|
| | | Critical Load (keq/ha/yr) | Modified Baseline (keq/ha/yr) | Lowest Critical Load class applicable | Modified Baseline % of Critical Load | PC | PC % of Critical Load | PEC% of Critical Load |
| OE17 | Rush Furlong SSSI | Min CL Min N: 0.295<br>Min CL Max N: 2.028<br>Min CL Max S: 1.59 | N: 1.4<br>S: 0.2 | Acid grassland | 79% | 0.001 | 0.0% | 79% |
| OE18 | Hewsons Field SSSI | Min CL Min N: 0.438<br>Min CL Max N: 2.048<br>Min CL Max S: 1.61 | N: 1.3<br>S: 0.2 | Acid grassland | 73% | 0.001 | 0.0% | 73% |
| OE19 | Messingham Sand Quarry SSSI | Min CL Min N: 0.142<br>Min CL Max N: 1.214<br>Min CL Max S: 1.016 | N: 2.7<br>S: 0.3 | Unmanaged Broadleaved/ Coniferous Woodland | 247% | 0.002 | 0.0% | 247% |
| OE20 | Manton and Twigmoor SSSI | Min CL Min N: 0.223<br>Min CL Max N: 0.556<br>Min CL Max S: 0.19 | N: 1.6<br>S: 0.3 | Acid grassland | 342% | 0.002 | 0.0% | 342% |
| OE21 | Scotton and Laughton Forest Ponds SSSI | Min CL Min N: 0.321<br>Min CL Max N: 0.484<br>Min CL Max S: 0.163 | N: 1.5<br>S: 0.2 | Bogs | 351% | 0.002 | 0.0% | 351% |

| Receptor ID | Site name | Acid deposition | | | | PC acid deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|---|
| | | Critical Load (keq/ha/yr) | Modified Baseline (keq/ha/yr) | Lowest Critical Load class applicable | Modified Baseline % of Critical Load | PC | PC % of Critical Load | PEC% of Critical Load |
| OE22 | Broughton Far Wood SSSI | Min CL Min N: 0.285<br>Min CL Max N: 0.989<br>Min CL Max S: 0.704 | N: 3.0<br>S: 0.3 | Unmanaged Broadleaved/ Coniferous Woodland | 334% | 0.004 | 0.0% | 334% |
| OE23 | Broughton Alder Wood SSSI | Broad-leafed, mixed and yew woodland – Not sensitive to acidity | | | | | | |
| OE24 | Scotton Beck Fields SSSI | Min CL Min N: 0.366<br>Min CL Max N: 0.556<br>Min CL Max S: 0.19 | N: 1.5<br>S: 0.2 | Acid grassland | 306% | 0.001 | 0.0% | 306% |
| OE25 | Scotton Common SSSI | Min CL Min N: 1.035<br>Min CL Max N: 1.225<br>Min CL Max S: 0.19 | N: 1.5<br>S: 0.2 | Dwarf shrub heath | 139% | 0.002 | 0.0% | 139% |
| OE26 | Laughton Common SSSI | Min CL Min N: 0.223<br>Min CL Max N: 0.576<br>Min CL Max S: 0.21 | N: 1.3<br>S: 0.2 | Acid grassland | 260% | 0.001 | 0.0% | 260% |
| OE27 | Stainforth and Keadby Canal Corridor LWS | No information available | | | | | | |

| Receptor ID Site name | | Acid deposition | | | | PC acid deposition (keq/ha/yr) | | |
|---|---|---|---|---|---|---|---|---|
| | | Critical Load (keq/ha/yr) | Modified Baseline (keq/ha/yr) | Lowest Critical Load class applicable | Modified Baseline % of Critical Load | PC | PC % of Critical Load | PEC% of Critical Load |
| OE28 | Keadby Wetland LWS | No information available | | | | | | |
| OE29 | Keadby Wet Grassland LWS | No information available | | | | | | |
| OE30 | Three Rivers LWS | No information available | | | | | | |
| OE31 | Ash tip | No information available | | | | | | |
| OE32 | Humber Estuary at Blacktoft Sands (Ramsar, SAC, SPA and SSSI) | Fen, Marsh and Swamp - Not sensitive to acidity | | | | | | |

# 6.0 CONCLUSIONS

6.1.1 The Proposed Development Change 3 results in PC increases at a number of the ecological receptors assessed. The increases are in general very small, and in the majority of cases, do not increase the percentage of the PC against the relevant critical level or load.

6.1.2 Where larger increases occur, mainly at the Humber Estuary receptor OE1-5 (due to this being the closest receptor downwind of the Proposed Development), the increases are not considered to change the conclusions of the assessment presented in **Chapter 8:** Air Quality of the ES Volume I (Document Ref. 6.2.8) [**APP-051**] and **Appendix 8B:** Air Quality – Operational Phase of ES Volume II (Document Ref. 6.3.6) [**APP-070**].

# 7.0 REFERENCES

ERM (2021). Keadby 2 – Ambient NOx, $NO_2$ and $NH_3$ Monitoring Report – Final. 7th May 2021.

Institute of Air Quality Management (IAQM) (2020). *A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites, Version 1.1* [Online]. Available from: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

KEADBY 3
# CARBON CAPTURE POWER STATION

A collaboration between **SSE Thermal** and **Equinor**

**Document Ref: 6.3.9**

**Planning Inspectorate Ref: EN010114**

**The Keadby 3 (Carbon Capture Equipped Gas Fired Generating Station) Order**

**Land at and in the vicinity of the Keadby Power Station site, Trentside, Keadby, North Lincolnshire**

# Environmental Statement Addendum Volume II – Appendix 9B: Operational Noise Information

**The Planning Act 2008**

**The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017**

**Applicant: Keadby Generation Limited**

**Date: May 2022**

## DOCUMENT HISTORY

| | | | |
|---|---|---|---|
| **Document Ref** | 6.3.9 - ES Addendum Volume II - Appendix 9B | | |
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| **Author** | Sam Ellwood / Jason Evans | | |
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| **Document Owner** | AECOM | | |

## GLOSSARY

| Abbreviation | Description |
|---|---|
| CCGT | Combined Cycle Gas Turbine - a highly efficient form of energy generation technology. An assembly of heat engines work in tandem using the same source of heat to convert it into mechanical energy which drives electrical generators and consequently generates electricity. |
| CCP | Carbon Capture Plant – plant used to capture carbon dioxide ($CO_2$) emissions produced from the use of fossil fuels in electricity generation and industrial processes. |
| ES | Environmental Statement - a report in which the process and results of an Environment Impact Assessment are documented. |
| FEED | Front End Engineering Design - engineering which comes after the conceptual design or feasibility study focusing on the technical requirements and estimated investment cost for the project. |
| HRSG | Heat Recovery Steam Generator - an energy recovery heat exchanger that recovers heat from a hot gas stream. It produces steam that can be used in a process (cogeneration) or used to drive a steam turbine (combined cycle). |
| ISO | International Organization for Standardization – produce international standards for a range of markets. |
| LIDAR | Light Detection and Ranging - a remote sensing method that uses light in the form of a pulsed laser to measure ranges. |
| OS | Ordnance Survey - the national mapping agency for Great Britain. |
| PEI | Preliminary Environmental Information - an initial statement of the main environmental information available for a study area. |

