

The Keadby 3 Low Carbon Gas Power Station Project

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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 Volume II - Appendix 16A: Population and Health Signposting

The Planning Act 2008

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

Applicant: Keadby Generation Limited

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GLOSSARY

| Abbreviation | Description |
|---------------------|---|
| AIL | Abnormal Indivisible Load |
| ALARP | As Low As Reasonably Practicable |
| AOD | Above Ordnance Datum |
| BAT | Best Available Techniques |
| BPM | Best Practicable Means |
| CCG | Clinical Commissioning Group |
| CCGT | Combined Cycle Gas Turbine |
| CCP | Carbon Capture Plant |
| CDG | Carriage of Dangerous Goods |
| COSHH | Control of Substances Hazardous to Health |
| CTMP | Construction Traffic Management Plan |
| CEMP | Construction Environmental Management Plan |
| CWTP | Construction Workers' Travel Plan |
| DCO | Development Consent Order |
| DECC | Department of Energy and Climate Change |
| DEMP | Decommissioning Environmental Management Plan |
| EIA | Environmental Impact Assessment |
| ELV | Emission Limit Value |
| EMF | Electromagnetic Field |
| ENA | Energy Networks Association |
| ES | Environmental Statement |
| GPP | Guidance for Pollution Prevention |
| HGV | Heavy Goods Vehicle |
| HSE | Health and Safety Executive |
| ICNIRP | International Commission on Non-Ionizing Radiation Protection |
| IED | Industrial Emissions Directive |
| JSNA | Joint Strategic Needs Assessment |

| Abbreviation | Description |
|---------------------|---|
| kV | Kilovolt |
| LSOA | Local Super Output Area |
| MHCLG | Ministry of Housing, Communities and Local Government |
| NDMA | N-nitroso-dimethylamine |
| NGET | National Grid Electricity Transmission |
| NHS | National Health Service |
| NLC | North Lincolnshire Council |
| NPPF | National Planning Policy Framework |
| NPS | National Policy Statement |
| NSR | Noise Sensitive Receptor |
| PCC | Power and Carbon Capture |
| PEI | Preliminary Environmental Information |
| PINS | Planning Inspectorate |
| PHE | Public Health England |
| PPG | Pollution Prevention Guidance |
| SWMP | Site Waste Management Plan |
| TTWA | Travel to Work Area |
| UV | Ultraviolet |
| WHO | World Health Organisation |
| μT | Microtesla |

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1.0 POPULATION AND HEALTH SIGNPOSTING

1.1 Introduction

1.1.1 This Appendix addresses the potential effects of the Proposed Development on human health including wellbeing. This assessment is predominantly a summary document, highlighting key aspects of the technical assessments completed and presented elsewhere in the Environmental Statement (ES) Main Report (ES Volume I - **Application Document Ref. 6.2**) in so far as they relate to impacts and effects on human health and wellbeing and in particular, the following chapters (ES Volume I - **Application Document Ref. 6.2**):

- **Chapter 8:** Air Quality;
- **Chapter 9:** Noise and Vibration;
- **Chapter 10:** Traffic and Transport;
- **Chapter 12:** Water Environment and Flood Risk;
- **Chapter 13:** Geology, Hydrogeology and Land Contamination;
- **Chapter 14:** Landscape and Visual Amenity; and
- **Chapter 16:** Socio-economics.

1.1.2 The chapters draw upon the findings presented in their supporting Appendices (ES Volume II – **Application Document Ref. 6.3**). No figures are produced specifically for this Appendix; rather figures produced for the purposes of other technical chapters of the ES have been referenced. These are provided in ES Volume III - **Application Document Ref. 6.4**.

1.1.3 An assessment of the Major Accidents and Disasters that have the potential to arise during the construction and operation of the Proposed Development can be found in **Chapter 18: Major Accidents and Disasters** (ES Volume I – **Application Document Ref. 6.2**).

1.2 Legislative Context

Legislative Background

1.2.1 Health is defined by the World Health Organisation (WHO) (2020) as:

“a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.”

1.2.2 The EIA Directive 2014 (Directive 2014/52/EU of the European Parliament and of the Council) and Section 5(2)(a) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 provide the legislative background regarding the assessment of the effects of certain public and private projects on the environment. These specifically include a requirement that the Environmental Impact Assessment (EIA) must identify, describe and assess in

an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on population and human health.

1.2.3 The effects on population and health that have been considered in the ES (ES Volume I – **Application Document Ref. 6.2**) including relevant legislation relating to each of these topics, are presented in the respective chapters and summarised here.

1.2.4 Electro Magnetic Field (EMF) effects must be controlled in accordance with the Control of Electromagnetic Fields at Work Regulations 2016, which sets out how employers must make and implement action plans to ensure compliance with the defined exposure limits (in Part 2 of the Schedule).