# CONTENTS



# TABLES

# 1.0 INTRODUCTION

## 1.1 Overview

1.1.1 This Technical Appendix supports **Chapter 9**: Noise and Vibration (ES Addendum Volume II – **Application Document Ref. 6.2.9 – Rev 02**) and describes the additional details for the operational noise assessment carried out as a result of Proposed Development Change 3 and considers the relevant Additional Information, detailed in **Chapter 9.**

1.1.2 No other Proposed Development Changes affect the operational noise assessment as outlined in Section 4 of ES Addendum Volume I.

# 2.0 OPERATIONAL NOISE INFORMATION

## 2.1 Noise model Settings

2.1.1 The Proposed Development with Proposed Development Change 3 was constructed in CadnaA (version 2021) acoustic modelling software. This software implements the sound propagation calculation methodology set out in ISO 9613-2:1996: Attenuation of Sound during Propagation Outdoors.

Additional Data Sources - Proposed Power Plant Site

2.1.2 Data sources in addition to those in **Appendix 9B:** Operational Noise Appendix provided in ES Volume II (**Application Document Ref. 6.3.9**) are shown in Table 1.

**Table 1: Modelling Input Data**

| Model element | Data package | Format | Source file | Received from | Received Data |
|---|---|---|---|---|---|
| Twin Absorber Sound Source Data | Noise Protection Concept Bid Stage | .pdf | GB1075_Keadby3_NPC_21_057_1_00 | Project Team | 18/01/2022 |
| Site building dimensions | 3D Site Model for Twin Absorber Layout | .nvd | KEADBY3 08-August 2021 | Project Team | 17/01/2022 |

Modelling Assumptions

2.1.3 The model was configured with the same specifications as for the assessment in the submitted ES with the exception of the changes shown in Table 2.

**Table 2: Modelling Assumptions**

| Original Assumption | Updated Assumption |
|---|---|
| Proposed Development maximum building dimensions were provided by the Project Team, including those presented in **Chapter 4**: The Proposed Development (ES Volume I – **Application Document Ref. 6.2**); | Where the layout had changed as a result of Proposed Development Change 3 (i.e. up to two absorbers and stacks) building dimensions were as in the 3D Site Model. Where the layout was unchanged building dimensions were as in the submitted application. |

| Original Assumption | Updated Assumption |
|---|---|
| Sound power levels for the absorber unit and Direct Contact Cooler (DCC) have been modelled based on the assumption of 85 dB $L_{Aeq,T}$ at 1 m in free field conditions from the equipment enclosed in the building which has been assumed, as a worst-case, to be the same dimensions as the building. This sound source has then been assumed to be enclosed in a building of 100mm thick concrete producing a reverberant internal level which has been used to calculate sound emission from the absorber | Sound power levels for the absorber units and Direct Contact Cooler as provided. Updated CCP sound power levels |

**Table 3: Sound Power Levels CCP up to two absorbers**

| Source | Linear sound power levels each frequency band (dB) | | | | | | | | | Number in model | $L_{WA}$ (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 31 | 63 | 125 | 250 | 500 | 1k | 2k | 4k | 8k | | |
| Inlet gas blower casing | 94 | 93 | 93 | 98 | 91 | 83 | 83 | 72 | 65 | 3 | 93 |
| Absorber stack exhaust (point of emission to atmosphere) | 112 | 103 | 102 | 95 | 101 | 93 | 89 | 77 | 79 | 2 | 100 |
| Absorber stack casing* | - | - | - | - | - | - | - | - | - | - | - |
| Absorber | 110 | 101 | 98 | 94 | 96 | 79 | 66 | 48 | 50 | 2 | 94 |
| Direct Contact Cooler** | - | - | - | - | - | - | - | - | - | - | - |
| Compressor | 149 | 138 | 117 | 89 | 76 | 72 | 60 | 53 | 50 | 1 | 114 |
| Pumps* | 107 | 111 | 110 | 99 | 88 | 81 | 79 | 77 | D 74 | 14*** | 96 |

* Absorber stack casing not listed as a noise source in provided sound power data so assumed to have negligible sound power

** Direct Contact Cooler not listed as a noise source in provided sound power data so assumed to have negligible sound power

***two pumps for each of: Absorber auxiliaries; amine pumps; chemical storage pumps; compressor pumps; DCC auxiliaries; fire water tank pumps; steam condensate pumps

Uncertainty

2.1.4 Sources of uncertainty noted in paragraph 2.1.3 of **Appendix 9B** or the submitted ES are unchanged by Proposed Development Change 3.

## 3.0 REFERENCES

AECOM (2020) Appendix 11B: Operational Noise Information. Available online: https://www.netzeroteesside.co.uk/wp-content/uploads/2020/06/PEIR-Appendix-11B-Operational-Noise-Information.pdf

Bechtel Overseas Corporation (2019) CO2 Capture Facility at Karsto, Norway FEED Study report

Environmental Resources Management (ERM) (2016) Keadby 2 Power Station Environmental Statement

Environmental Resources Management (ERM) (2018) Keadby 2 Power Station Environmental Statement Update Report

KEADBY 3
# CARBON CAPTURE POWER STATION

A collaboration between **SSE Thermal** and **Equinor**

**Document Ref: 6.2.15**

**Planning Inspectorate Ref: EN010114**

**The Keadby 3 (Carbon Capture Equipped Gas Fired Generating Station) Order**

**Land at and in the vicinity of the Keadby Power Station site, Trentside, Keadby, North Lincolnshire**

# Environmental Statement Addendum Volume II – Appendix 15D: Interim Report on Archaeological Investigation and Recording

**The Planning Act 2008**

**The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017**

**Applicant: Keadby Generation Limited**

**Date: May 2022**

## DOCUMENT HISTORY

| | |
|---|---|
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York Archaeology

# The Keadby 3 Carbon Capture Power Station Project: Interim Report on Archaeological Investigation and Recording

Report Number YA/2022/063

# The Keadby 3 Carbon Capture Power Station Project:
# Interim Report on Archaeological Investigation and Recording

**York Archaeology – Nottingham Office**
**Unit 1 Holly Lane, Chilwell, Nottingham NG9 4AB**
Phone: +44 (0)115 8967400
yaenquiries@yorkat.co.uk www.yorkarchaeology.co.uk

# KEY PROJECT INFORMATION

| | |
|---|---|
| Project Name | Keadby 3 Carbon Capture Power Station Project |
| TPA Project Code | KAS2 |
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| Authors | O. Davies-Ellis, R. Lowther |
| Illustrations | M. Hughes |
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## SUMMARY


- York Archaeology were commissioned by Keadby Generation Limited to undertake archaeological trial trenching and geoarchaeological test-pitting in relation to the proposed carbon capture power station (the Proposed Development) (Planning Inspectorate Ref: EN010114), on land at, and in the vicinity of, the existing Keadby Power Station, Trentside, Keadby, Scunthorpe, DN 17 3EF (the Proposed Development Site).