1.2.5 Regulation 7(2) states:

“The action plan must include consideration of, where relevant—

(a) other working methods that entail lower exposure to electromagnetic fields;

(b) replacement equipment designed to reduce the level of exposure;

(c) technical measures to reduce the emission of electromagnetic fields, including, where necessary, the use of interlocks, screening or similar health protection mechanisms;

(d) demarcation and access control measures;

(e) maintenance programmes for work equipment, workplaces and workstation systems;

(f) the design and layout of workplaces and workstations;

(g) limitations on the duration and intensity of exposure; and

(h) the availability of suitable personal protective equipment.”

Planning Policy Context

National Planning Policy

1.2.6 Given that this chapter is predominantly a summary document, the planning policy related to population and health impacts is presented in each of the technical chapters as described above and in **Chapter 7: Legislative Context and Planning Policy** (ES Volume I - **Application Document Ref. 6.2**).

1.2.7 The Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (DECC) (DECC, 2011a) begins by describing the process of sustainability appraisal that the Policy Statement was subject to. In relation to positive effects of energy policy for health, EN-1 states:

“The energy NPSs are likely to ... have positive effects for health and well-being in the medium to longer term, through helping to secure affordable supplies of energy and minimising fuel poverty; positive medium and long term effects are also likely for equalities.”

1.2.8 EN-1 also recognises that energy infrastructure can have negative effects for health, stating:

“There may also be cumulative negative effects on water quality, water resources, flood risk, coastal change and health at the regional or sub-regional levels depending upon location and the extent of clustering of new energy and other infrastructure. Proposed energy developments will still be subject to project level assessments, including Environmental Impact Assessment, and this will address locationally specific effects.”

1.2.9 Section 4.13 of EN-1 makes clear that:

“Energy production has the potential to impact on the health and well-being (“health”) of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the production, distribution and use of energy may have negative impacts on some people’s health ... Direct impacts on health may include increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in pests.”

1.2.10 EN-1 also recognises that:

“Open spaces, sports and recreational facilities all help to underpin people’s quality of life and have a vital role to play in promoting healthy living...Green infrastructure ... a network of multi-functional green spaces, both new and existing, both rural and urban, ... is integral to the health and quality of life of sustainable communities.”

1.2.11 The NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (DECC, 2011b) also begins by describing the process of sustainability appraisal that the Policy Statement was subject to. In relation to health and wellbeing, EN-21 states:

“Through supporting the transition to a low carbon economy, EN-2 is considered likely to have positive effects on the Economy and Skills, and Health and Well-being as secondary benefits and positive effects in the medium/long term on climate change. However, these positive effects are uncertain because of the need to demonstrate viability of CCS”.

1.2.12 The NPS adds:

“There are also likely to be some negative effects on Air Quality and Well-being, given the link between air quality and public health.”

1.2.13 The NPS for gas supply infrastructure and gas and oil pipelines (EN-4) (Section 2.4) sets out the regime for managing hazardous substances and role of the

Health and Safety Executive (HSE) in advising on risks taking into account the local population.

- 1.2.14 The National Policy Statement for Electricity Networks Infrastructure (EN-5) (DECC, 2011c) provides specific policy in relation to electro-magnetic fields (EMF) resulting from electricity networks and their known and potential effects on health, stating:

“All overhead power lines produce EMFs, and these tend to be highest directly under a line and decrease to the sides at increasing distance. Although putting cables underground eliminates the electric field, they still produce magnetic fields, which are highest directly above the cable (see para 2.10.12). EMFs can have both direct and indirect effects on human health. The direct effects occur in terms of impacts on the central nervous system resulting in its normal functioning being affected. Indirect effects occur through electric charges building up on the surface of the body producing a microshock on contact with a grounded object, or vice versa, which, depending on the field strength and other exposure factors, can range from barely perceptible to being an annoyance or even painful.”

- 1.2.15 NPS EN-5 makes reference to health protection guidelines for public and occupational exposure which are further discussed below (see ‘Other Guidance’).

- 1.2.16 The National Planning Policy Framework (NPPF) (MHCLG, 2019), described within other ES technical chapters (ES Volume I – **Application Document Ref. 6.2**) contains policies that are relevant at a national level and are supported and expanded upon by the ‘Planning Practice Guidance’, which is regularly updated.

- 1.2.17 Paragraph 5 of the NPPF makes it clear that the document does not contain specific policies for Nationally Significant Infrastructure Projects (NSIP) such as the Proposed Development and that applications in relation to NSIP are to be determined in accordance with the decision making framework set out in the Planning Act 2008 and relevant NPS, as well as any other matters that are considered relevant. The NPPF and the Planning Practice Guidance are matters which the Secretary of State is likely to consider both important and relevant to his decision on any Development Consent Order (DCO) application for the Proposed Development.

- 1.2.18 Policies of particular relevance to the scope of this chapter are those described in the relevant technical chapters (e.g. promoting sustainable transport as described in **Chapter 10: Traffic and Transport** (ES Volume I - **Application Document Ref. 6.2**)), but more specifically, Part 8 of the NPPF relates to promoting healthy communities. It states that:

“Planning policies and decisions should aim to achieve healthy, inclusive and safe places Access to a network of high quality open spaces and opportunities for sport and physical activity is important for the health and well-being of communities.”