- The archaeological works followed a Written Scheme of Investigation (WSI) prepared by AECOM (archaeological consultants to Keadby Generation Limited) and in accordance with the Chartered Institute for Archaeologists Code of Conduct (CIfA) (2020a) and the Standard and Guidance for Archaeological Field Evaluation (CIfA 2020b).

- Previous phases of evaluation have been undertaken as part of the Proposed Development including a geophysical survey (Magnitude Surveys, 2021) and a geoarchaeological hand auger survey (Trent and Peak Archaeology 2021) undertaken in 2021.

- The bulk of identified features are interpreted as dug channels relating to the practice of flood-warping of the area. However, features in Trenches 32, 27, 43 and 44 may represent earlier field boundaries/drainage that was subsequently covered by later warping practice.

- Organic silt-clay peat was found as a layer across the majority of both site areas. Five column samples and associated bulk samples were retained from small depressions of the 'natural' Sutton Sands which will be subject to forthcoming palaeoenvironmental and radiocarbon assessment. Macrofossil wood samples will also be analysed by an archaeobotanist. An OSL sample was also collected to allow the possibility to discern reworking of the Sutton Sands. The analysis of these samples will form part of an updated geoarchaeological assessment in due course, providing an updated history of the evolution of the site area.

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# 1. INTRODUCTION

## 1.1 Site Background

1.1.1 York Archaeology was commissioned by AECOM and Keadby Generation Limited to undertake a programme of archaeological investigation and recording at Keadby 3 carbon capture power station, adjacent to existing Keadby 1 and Keadby 2 power stations(Figure 1, from here on referred as 'the Site').

1.1.2 Groundworks consisted of a total of 50 trenches across the two areas, each measuring 50m (L) x 2m (W). A total of 26 trenches in Area 1 and 24 trenches in Area 2 were proposed (refer to Figures 1-5), although four trenches in Area 1 were not excavated due to ground conditions.

1.1.3 Works for this archaeological investigation were conducted between the 15th March and 14th April 2022. These works were conducted in compliance with the methodology prescribed in the approved Written Scheme of Investigation (WSI) produced by AECOM (2022) with the guidance of the North Lincolnshire Planning Archaeologist.

# 2. SITE BACKGROUND

## 2.1 Location, Topography and Geology

2.1.1 The Site is located within and near to the existing Keadby Power Station site near Scunthorpe, North Lincolnshire, and lies within the administrative boundary of North Lincolnshire Council (Figure 1). It is centred on national grid reference (NGR) 482351 411796 and encompasses an area of approximately 69.4 hectares (ha). This includes an area of approximately 18.7 ha to the west of Keadby 2 Power Station in which the generating station (CCGT plant, cooling infrastructure and CCP) and gas connection will be developed (the Proposed PCC Site).

2.1.2 Two areas within the Site have been identified for further evaluation, comprising Area 1 which is located on Keadby Common (the Proposed PCC Site), immediately to the west of the Keadby Power Station sub-station and Area 2, which is located across arable fields (Construction Laydown Area 2), immediately to the south of the Stainforth and Keadby Canal (Figure 1).

2.1.3 Ground level across Area 1 is relatively flat, ranging from *c* 0.55-0.8m above Ordnance Datum (AOD). Ground level across Area 2 ranges from *c* 0.8–1.25m AOD, with the lower lying land being located in the east of the area.

2.1.4 The underlying geology across both areas is recorded as alluvium and warp deposits overlying the Sutton Sand Formation, which in turn overlies the Mercia Mudstone bedrock (British Geology Survey 2022).

2.1.5 The Cranfield Soil Site Reporter records the site as an area of Loamy and clayey soils of coastal flats with naturally high groundwater (Soilscapes 2022).

## 2.2 Historical and Archaeological Background

2.2.1 The archaeological and historical background of the Proposed Development Site has been set out in detail in a Desk-Based Assessment (Appendix 15A, ES Volume II – Application Document Ref. 6.3.29 [APP-093]) and is summarised here. It utilised a Study Area comprising 1km from the boundary of the Site.

Palaeoenviromental

2.2.2 Palaeoenvironmental remains are considered heritage assets based on their potential to reconstruct past environments. The presence of peat deposits within the Site and study area has been demonstrated, with deposition occurring between the Late Neolithic and Iron Age periods. Further palaeochannels, pre-dating post-medieval drainage schemes, have been identified to the northeast and south of the Site, indicating the presence of a former channel (approximately 13-14m below ground level) of the River Trent beneath the footprint of the Keadby 1 Power Station, with a possible area of higher ground (eyot) to the east.

Bronze Age (*c* 2400 — 700 BC) and Iron Age (*c* 700 BC — AD 43)

2.2.3 The majority of known evidence for prehistoric activity is located on the higher ground ridges of Crowle and Belton, in areas not impacted by the post-medieval warping sediments and earlier alluviation events. Baseline assessment has demonstrated that peat deposition occurred in the Late Neolithic period, and there is potential for a buried pre-Neolithic land surface to exist beneath this.

2.2.4 The wetland marsh environment from the Late Neolithic onwards, would be attractive to populations, yielding rich resources (peat, fish, game, plants, wood). The proximity of the area to known sites of prehistoric settlement (such as at Crowle) mean that this wetland environment would have been easily accessible during these periods. Evidence of Bronze Age activity in the wider area includes a hoard of socketed axes and a Bronze Age shield, and a possible one-tree log boat identified near White House Farm. The latter was found within a peat layer and demonstrates the preservation potential of such deposits.

Romano-British Period (*c* AD 43 — 410)

2.2.5 The recovery of a Romano-British 'bog body', dated to the late 3rd to 4th centuries, *c* 270m north of the Site demonstrates the level of preservation that peat provides, as well as demonstrating Roman activity within the area. Roman occupation is known to have occurred at Crowle, which may have functioned as a trading post at this time. A possible, small, Romano-British settlement is thought to exist within the eastern limits of the Site, within the Water Connection Corridor, based on a recorded pottery scatter. This settlement may be associated with occupation of an eyot (island) during this period.

Early Medieval Period (*c* AD 410 — 1066) and Medieval Period (*c* AD 1066 – 1485)

2.2.6 The place names Keadby and Gunness suggest Viking derivation, with Keadby thought to mean 'Kaeti or keti's farmstead' and Gunness to mean 'Gunni's headland'. If settlements existed here at this time they may have been connected to retreating positions of the Danes, mentioned in 11th century Anglo-Saxon chronicles as Danes taking shelter in the marshlands of Axholme in order to use its sea and river connections.

2.2.7 Throughout the medieval period the Site is likely to have remained marshland, used as summer pasture and exploited for the rich fishing and hunting resources that such an environment would have provided. To date, however, no medieval remains have been identified within the Site and the only remains recovered in the vicinity of the Site is a lead spindlewhorl, found in a garden in Gunness.

Post-Medieval Period (*c* AD 1540 – 1899) and Modern Period (*c* AD 1899 – Present)

2.2.8 The post-medieval period saw dramatic and systematic drainage programmes on the Isle of Axholme, converting areas of marshland and moorland into organised, drained and fertile enclosures to create an entirely new landscape. The work comprised cutting of new drains, constructions of dykes, re-directing the flow of the island's bounding rivers, and warping systems. The ambitious programme began in the 1620s, designed by Cornelius Vermuyden, who had been commissioned by Charles I to drain the land.

2.2.9 The first power station was constructed within the Keadby Power Station site and opened in 1952. The power station was coal fired and comprised a coal store, compounds, chimneys, conveyors, turbine house, boiler house and further features.

The power station operated until 1984 and was replaced in 1996 by Keadby 1 Power Station, a gas-fired power station constructed on the main footprint of the previous station in the 1990s

## 3. AIMS AND OBJECTIVES

### 3.1 Aims

3.1.1 The Site-specific aims have been developed to address the key areas of archaeological and palaeoenvironmental interest identified from the geophysical survey and hand auger survey results, and through research of the archaeological and historic baseline. These site-specific aims include:

- To assess the date, extent and palaeoenvironmental potential of any organic deposits and possible former land surfaces that may survive;
- To record the presence / absence, location and extent of archaeological evidence associated with the prehistoric, Roman and post-medieval activity in the area;
- To assess the effect that later activity had on the state of preservation of any archaeological and palaeoenvironmental remains; and
- To inform research questions to be addressed during any archaeological mitigation works.

### 3.2 Objectives

3.2.1 The general objectives of the archaeological trial trenching were:

- To confirm the presence or absence of surviving archaeological remains;
- To determine the location, nature, extent, date, condition, state of preservation, significance and complexity of any archaeological remains and geoarchaeological / palaeoenvironmental sequences;
- To determine the likely range, quality and quantity of artefactual and environmental evidence present;

- To interpret the archaeological remains within their local, regional and national archaeological context; and
- To inform the requirement for and scope of any archaeological mitigation works that may be required.

# 4. RESULTS

## 4.1 Overview

4.1.1 A total of 46 trenches, measuring 50m by 2m, were excavated within the site. These excavations were divided into two areas. Area 1 consisted of 22 trenches, with 4 not competed due to wet ground conditions. The southern field within Area 1 had been the site of modern rubble dumping, which may have removed any relevant features/deposits. Area 2 contained the remaining 24 trenches, several of which were moved due to field drains. The following trench overview only includes excavations that had potential or confirmed archaeological features.

## 4.2 Trench 01 (Plate 01)

4.2.1 Trench 01 was situated in the far north-western corner of Area 1. At the base of the trench were natural sands, overlain by peat deposit (0103), which measured 0.24m thick. This had been cut by possible cut warp drain/channel [0105], which matched the geophysical results. It ran on a north west-south east alignment in the western corner of the trench and measured in excess of 2.6m in width and 0.34m in depth. However, the entire profile was not uncovered as it extended outside the limit of excavation. The associated fill (0106) consisted of repeated laminations of sand/ silty sand very closely resembling (0102). This feature is provisionally assumed to represent a post-medieval linear dug to direct water for land warping, hereafter referred to as warp drain/channels. Geophysical results indicated these features continued in Trenches 04, 11, 16.

4.2.2 Covering [0105] and (0103) was a 0.36m thick warp deposit (0102), which in turn was overlain by agricultural topsoil (0101), measuring 0.36-0.45m in thickness.

## 4.3 Trench 02

4.3.1 Trench 02 was situated in the north-western edge of Area 1. The sequence in-section consisted of natural sands, followed by 0.22m thick peat deposit (0203), overlain by 0.22m thick alluvium (0203), with agricultural topsoil completing the sequence.

Geophysical results indicated the presence of one east-west aligned feature in this trench, which was established as a modern field drain.

4.4 **Trench 03**

4.4.1 Trench 03 was situated in the north-western edge of Area 1. The sequence in-section was similar to that in Trench 02. Geophysical results indicated that two features were present in this trench. These comprised an east-west aligned feature, which was established to be a modern field drain, and a northeast-southwest aligned linear feature, which could not be identified in the trench base or after cleaning trench sections.

4.5 **Trench 04**

4.5.1 Trench 04 was situated in the north-western corner of Area 1, running north-south. Overlying natural sands was peat deposit (0402), measuring between 0.34-0.50m thick, which had been cut by a possible cut warp drain/channel [0405]. This was one of three linear features indicated by the geophysical survey to be present in this trench. It ran on a northwest – southeast alignment and measured 4.40m in width by 0.34m in depth. The associated fill (0406) consisted of repeated laminations of sand/ silty sand light brownish-yellow in colouration. The other potential linear feature, was right-angled and thought to represent a possible enclosure, but could not be located in the trench.

4.5.2 Immediately above the peat and drain/channel [0405] was agricultural topsoil (0401).

4.6 **Trench 05**

4.6.1 Trench 05 was situated along the northern edge of Area 1, running east-west. Natural sands were covered by 0.26m peat deposit (0502), which was overlain by agricultural topsoil. Geophysical results indicated the presence of one north-south feature in this trench, which was established as a modern field drain.

4.7 **Trench 06**

4.7.1 Trench 06 was situated along the western edge of Area 1, running north-south. The sequence in-section consisted of natural sands, covered by 0.26m thick peat deposit (0602), in turn covered by agricultural topsoil (0601). Geophysical survey highlighted the possible presence of two linear features in this location. Both were confirmed to be land drains.

4.8 **Trench 07**

4.8.1 Trench 07 was north-south aligned and situated along the western corner of Area 1. The sequence in-section consisted of natural sands, covered by 0.26m thick peat deposit (0702), in turn covered by agricultural topsoil (0701). Geophysical survey indicated the same results as Trench 06; both were again confirmed as land drains.

4.9 **Trench 10 (Plates 3,4)**

4.9.1 Trench 10 was north-south aligned and was located in the centre of Area 1. The sequence in-section consisted of natural sands, followed by 0.16m thick peat deposit (0703), overlain by agricultural topsoil.