1.2.19 Paragraph 180 goes on to state that:

“to prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health should be taken into account”.

Local Planning Policy

1.2.20 Local planning policy relevant to population and health is as described within chapters that consider emissions to air (**Chapter 8: Air Quality**), noise and vibration (**Chapter 9: Noise and Vibration**), traffic (**Chapter 10: Traffic and Transport**), water (**Chapter 12: Water Environment and Flood Risk**), land quality/contamination (**Chapter 13: Geology, Hydrogeology and Land Contamination**), visual amenity/neighbourhood (**Chapter 14: Landscape and Visual Amenity**) and socio-economics (**Chapter 16: Socio-economics**) (ES Volume I - **Application Document Ref. 6.2**).

1.2.21 North Lincolnshire Council (NLC) (2016) has produced supplementary planning guidance on how health implications of new developments should be considered. *Planning for Health and Wellbeing* (2016) forms part of the Local Development Framework and is strategically linked to North Lincolnshire’s Health and Wellbeing Strategy (2016) and North Lincolnshire’s Joint Strategic Assessment (2018).

Other Guidance

1.2.22 To prevent the known adverse health effects of EMF, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) developed health protection guidelines in 1998 (ICNIRP, 1998) for both public and occupational exposure which have been taken into account in assessing the potential for health effects related to EMF.

1.3 Assessment Methodology and Significance Criteria

Consultation

1.3.1 The consultation undertaken with statutory consultees to inform this Appendix is summarised in Table 1, below.

Table 1: Summary of Consultation

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------------------|---|---|--|
| Planning Inspectorate | EIA Scoping Opinion for the Proposed Development (June 2020). | In Section 4.9 Socio-Economics, ID 4.9.4 relates to inequalities. The Planning Inspectorate stated that the local area has indices of multiple deprivation amongst the 30% most deprived in the country and that the ES should consider how the development might impact local inequality, including health inequality. | Consideration has been given as to how the development might impact local inequalities, including health inequalities within this Appendix. Chapter 16: Socio-economics (ES Volume I – Application Document Ref. 6.2) has assessed the major beneficial effects related to job opportunities generated during the construction of the Proposed Development and describes the positive socio-economic impacts in the Scunthorpe Travel to Work Area (TTWA) and surrounding areas, which have the potential to reduce local inequalities. Additional mitigation opportunities for skills and training within local communities are identified in |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------------------|---|---|---|
| | | | Chapter 16: Socio-economics (ES Volume I – Application Document Ref. 6.2). |
| Planning Inspectorate | EIA Scoping Opinion for the Proposed Development (June 2020). | In Section 4.11 Population and Human Health, ID 4.11.1, the Planning Inspectorate agrees that a standalone population and human health chapter is not required but welcomes a proposed signposting document to summarise the results of the assessment and determine combined effects on health receptors. The Planning Inspectorate notes that where significant effects to human health receptors are likely, a full assessment with relevant methodology should be included. Proposed mitigation measures supporting the conclusion to the assessment should be included in the relevant ES chapter. | This Appendix provides a summary of key information, assessments, proposed mitigation measures and residual health-related effects described elsewhere in the ES. No significant residual adverse effects on human health are predicted in this ES. |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------------------|---|---|---|
| Planning Inspectorate | EIA Scoping Opinion for the Proposed Development (June 2020). | In Section 4.11, Population and Human Health, ID 4.11.2, the Planning Inspectorate notes that the ES should clarify the extent to which EMF has been considered and significant effects from EMF should be assessed in the ES as necessary. | Risks associated with EMF have been considered in this Appendix. Information on EMF risks was gathered from the Electric and Magnetic Fields and Health website, and ICNIRP guidelines were used as the reference for the recommended limits of exposure. |
| Planning Inspectorate | EIA Scoping Opinion for the Proposed Development (June 2020). | In Section 4.11, Socio-Economics, ID 4.9.5, the Inspectorate notes the ES should assess any significant impacts on demand for healthcare as a result of an influx of workers during the construction stage. | Chapter 16: Socio-economics (ES Volume I - Application Document Ref. 6.2) assesses the potential for a significant influx of workers during the construction stage and associated effects. |
| Public Health England | January 2021 (Stage II Consultation / PEI Report) | It is recommended the public health impacts and mitigation from wastes arising from the development, their disposal and transport also be assessed and included in this application. | A Framework Construction Environmental Management Plan including Framework Site Waste Management Plan (Application Document Ref 7.1) accompanies the DCO Application and identifies risks |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|----------------------------------|---|--|
| | | <p>Further details and clarity are recommended in relation to electromagnetic fields (EMF). The assessment of public health impacts from EMFs has only looked at the operational stages. It is recommended that construction and decommissioning phases are also included.</p> <p>Further clarity regarding the location of potential electrical connections and the associated</p> | <p>associated with waste arising from construction of the Proposed Development Site, their disposal and transportation, and outlines impact avoidance and mitigation measures to minimise impacts upon public health.</p> <p>Risks associated with EMF have been considered in this Appendix. As a result of the type and location of the electrical connection and its distance from residential areas, effects during the construction and decommissioning phases will be neutral and no formal assessment of risks has been undertaken. Further detail and explanation of EMF has been included and Section 3.3 of this Appendix outlines measures to protect the occupationally EMF-</p> |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|-------------------------------|---|--|
| | | <p>132kV substation is recommended.</p> <p>The assessment does not acknowledge Red House and adjacent properties as receptors. Confirmation that these are not located within 50m of the new infrastructure is recommended, otherwise more details on the EMF levels should be provided.</p> <p>Uncertainties regarding the carbon capture process and equipment makes it difficult to assess the potential public human health impacts. We would welcome the inclusion of further details regarding the proposed technologies.</p> <p>Clearer and more accurate identification, reference and justification for selection of the</p> | <p>exposed occupation during those phases.</p> <p>The location of the potential electrical connection to the Northern Powergrid 132kV substation on Chapel Lane is shown on Figure 3.3 (ES Volume III - Application Document Ref. 6.4).</p> <p>The property 'Red House' has been demolished, as detailed in Chapter 3: The Site and Surrounding Area (ES Volume I - Application Document Ref. 6.2).</p> <p>Details of the carbon capture processes and technologies, are contained within Chapter 4 (ES Volume I - Application Document Ref. 6.2) and the Carbon Capture Readiness</p> |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|-------------------------------|---|---|
| | | <p>human health receptors in the assessments is recommended. Although human health receptors have been selected to be representative of residential dwellings in the area, consideration is needed for inclusion of Red House and adjacent properties which are in close proximity to the main site (noted to be adjacent to emergency vehicle access road), Roe Farm, and Scunthorpe Sea Cadets (youth group), which have not been acknowledged.</p> <p>It appears that gaps remain in the assessment of emissions from the proposed development and the cumulative impacts from nearby development/works, including the</p> | <p>Assessment (Application Document Ref 5.8).</p> <p>Within the assessments presented in the Preliminary Environmental Information Report and also in this ES (ES Volume I – Application Document Ref. 6.2), the results of assessments have been reported at the point of maximum impact, irrespective of the individual receptor locations. Roe Farm has been acknowledged in this Appendix as being the closest residential receptor to the existing National Grid 400kV Substation. However, it is confirmed that both Roe Farm and Scunthorpe Sea Cadets Boat Station are located more than 50m from the Proposed Development Site</p> |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|-------------------------------|--|--|
| | | <p>Keadby 2 development site and Keadby 1 Power Station.</p> <p>It is noted that future plans for Keadby 1 have not yet been confirmed, with options comprising either continued operation (subject to a new contract) or decommissioning followed by removal.</p> | <p>boundary and any new infrastructure proposed.</p> <p>The approach to the assessment of emissions from the proposed development and the approach to the assessment of cumulative impacts due to emissions is identified within Chapter 8: Air Quality (ES Volume I - Application Document Ref. 6.2) and within Appendix 8A (ES Volume II - Application Document Ref. 6.3). The framework CEMP (Application Document Ref. 7.1) will secure the required mitigation to ensure there are no significant effects beyond the site boundary during construction. Other schemes in the vicinity are required to ensure their own operations do not cause significant effects also, and it is</p> |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|-------------------------------|--|--|
| | | <p>In view of the proximity of residential properties to the water connection, discharge corridors, abnormal indivisible load route and permanent emergency access via Chapel Road; it is recommended that further details are included in each of the chapters regarding the nature of these and any potential impacts from the construction, operational and decommissioning phases.</p> | <p>considered that this provides a suitable level of protection.</p> <p>It is correct that future plans for the Keadby 1 Power Station have not yet been confirmed, with options comprising either continued operation (subject to a new contract) or decommissioning followed by removal. Potential cumulative impacts relating to other developments have been considered within Chapter 19: Cumulative and Combined Effects (ES Volume I - Application Document Ref. 6.2). However, the Applicant has confirmed that any future decommissioning and demolition of Keadby 1 would not take place at the same time as construction of the Proposed Development. As such, there is no potential for cumulative</p> |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|-------------------------------|-------------------------------|--|
| | | | <p>effects between the construction of the Proposed Development and concurrent demolition of Keadby 1 Power Station that are identified within this application. Similarly, Keadby 1 Power Station would not be operated at the same time as the Proposed Development and therefore no cumulative operational effects would arise. The future baseline presented within the assessments contained within this ES, including the landscape and visual amenity impact assessment in Chapter 14: Landscape and Visual Amenity (ES Volume I - Application Document Ref. 6.2) are based on the scenario that structures associated with Keadby 1 will remain on site. An additional future baseline scenario has been included in Chapter 14:</p> |

| Consultee | Method of Consultation (Date) | Summary of Consultee Comments | Summary of Response/How Comments Have Been Addressed |
|-----------|----------------------------------|----------------------------------|---|
| | | | <p>Landscape and Visual Amenity (ES Volume I – Application Document Ref 6.2) to assess a scenario where the structures associated with Keadby 1 Power Station have been removed.</p> <p>Potential impacts upon residential receptors surrounding the water connection, discharge corridors, abnormal indivisible load routes and permanent emergency access via Chapel Lane are detailed within the ES chapters and supporting appendices.</p> |