4.9.2 Geophysical findings suggested the presence of two possible linear features in this part of the Site. Two features, representing probable warp drains were uncovered. Linear feature [1005] was a southwest-northeast aligned linear feature measuring 6.02m in width and 0.22m in depth. The related fill (1006) was a light brown- yellow silt/sand laminations.

4.9.3 Near the centre of the trench, [1007] was a similar east-west aligned linear feature, measuring 0.38m in depth and 2.81m in width. Fills consisted of a primary fill of dark brown sandy silt (1010), containing moderate organic remains (this fill was bulk sampled), covered by upper fill (1008), comprising light yellowish-brown sand with regular well-defined silty sand laminations. This feature appeared to be a warp drain.

4.9.4 Neither of these features corresponded closely to the geophysical survey, as no linear features were indicated where [1005] was found, and [1007] was positioned in the approximate location of a geophysical anomaly, but lacked the curvilinear nature of the feature indicated by the survey. Moreover, a further possible feature that the survey suggested would be present in the southern end of the trench could not be found.

4.10 **Trench 11 (Plate 5)**

4.10.1 Trench 11 was present in the centre/centre western part of the Site, running northeast-southwest. Natural sands were overlain by peat deposit (1102), measuring 0.09-0.24m in thickness, in turn covered by agricultural topsoil.

4.10.2 Geophysical data identified the potential for four linear features to be present in this part of the Site, but only two linear features were identified. The north/northwest-south/southeast aligned cut [1005] measured 4.10m in width by 0.68m in depth and truncated peat deposit (1102). It contained a single fill (1105), composed of light brownish-yellow sand with regular well-defined silt laminations. This feature

corresponded with geophysical data, and was provisionally identified as a warping channel/drain. The other feature was a modern field drain, which did not appear on the geophysical survey.

4.11 **Trench 12 (Plates 6, 7)**

4.11.1 Trench 12 was situated in the centre of Area 1. Natural sands were overlain by peat (1202), measuring 0.26-65m thick (which was column/bulk sampled). Geophysical survey indicated the presence of three linear features, of which all were identified. These consisted of two probable warp drains, [1205], [1209] and a field drain. Feature [1205] was north-south aligned and measured 1.52m in width and 0.25m in depth. Feature [1209] was of a similar nature and orientation. The associated fills of both features consisted of repeated laminations of sand/ silty sand. Geophysical data implies that [1205] and [1209] met as they headed north. The other linear feature found was a field drain.

4.11.2 Agricultural topsoil (1201) completed the sequence.

4.12 **Trench 13**

4.12.1 Trench 13 was situated in the north-east corner of Area 1 and ran north-south. The sequence in-section consisted of natural sands, overlain by peat (1302), 0.17m thick, covered by agricultural topsoil. Geophysical survey indicated the presence of one linear east-west aligned feature, which was located in the trench and was established to be a modern land drain.

4.13 **Trench 15**

4.13.1 Trench 15 was situated towards the east of Area 1 and was aligned east-west. The sequence in-section was similar to Trench 13, although here the peat (1502) measured 0.26m thick. Geophysical survey indicated the presence of one linear north-south feature, which was established as a modern land drain.

4.14 **Trench 16 (Plate 8)**

4.14.1 Trench 16 was situated towards the east of Area 1, and ran east-west. At its base were natural sands, overlain by a 0.19m thick layer of peat (1602). Geophysical data indicated a possible weak linear continuation from Trench 12, which was found as [1604]. This feature was more substantial than the survey suggested, and is again likely a warping channel/drain. It measured 3.24m in width and 0.41m in depth and cut through the peat and sands. It contained a single fill (1605), a light yellow- brown formed from repeated silt/sand laminations.

4.15 **Trench 19 (Plate 9)**

4.15.1 Trench 19 was present in the south-western corner of Area 1. Much of the upper sequence had been removed by a modern tip for demolition waste, (1901). Limited amounts of peat (1902) survived, measuring less than 0.20m in section, but as with elsewhere on the Site were seen to overlay natural sands.

4.15.2 No geophysical data was recorded for this part of the Site, but three east-west aligned linear features were uncovered: [1906], [1910], and [1912]. Linear feature [1906] measured 1.44m at its greatest width and was 0.46m in depth. Associated fills consisted of a lower dark silty sand layer (1907), overlaid with (1908) a light bluish grey clayey silt.

4.15.3 Linear feature [1909] was more heavily truncated by the demolition event, but from the remaining section of feature it could be seen to have a dark silty sand basal fill (1910) and a light brownish grey silty clay upper fill (1911).

4.15.4 Linear feature [1912] measured at least 1.34m with a depth of 0.37m. The feature contained a marginally more complex fill sequence. Working downwards stratigraphically, (1915) was visually and in composition identical to (1908) and (1911). This overlaid a narrow lens of mid-greyish brown silty clay (1914). At the base was another dark silty sand fill (1913)

4.15.5 Environmental samples were taken from the lower organic fills of [1906] and [1912]

4.15.6 No concrete evidence for usage of these features was determined, but they are provisionally assumed to represent land drainage of undetermined date, pending environmental sample analysis.

4.16 **Trench 27 (Plates 10, 11)**

4.16.1 Trench 27 was located in the north-western corner of Area 2, on the far side of the goods road. Due to the presence of a nearby field drain, this trench was moved some 28m to the west of its original agreed location. Geophysical data indicated the presence of a single, north-south aligned feature, which was located in the trench and recorded as [2705]. This feature measured 2.30m in width and 0.08 in depth. Its lower fill (2706) consisted of a mix of alluvial and redeposited peat (2706) and was covered by upper fill (2707), composed of mid grey brown laminated silt and sand. This feature may represent a field boundary/drainage predating the post-medieval warping deposits.

4.16.2 A further cut feature was found to the west of [2705] but was not seen on the geophysical survey. It was recorded as [2708] and was interpreted as a wrap channel/drain. It did not have clear profile/ heading defined, due to the angle at which it appears within the excavation.

4.17 **Trench 28**

4.17.1 Trench 28 was located in the centre-north corner of Area 2, on the far side of the goods road. Natural sands (2803) were overlain by peat, 0.06m thick and then by agricultural topsoil. One north-south feature was identified within this part of the Site by the geophysical survey, this was established as a land drain.

4.18 **Trench 32 (Plates 13)**

4.18.1 Trench 32 ran northwest-southeast to the north-centre of Area 2. Geophysical findings indicated the presence of a single north-south aligned linear feature, which was located in the trench and recorded as [3206]. This feature measured 2.40m in width and 0.6m in depth. It contained three distinct fills, consisting of basal fill (3212), a dark grey-brown mixed sand/silt with frequent organics, covered by (3208), a mottled mid grey brown sand with remains of redeposited peat substance, with upper fill (3202), completing the sequence. This latter fill resembled the warping deposits.