Impact Assessment and Significance Criteria

- 1.3.2 With the exception of effects relating to EMF, this Appendix summarises key information, assessments, proposed mitigation measures and residual health-related effects described elsewhere in the ES.
- 1.3.3 The methodologies for these assessments, including definition of study area, identification of receptors and their sensitivity, identification of impacts and their magnitude, and assessment of effects, are set out in the relevant technical chapters.
- 1.3.4 Standardised terminology is used to describe the relative significance of effects throughout this ES (unless stated otherwise in specific chapters). Effects are described as:
- adverse – detrimental or negative to a receptor or group;
 - beneficial – advantageous or positive effect to a receptor group;
 - neutral – imperceptible effects to a receptor group;
 - minor – slight, very short or highly localised effects of no significant consequence;
 - moderate – more than a slight, very short or localised effect (by extent, duration or magnitude), which may be considered significant; or
 - major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.
- 1.3.5 As outlined in **Chapter 2: Assessment Methodology** (ES Volume I - **Application Document Ref. 6.2**), for the purposes of this assessment, moderate and major effects are deemed ‘significant’.

Electromagnetic Fields

- 1.3.6 Electric fields are the result of voltages applied to electrical conductors and equipment which diminish rapidly from the source. Magnetic fields depend on electrical currents flowing, which vary according to the electrical power requirements at any given time, and which also diminish rapidly with distance from the source. EMFs arise from generation, transmission, distribution and use of electricity and therefore occur around infrastructure associated with electrical transmission.
- 1.3.7 Risks associated with EMF have been derived considering the advice provided by Public Health England (PHE) in their response issued with the EIA Scoping Opinion (**Appendix 1B** (ES Volume II - **Application Document Ref. 6.3**)). Additionally, the Electric and Magnetic Fields and Health website (www.emfs.info) has been used in order to gather information on EMF risks

associated with the types of infrastructure proposed. ICNIRP guidelines have been used as the reference for the recommended limits of exposure of the general public, following current Government policy.

1.3.8 The associated reference levels are summarised in Table 2, below:

Table 2: EMF Reference Levels

| Reference Levels | Electrical Field | Magnetic Field |
|-----------------------|------------------|----------------|
| Public exposure | 5 kV/ m | 100 μ T |
| Occupational exposure | 10 kV/ m | 500 μ T |

Source: ICNIRP, EMF guidelines, Health Physics 74, 494-522 (1998)

1.3.9 If people are not exposed to field strengths above these levels, direct effects on the central nervous system would be avoided and indirect effects would be limited. These reference levels outlined above provide guidance for assessing compliance with basic restrictions and reducing the risks of indirect effects.

1.3.10 The assessment of potential EMF related effects does not follow the 'standard' EIA methodology of identifying the sensitivity of receptors and magnitude of effects to classify the effect using a matrix. Rather all human receptors located within the electrical field are identified and, with reference to the identified impact avoidance measures, effects are qualitatively either considered to be significant or not significant, based on professional judgement.

1.3.11 Potential EMF effects are not predicted to arise during the construction or decommissioning phases of the Proposed Development since electrical currents would not flow through cables during their installation or removal and therefore direct and indirect effects would be avoided. Measures will be implemented to protect construction workers from any potential EMF effects associated with existing infrastructure at the Proposed Development Site.

1.3.12 Identification of sensitive receptors and an assessment of the potential impact of exposure during the operation and maintenance phases of the Proposed Development has been undertaken.

Extent of the Study Area

1.3.13 The definition of the study area relevant to each of the population and health-related assessments in **Chapters 8: Air Quality**, **Chapter 9: Noise and Vibration**, **Chapter 10: Traffic and Transport**, **Chapter 12: Water Environment and Flood Risk**, **Chapter 13: Geology, Hydrogeology and Land Contamination**, **Chapter 14: Landscape and Visual Amenity**, and **Chapter 16: Socio-economics** are set out in each chapter (see ES Volume I - **Application Document Ref. 6.2**). The study areas are determined by the receptors and impacts specific to each technical discipline and, as such, they vary in size.