4.18.2 A further, truncated, linear feature was found running parallel to [3206], and was recorded as [3210]. A total width of 1.34m and depth of 0.17m survived. The fill consisted of a light brown yellow sand mixed with the occasional lump of sandy peat substance. No clear usage could be identified.

4.19 **Trench 33**

4.19.1 Trench 33 ran north-south, and was situated in the north-centre of Area 2. In-section recording showed a peat layer at its base, less than 0.1m thick on average, covered by an alluvial layer, some 0.16m thick, representing possible remains of warp flooding. Agricultural topsoil completed the sequence.

4.19.2 Geophysical data indicated the possible presence of two east-west aligned linear features, neither of which could be identified in the trench.

4.20 **Trench 34**

4.20.1 Trench 34 was present in the north-east corner of area 2, running east-west. It contained very narrow band of peat (3402) at its base covered agricultural topsoil.

Geophysical evidence suggested the presence of a single linear, which was identified in the trench as a land drain.

4.21 **Trench 35**

4.21.1 Trench 35 was present in the east corner of Area 2, running north-south. It contained Agricultural topsoil, and a band of peat (3502). Geophysical evidence suggested two linear readings, both of which were found to be land drains.

4.22 **Trench 36 (Plates 13, 14)**

4.22.1 Trench 36 was located near the centre of Area 2 and ran on a northwest-southeast alignment. Geophysical survey indicated the possible presence of three features. Two of these were clearly located, and an additional feature was identified.

4.22.2 Linear feature [3607] ran on a north-south alignment, but its full dimensions were uncertain as it was truncated by another linear feature, [3605]. Its single fill (3612) consisted of a light brown yellow sand mixed with the occasional lump of sandy peat substance. No clear usage could be determined.

4.22.3 Linear feature [3605] measured 1.8m in width, 0.76m in depth and ran roughly north-south. This likely indicated a continuation of [3206]. The primary fill was a mottled, light-yellow sand with peat inclusions, most likely a result of redeposition. A small light brown-yellow laminated silty/sand fill was noted overlaying (3611). This was assumed to be the result of warp flooding infilling what remained of the ditch.

4.22.4 The other feature found in the trench, not identified by the geophysics, was a large north-south aligned ditch, [3606]. It measured 2.72m wide and 0.94m in depth. Associated fills were a primary fill (3614) of mid, reddish-brown silty sand with moderate organics (which was bulk sampled), covered by an upper fill of mid orange-brown silty sand. A timber was located in the section. It was badly degraded and could not be species-identified, but showed with no indication of having been worked. This feature was provisionally identified as a field boundary/drainage predating the post-medieval warping deposits.

4.23 **Trench 37**

4.23.1 Trench 37 was aligned northeast-southwest, and was located along the western edge of Area 2. A similar sequence to other trenches, of natural sands covered by peat and then agricultural topsoil, was observed. Neither of the two potential features suggested to be present by the geophysical survey could be found.

4.24 **Trench 38**

4.24.1 Trench 38 was aligned north-south, and was located along the western side of Area 2. Neither of the two potential features suggested by the geophysical survey could be found, but a field drain was present.

4.25 **Trench 41**

4.25.1 Trench 41 was present along the western edge of Area 2. It contained a notable depression to the natural sands which had infilled with a peaty substance, measured at 1.65m at lowest depth. Only two field drains were present.

4.26 **Trench 42**

4.26.1 Trench 42 ran on a northwest-southeast alignment, and was located in the south-western corner of Area 2. The linear feature present on the geophysical survey was identified and found to be a field drain.

4.27 **Trench 43 (Plate 16)**

4.27.1 Trench 46 was situated in the south-central section of Area 2. It contained a thick warp deposit up to 0.56m in thickness. Geophysical survey had indicated the possibility of a series of intersecting features. An assumed warp drain [4305] was found, but this did not clearly match the geophysical data.

4.27.2 Feature [4305] did not have clear profile/ heading defined, due to the angle at which it appeared within the excavation. Its maximum depth was 0.54m, though rapidly rising groundwater hindered excavation. The associated fill (4306) was a light red-yellow with fine silt/sand laminations identical to the upper warp deposits.

4.28 **Trench 44 (Plate 15)**

4.28.1 Trench 44 ran on a northeast-southwest alignment, and was situated in the south-central of part of Area 2. Deposits in section indicted warp flooding measuring some 0.19m thick, along with peat at least 0.16m thick. Three potential features were identified in the geophysical data, of which two were clearly identified. One as a field drain, the other was a linear feature recorded as [4404].

4.28.2 Feature [4404] measured 0.90m wide and 0.41m in depth. It contained a darker basal fill (4407), covered by upper mixed silty sand (4406). Provisionally assumed to represent a pre-warping land drainage/ boundary ditch.

4.29 **Trench 46**

4.29.1 Trench 46 was situated in the south-central section of Area 2. Geophysical survey indicated an undetermined signature, this was identified as a damaged field drain.

## 5. DISCUSSION OF ARCHAEOLOGICAL FINDINGS

5.1.1 The vast majority of the archaeological features identified during the trenching excavation related to the post-medieval process of flood warping. The stratigraphy for Area 2 in particular showed an undulating layer of the sediment formed during the warping process. Features identified in Trenches 01, 04 ,11, 12 and 16 offer clear examples of the practical methods utilised to this end. These could either be channels for bringing in river water or return drains to remove excess fluid. Less well-defined instances were also found in Trenches 43 and 27.

5.1.2 Further linear features were identified in Trenches 19, 27, 32, 36 and 44. These features may indicate pre-existing field boundaries/drainage relating to land use before the warping process. No dates were established on-site, pending the findings from environmental sampling.

5.1.3 All identified features clearly post-date the formation of the peat throughout site, having been cut into this deposit.

## 6. GEOARCHAEOLOGICAL FINDINGS *by Richard Lowther*

### Overview of samples retained

6.1 The trench evaluation comprised the pulling of forty-six trenches within two areas (22 in Area 1, 24 in Area 2; Figures 1-5). Through onsite inspection, consultation with the geophysical data, and the county archaeologist, five column samples with associated bulk samples were retrieved across both areas for further paleoenvironmental assessment and radiocarbon dating (Table 1; Appendix 2). These samples were predominantly collected within hollows of the natural sand whereby organic sediment accumulation is provisionally considered to represent the greatest thickness of this unit across the site. Column samples from Area 2 (ES 01, 05, and 07) were derived from an area attributed as natural spread on the geophysical record (York Archaeology, 2022).

Table 1: Summary of column and bulk samples recovered and their approximate location. GPS locations for these samples are not available at this stage and will be provided in the full report. Approximate locations are also provided on Figures 1-5.

| Trench No. | Colum and Bulk sample number | Approx. location within trench | Total Column thickness (m) | Approx. peat thickness (m) | OSL Sample? |
|---|---|---|---|---|---|
| TR06 | ES 12, 11 | Northern | 0.43 | 0.25 | No |
| TR12 | ES 14, 15 | Central | 0.50 | 0.40 | No |
| TR41 | ES 07, 08 | Central | 0.50 | 0.34 | No |
| TR45 | ES 01, 03 | Southern | 0.41 | 0.33 | Yes |
| TR46 | ES 05, 06 | Central | 0.50 | 0.42 | No |

Table 2: Summary of test pits completed across Area 1

| Trench of test pit | Location (end of trench) | Maximum Depth (m BGL) |
|---|---|---|
| TR02 | Southern | 3.00 |
| TR05 | Eastern | 2.60 |
| TR08 | Northern | 2.90 |
| TR11 | South-western | 2.80 |
| TR12 | Western | 2.80 |
| TR13 | Southern | 3.40 |
| TR14 | Northern | 2.80 |
| TR26 | Eastern | 2.70 |

Table 3: Summary of test pits completed across Area 2

| Trench of test pit | Location (end of trench) | Maximum Depth (m BGL) |
|---|---|---|
| TR31 | Southern | 2.30 |
| TR32 | North-western | 2.50 |
| TR33 | Southern | 1.80 |
| TR34 | Eastern | 2.10 |
| TR37 | South-western | 3.10 |
| TR39 | Western | 3.50 |
| TR43 | Northern | 1.80 |

| | | |
|---|---|---|
| TR44 | Eastern | 1.90 |

## Lithology and initial discussion of deposits

### *Sutton Sands*

6.2 The basal deposits of each trench predominantly consisted of yellow/white occasionally mottled sands, likely representing the aeolian (wind-blown) Sutton Sand Formation (c. 10,700-9,950 years BP (Bateman *et al.* 2015). Slight variations in colour with the inclusion of dark brown/black blotches likely reflects the percolation of water from the peat into the natural sands. Undulations to the sand surface were visibly noticeable, for instance in TR12 and TR41, supporting the undulating profile modelled from the results of the hand auger survey (TPA 2021).

6.3 Test pits (Tables 2, 3) were carried out at a maximum of 25 trenches down to a maximum of 3m BGL (unless collapse) to discern any potential for buried land surfaces. No such archaeological features or artefacts were found. Slight variations of the colour of the sands could possibly represent the influence of weathered bedrock (reddish-brown Mercia Mudstone) or mineral deposition by water percolation. The deposits of sands continued below the limits of excavation, consistent with the large but variable (5-15m) thickness of the Sutton Sands demonstrated across the Lower Trent Valley (Lillie, 1998).

6.4 One OSL sample (ES02) was retrieved associated with the top of the sands adjacent to the base of TR45 column sample ES 01. The sample was retrieved to enable the possibility of discerning the potential of reworking of the sands during the Holocene as highlighted by the hand auger survey (TPA, 2021), with the site being part of a wide floodplain of the Lower Trent Valley. Due to water incursion, particularly within the deeper undulations of the sand surface where the associated column samples were taken, OSL samples were not retrieved in other areas. Nevertheless, the recovered

sample may provide a suitable indication of any potential reworking exhibited at the site which was not originally visible through on-site inspection.

**Organic silt-clay peat**

6.5 Overlying the sands within most of the trenches saw a thin but variable (c.0.05-0.40m) thick layer of dark brown (black) silt-clay peat. The peat from Area 2 differed in composition to Area 1, containing moderate-well humified organic material, compared to the frequent bark, wood, and reed fragments within the peat of Area 1. The peat from Area 2 also lacked the indicative strong organic odour usually indicative of peatland environments which may initially suggest that the unit has partially dried out through loss of/intermittent waterlogging. This finding likely accords with the water management of the site (numerous post-Medieval/Modern field drains and boundary ditches) to support agricultural practices through to the present.

6.6 In contrast to Area 1, the deposits displayed moderate to well humified organic material. Only very occasional preserved root fragments were found across the 24 trenches which may further support an initial interpretation of loss of waterlogging and resulting wood degradation. These potential existing impacts to the peat can be further determined through the preservation of pollen grains analysed by a palynologist amongst producing the pollen record for the site.

6.7 The peat from Area 1 displayed numerous preserved tree stumps, trunks, and bark fragments, from which samples have been retained. These are tentatively assessed as *Pinus* (Pine) wood and *Betula* (Birch) bark. Such interpretations along with the identification of the numerous other wood samples retrieved (Appendix 2) will be verified by an in-house archaeobotanist in due course. Such macrofossil samples enable an understanding of the evolution of peatland development through time. It may be initially suggested that the peat surface dried at a point in time to an extent to possibly allow for woodland development at this area of the site. More acute changes to the peat stratigraphy may be later seen through the geoarchaeological assessment of the column samples (ES 12 TR06, and ES 14 TR12). The finding of preserved reed fragments suggests a change of local landscape to/from an open fenland/marshland during one time of Area 1's history.

6.8 The peat stratigraphically overlies the early Holocene (Early Mesolithic) Sutton Sands, and is predominantly overlain by Modern alluvial 'warp'. As a result, this unit may have developed across multiple archaeological cultural periods. Despite finding no archaeological remains within the trenches, bulk sediment samples taken in conjunction with the column samples (ES 12 TR06, and ES 14 TR12) may yet recover

archaeological artefacts and ecofacts given the former peatland landscape would have provided a rich environment and resource for exploitation by potential settlers. Palaeoenvironmental analysis and radiocarbon dating of the organic sediments or macrofossils recovered from the column samples will assess the archaeological significance of these samples in due course.

**Fine-grained Alluvium**

6.9 Occasionally overlying the peat deposits saw a varying thickness (c. 0.05-0.30m) of fairly stiff light grey brown silt-clay alluvium. This homogenous silt-clay unit is predominantly of greater thickness than the similar composition silt-clay material deposited in laminations seen within the overlying warp, suggesting the two deposits may be separate units. It is suggested that the unit represents the gradual accumulation of fine-grained overbank alluvium as part of flooding events. The boundary between the upper peat and lower alluvium was often sharp, demonstrating the complete loss of peat development at the site. The significance of this finding will be assessed following the palaeoenvironmental analysis and radiocarbon dating to suggest a likely forcing method (potentially human induced) for this sharp sediment transition.