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- 1.3.14 For the definition of the baseline for health of the local population, the study area is as defined for the socio-economics assessment in **Chapter 16: Socio-economics (ES Volume I - Application Document Ref. 6.2)**.
- 1.3.15 To determine the study area in respect of EMF, it is necessary to consider where exposure to EMF is likely, considering the Proposed Development.
- 1.3.16 EMF comprises electric and magnetic fields, the magnitude of which is defined by the design characteristics of the sources. It is recognised that there are potential health impacts associated with electrical and magnetic fields around substations and the connecting cables and power lines and that there are a number of residential receptors within and in close proximity to the Proposed Development Site. Direct effects on humans are primarily as a result of the induction of currents. Most known effects occur in cases where public exposure occurs for a considerable duration, for example, at residential dwellings.
- 1.3.17 As described in **Chapter 4: The Proposed Development (ES Volume I – Application Document Ref. 6.2)**, the electricity generated by the Proposed Development will be exported into the National Grid Electricity Transmission (NGET) System, connecting to an existing National Grid 400kV substation via an overground (not overhead) or underground connection (immediately east of the Proposed PCC Site).
- 1.3.18 An option to connect to an existing 132kV Northern Powergrid substation is also under consideration. If this option is taken forward, electrical cables will be required to be laid underground to connect the Proposed PCC Site with the 132kV Northern Powergrid substation on Chapel Lane. Two potential routes are included in the Proposed Development, as shown on **Figure 3.3 (ES Volume III - Application Document Ref. 6.4)**.
- 1.3.19 The usual way of expressing the field from an EMF source, and thereby determining the potential exposure area and corresponding study area, is to show how the field reduces with distance. The components of the Proposed Development (and potential associated connection off-site) are considered in turn below.
- 1.3.20 For substations where 400kV lines are switched, it is reported that a receptor would need to be within a few metres of the perimeter boundary to receive an elevated field. The National Grid 400kV substation already exists, its perimeter wall is located circa 400m from the closest residential receptor, (Roe Farm) and there will be no new EMF effects at this receptor associated with the Proposed Development because the substation will not be extended beyond its existing boundary. The existing National Grid 400kV substation is therefore **scoped out** of the assessment.
- 1.3.21 The 132kV Northern Powergrid substation is located circa 210m from the closest residential receptors, Hawthorne and Holly House, on Chapel Lane, and

therefore there will be no new EMF effects associated with its use. It has therefore also been **scoped out** of the assessment.

- 1.3.22 In relation to the new sections of underground or overground (but not overhead) cables that may connect into the existing National Grid 400kV substation or the local distribution network off-site, research (see www.emfs.info) indicates that underground cables do not produce any electric fields that reach ground level and that ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line. Magnetic fields reduce to background levels at distances of around 20m from underground cables. To adopt a conservative approach, a study area in respect of underground cables has been set at a 50m linear distance from the centreline of the cables.
- 1.3.23 As noted above, there are no residential receptors within 50m of any potential EMF source; the nearest receptors are located at over 200m from the Potential Electrical Connection to the 132kV Northern Powergrid Substation and at greater distances from the Electrical Connection Area to National Grid 400kV substation (shown on **Figure 3.3** (ES Volume III - **Application Document Ref. 6.4**)), respectively.
- 1.3.24 As such, no likely significant effects are anticipated in relation to EMF for any residential receptors. Therefore, the effects during the operation and maintenance phases on public health will be neutral. These initial findings will be reviewed, and if required, subject to further assessment should further design development result in a likely change to these findings. Since members of the public would not be exposed to EMF field strengths equal to or greater than those outlined in Table 2, no further assessment in relation to public health effects of EMF is presented in this Appendix, although occupational health protection is addressed in Section 3.3.

Sources of Information

- 1.3.25 The data sources and methods used in surveys are set out in **Chapter 4**: The Proposed Development, **Chapter 5**: Construction and Management and each of the chapters on emissions to air (**Chapter 8**: Air Quality, Sections 8.3 and 8.4), noise and vibration (**Chapter 9**: Noise and Vibration, Sections 9.3 and 9.4), traffic and transport (**Chapter 10**: Traffic and Transport, Sections 10.3 and 10.4), emissions to water (**Chapter 12**: Water Environment and Flood Risk, Sections 12.3 and 12.4), land quality/ contamination (**Chapter 13**: Geology, Hydrogeology and Land Contamination, Sections 13.3 and 13.4) and socio-economics (**Chapter 16**: Socio-economics, Sections 16.3 and 16.4) (all ES Volume I - **Application Document Ref. 6.2**).
- 1.3.26 Health profiles produced annually by PHE have been utilised in the assessment. Data available for 2019 has been used, representing the most up to date information (Public Health England, 2019). Furthermore, data on three

indicators of mental health has been sourced for the relevant Clinical Commissioning Group (CCG) areas in order to determine the baseline status of the population in this respect.

- 1.3.27 PHE health profile data for North Lincolnshire and surrounding authorities including North East Lincolnshire, West Lindsey, Bassetlaw, Doncaster and East Riding of Yorkshire has been used. By virtue of the geographical scale of these datasets, they include a much broader population than is predicted to receive direct or indirect impacts associated with the Proposed Development. This allows data for North Lincolnshire (within which any impacts would be expected to occur) to be compared with other neighbouring authorities within the region, so that any particular local trends, vulnerable groups or inequalities can be more readily identified. Using these sources, baseline data on the health of people within the local area can also be compared with average values for all areas of England.

2.0 BASELINE CONDITIONS

Existing Baseline

- 2.1.1 This section considers the community profile in the study area (North Lincolnshire, North East Lincolnshire, West Lindsey, Bassetlaw, Doncaster and East Riding of Yorkshire Council) including 2019 data for overall health and mental health status of the population.

Physical Health

- 2.1.2 The distribution of the existing local population has been described earlier in this ES (see **Chapter 3: The Site and Surrounding Area** (ES Volume I - **Application Document Ref. 6.2**)).
- 2.1.3 Public health profile data (PHE, 2019) show that North Lincolnshire has a population of 172,005 representing a slight increase compared to census information (168,721) reported in **Chapter 16: Socio-economics** (ES Volume I - **Application Document Ref. 6.2**). The average life expectancy for people living within North Lincolnshire and the surrounding local authorities varies when compared to the national average (see Table 3, below):

Table 3: Life Expectancy and Health Inequalities in the Surrounding Local Authority Areas

| Location | Population | Female Average (Years) | Male Average (Years) | Difference in Life Expectancy Between Most and Least Deprived Areas (Female Years) | Difference in Life Expectancy Between Most and Least Deprived Areas (Male Years) | Average |
|---------------------------|----------------|------------------------|----------------------|--|--|------------|
| England | 55,977,178 | 83.2 | 79.6 | 7.5 | 9.5 | 8.5 |
| North Lincolnshire | 172,005 | 82.4 | 79.0 | 9.1 | 9.7 | 9.4 |
| North East Lincolnshire | 159,821 | 82.2 | 77.6 | 9.1 | 13.1 | 11.1 |
| West Lindsey | 94,869 | 83.5 | 79.6 | 6.0 | 7.7 | 6.85 |
| Bassetlaw | 116,839 | 82.5 | 78.7 | 6.9 | 8.7 | 7.8 |
| Doncaster | 310,542 | 81.6 | 78.0 | 8.2 | 10.9 | 9.55 |
| East Riding of Yorkshire | 339,614 | 83.8 | 80.1 | 3.8 | 6.3 | 5.05 |

(PHE, 2019)

- 2.1.4 Within each local authority, health inequalities exist, marked by the variance in life expectancy for men and women in the most deprived areas, compared to the least deprived areas. The male and female life expectancy values for North Lincolnshire and adjacent authorities (North East Lincolnshire, Bassetlaw and Doncaster) are below the average life expectancy values for males and females in England as a whole.
- 2.1.5 North Lincolnshire has a significant difference in life expectancy between the most and least deprived areas, with an average of 9.4 years, whilst the difference in life expectancy for females between the most and least deprived areas of North Lincolnshire is 9.1 years (equal to that of North East Lincolnshire, but higher than the national average and all other surrounding authorities). The difference in life expectancy for males between the most and least deprived areas of North Lincolnshire is 9.7 years which is higher than the national average and a number of surrounding authorities (West Lindsey, Bassetlaw and the East Riding of Yorkshire). These differences in life expectancy, particularly for women, indicate that health inequalities are more apparent in North Lincolnshire compared to the majority of the surrounding authorities.
- 2.1.6 Various factors contribute to mortality and indices are reported for six factors which can be used to determine health inequalities of a local area, when compared to national average and neighbouring authorities. These are presented in Table 4, below.

Table 4: Baseline Mortality Rates Within Local Authority Areas in the Vicinity of the Site

| COMMUNITY | INFANT DEATHS ^A | ROAD INJURIES AND DEATHS ^B | SUICIDE RATE ^C | EARLY DEATHS: CARDIOVASCULAR ^D | EARLY DEATHS: CANCER ^B | EXCESS WINTER DEATH ^E |
|---------------------------|----------------------------|---------------------------------------|---------------------------|---|-----------------------------------|----------------------------------|
| England | 3.93 | 42.6 | 9.64 | 71.7 | 132.3 | 30.1 |
| North Lincolnshire | 3.72 | 64.0 | 9.77 | 72.3 | 144.1 | 31.1 |
| North East Lincolnshire | 4.85 | 53.6 | 9.63 | 88.2 | 162.6 | 25.2 |
| West Lindsey | 3.43 | 94.7 | 11.5 | 70.4 | 128.8 | 38.1 |
| Bassetlaw | 3.62 | 58.2 | 12.9 | 80.9 | 141.4 | 31.7 |
| Doncaster | 4.05 | 63.0 | 12.3 | 83.2 | 157.4 | 36.3 |
| East Riding of Yorkshire | 2.0 | 63.0 | 11.4 | 64.9 | 122.4 | 36.9 |

(PHE, 2019)

a. rate per 1,000 live births

b. values expressed as per 100,000 population

c. directly age-standardised rate per 100,000 population aged 10 and over

d. directly age-standardised rate per 100,000 population aged under 75

e. ratio of excess winter deaths to average of non-winter deaths

- 2.1.7 The health outcomes for people in the local area, when compared with the England average, show that four of the six local authorities, including North Lincolnshire, have a lower than the national average infant mortality rate.
- 2.1.8 All of the local authority areas have a rate of road injuries and deaths considerably higher than the national average.
- 2.1.9 With the exception of North East Lincolnshire, all of the authority areas considered, including North Lincolnshire, have a higher than average suicide rate, with the rate in Bassetlaw and Doncaster significantly higher than the England average.
- 2.1.10 Four of the six the local authority areas considered, including North Lincolnshire, have higher early death rates related to cardiovascular issues and cancer compared to the England average.
- 2.1.11 The rate of excess winter deaths within all of the local authorities, excluding North East Lincolnshire, is higher than the England average.