**Alluvial 'warp'**

6.10 Where peat deposits were found, a varying (c. 0.10-0.50m) thickness of laminated fine sands and clay-silt were experienced in the majority of the trenches. The unit is attributed as alluvial 'warp', an artificially induced deposit derived from the settling of material from suspension following repeated deliberate flooding of areas. This practice originated in the Lower Trent Valley from the late 18$^{th}$ Century to the late 19$^{th}$ Century, and is recorded in multiple localities in the Isle of Axholme (Gaunt, 1994; Lillie, 1998; BGS, 2022). Slight variations of the composition and lamination thickness of the warp may relate to slight differences of an area's elevation and proximity to the former warp channels.

6.11 Area 2 displayed this unit across the majority of the trenches, in contrast to Area 1 which saw comparatively reduced visibility as a layer, but more defined presence adjacent to and as a fill of cut channels, those themselves interpreted as warping channels. In some instances, these cut channels filled with warp partially and occasionally fully truncate the peat deposits.

6.12 Similarly, to the boundaries found between the peat and the alluvial layers, the sharp

boundary between the peat and the overlying warp demonstrates a local landscape change from a natural waterlogged peatland to the artificially raised and drained agricultural fields seen at present. Instances where warp deposits were of minor thickness and/or absence may reflect the unit's partial or full truncation by modern agricultural ploughing or industrial land clearance, or an area's relative location outside the warping enclosures. Where peat and warp were absent in Area 1 it is likely that this is a result of truncation during the removal of industrial landfill which formerly covered the entire area. No below ground contamination relating to the site's use for landfill was encountered by the trenching or the previous borehole survey. This would suggest that any potential peat or warp deposits were removed when the landfill was cleared. Dumps of rubble material found in the southern part of Area 1 are likely to relate to the site's use as a storage facility for materials and waste during construction of the power station.

**Made Ground**

6.13 In Trench 21, both the peat and warp deposits are absent which may relate to their full truncation and the creation of a made ground surface containing various industrial materials. Trench 19 also saw a unit of made ground which also contained archaeological features.

**Topsoil**

6.14 The sediment sequence is capped by a fairly thick topsoil (*c* 0.40-0.50m). Only very occasionally was a subsoil identified, suggesting the predominant mixing of the two soil horizons by agricultural means. It is likely that any archaeology within this horizon is scattered across the site. Apart from the occasional residual modern pot seen on the surface of the ploughed fields of Area 2, no archaeological remains were recovered from this unit. The highly oxidised nature of the unit has low preservation potential for organic remains.

**Proposed palaeoenvironmental assessment**

6.15 A programme of range-finder radiocarbon dating and palynological assessment will be shortly underway from some of the samples noted in Table 1. It is hoped that this data will help to better constrain the chronological framework and palaeoenvironmental history for the evolution of the site situated on the Lower Trent Valley floodplain. The proposed assessment allows for a refined evaluation of the archaeological and geoarchaeological findings to a suite of potential research objectives set out in the East Midlands Historic Environment Research Framework (Knight, Vyner, and Allen, 2012). In addition, the findings will be discussed with those

from previous reports (i.e. Headland, 2018), providing an updated history of the site area.

6.16 At this stage, the preservation of the palaeoenvironmental proxies (i.e pollen) within the waterlogged organic samples is unknown. Should these be found to be poor through specialist assessment, further sample extraction in alternative areas may be recommended to collect improved sequences. In addition, more defined targets for future sampling may be recommended following the results of the full report.

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## APPENDIX 1: PLATES

Plate 1: Feature [0105], looking south

Plate 2: Feature [0405], looking northwest

Plate 3: Feature [1005]

Plate 4: Feature [1007], looking east

Plate 5: Feature [1105], looking east

Plate 6: Feature [1206], looking north

Plate 7: Feature [1209], looking north

Plate 8: Feature [1604], looking north

Plate 9: Features [1906], [1910] and [1912], looking east

Plate 10: Feature [2705], looking north

Plate 11: Feature [2704], looking northeast

Plate 12: Features [3206] and [3210]

Plate 13, Feature [3605], looking north

Plate 14: Feature [3606], looking northwest

Plate 15: Feature [4404], looking southwest

Plate 16: Feature [4305], looking north

## APPENDIX 2: SAMPLE REGISTER

| Sample no. | Trench no. | Context type | Sample size | No. buckets | % context | Reason for sampling | Further sheet? |
|---|---|---|---|---|---|---|---|
| 01 | 45 | Column | 1x 0.41m L column | / | >1% | C14, Microfossils | Y |
| 02 | 45 | OSL | 1 tube | / | >1% | OSL dating | N |
| 03 | 45 | Bulk from ES 01 | X3 10L | 3 | >1% | Waterlogged | |
| 04 | 45 | Moisture control for ES 02 | 1 small bag | / | >1% | OSL dating | N |
| 05 | 46 | Column | 1x 0.5m L column | / | >1% | C14, Microfossils | Y |
| 06 | 46 | Bulk from ES 05 | X4 10L | 4 | >1% | Waterlogged | |
| 07 | 41 | Column | 1x 0.5m L column | / | >1% | C14, Microfossils | Y |
| 08 | 41 | Bulk from ES 07 | X4 10L | 4 | >1% | Waterlogged | |
| 09 | 27 | Bulk of [2705] | 10L | 1 | >1% | Dating | |
| 10 | 36 | Wood from [3606] | 1 large bag | / | >1% | Species ID | |
| 11 | 06 | Bulk from ES 12 | X3 10L | 3 | >1% | Waterlogged | |
| 12 | 06 | Column | 1x 0.42m L column | / | >1% | C14, Microfossils | Y |
| 13 | 12 | Bulk from ES 14 | X3 10L | 3 | >1% | Waterlogged | |
| 14 | 12 | Column | 1x 0.52m L column | 1 | >1% | C14, Microfossils | Y |
| 15 | 10 | Bulk | <10L | 1 | >1% | Dating | |
| 16 | 32 | Bulk | <10L | 1 | >1% | Dating | Y |
| 17 | 19 | Bulk of [1912] | <10L | 1 | >1% | Dating | |
| 18 | 19 | Bulk of [1906] | <10L | 1 | >1% | Dating | Y |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19 | 06 (from ES 11 1/3) | Grab. Assoc. ES 12 | 1 bag | / | >1% | C14, species ID | N |
| 20 | 06 (from ES 11 2/3). | Grab. Assoc. ES 12 | 1 bag | / | >1% | C14, species ID | N |
| 21 | 09 from (0903) | Grab | 1 bag | / | >1% | C14, species ID | N |
| 22 | 12 (from 1204). | Grab Assoc. ES 14 0.22-0.23m | 1 bag | / | >1% | C14, species ID | N |
| 23 | 02 from (0204) | Grab. | 1 bag | / | >1% | C14, species ID | N |
| 24 | 12 from (1204). | Grab. Assoc. ES 14 0.35-0.38m | 1 bag | / | >1% | C14, species ID | N |
| 25 | 12 from (1204). | Grab | 1 bag | / | >1% | C14, species ID | N |

# APPENDIX 3: FIGURES