Mental Health

- 2.1.12 Mental health and well-being profiles produced by PHE provide a summary of the mental health of people within local authority areas and a comparison of local mental health with average values for all areas of England. Mental health profiles for 2018/ 19 have been obtained from the National Health Service (NHS) North Lincolnshire Clinical Commissioning Group (CCG) Joint Strategic Needs Assessment (JSNA) Report (PHE, 2018) and are provided in Table 5, below.

Table 5: Public Health England JSNA Report on Common Mental Health Disorders

| Clinical Commissioning Group | Socio-Economic Deprivation Overall Indices of Multiple Deprivation Score¹ | People Estimated to Have Any Common Mental Health Disorder (%)² | Long Term Mental Health Problems Among GP Survey Respondents (%)² |
|-------------------------------------|---|---|---|
| England (national average) | 21.8 | 16.9 | 9.9 |
| North Lincolnshire | 21.4 | 16.8 | 9.4 |
| North East Lincolnshire | 30.9 | 18.1 | 13.8 |
| West Lindsey | 19.2 | 15.3 | - |
| Bassetlaw | 22.7 | 17.7 | 8.6 |
| Doncaster | 29.1 | 19.1 | 10.6 |

| Clinical Commissioning Group | Socio-Economic Deprivation Overall Indices of Multiple Deprivation Score ¹ | People Estimated to Have Any Common Mental Health Disorder (%) ² | Long Term Mental Health Problems Among GP Survey Respondents (%) ² |
|------------------------------|---|---|---|
| East Riding of Yorkshire | 15.8 | 14.2 | 8.3 |

(PHE, 2018)

1. IMD, 2015. The indices of multiple deprivation score is the official measure of relative deprivation in England and defines deprivation to encompass a wide range of an individual's living conditions (MHCLG, 2019).

2. Aged 16 & over

2.1.13 **Chapter 16: Socio-economics (ES Volume I – Application Document Ref. 6.2)** provides data on the levels of socio-economic deprivation in the local area:

- the Proposed Development takes place in the local super output area (LSOA) North Lincolnshire 006C which is in the 40% of least deprived neighbourhoods in England;
- the neighbouring LSOA, covering Keadby village, features in the 30% most deprived neighbourhoods in England, illustrating the disparity between the areas;
- North Lincolnshire ranks is in the top 40% of deprived Local Authority areas;
- North Lincolnshire is in the top 25% of most deprived authorities for the 'Education, Skills and Training' domain; and
- North Lincolnshire is in the top third of authorities for the 'Employment', 'Health', 'Crime' and 'Income' domains.

2.1.14 In summary therefore, North Lincolnshire is an area highly affected by deprivation. Furthermore, three of the surrounding authorities have levels of socio-economic deprivation that are higher than the national average, with levels in North East Lincolnshire and Doncaster being particularly high.

2.1.15 Of the six local authorities, three (including North Lincolnshire) have a lower number of people estimated to have any common mental health disorder when compared to the national average. Furthermore, North Lincolnshire has a lower percentage of long term mental health problems among survey responders than the national average, and the surrounding areas of Doncaster and North East Lincolnshire.

Future Baseline

2.1.16 Future baseline conditions are predicted for each topic where relevant in the technical chapters of this ES, whereby the conditions anticipated to prevail if the

Proposed Development was not to be progressed are identified for comparison, where appropriate, with the predicted conditions with the Proposed Development. For example, potential future changes in air quality, which may affect human health, are described in **Chapter 8: Air Quality** (ES Volume I - **Application Document Ref. 6.2**).

2.1.17 Changes to public health and health inequalities are not straightforward to predict. The NHS North Lincolnshire CCG has identified the following key priorities in their JSNA Report (NHS North Lincolnshire Clinical Commissioning Group, 2016) for health and wellbeing of people in North Lincolnshire. These priorities are:

- children have the best start in life and thrive;
- people live, work and socialise in healthy places;
- healthy lifestyles are the norm;
- people live well for longer and enjoy good mental wellbeing;
- people age well and are enabled to live independently in the community; and
- people get the right care and support at the right time.

2.1.18 The North Lincolnshire Joint Health and Wellbeing Strategy builds upon the JSNA and the six strategic priority outcomes outlined above, focussing on ways in which North Lincolnshire can work together to improve health and wellbeing, and reduce inequalities for residents.

2.1.19 No specific predictions for future baseline public health are available for the local area. However, The King's Fund (www.kingsfund.org.uk/time-to-thinkdifferently/trends) publishes analysis of future trends in health nationally which can be used to provide broad statements about potential health changes expected in the medium to longer term within the region.

2.1.20 The King's Fund reports that life expectancy has increased dramatically over the previous century and is predicted to continue to increase. Whereas in 2012, men could expect to live for just over 79 years and women to 83 years, by 2032 this is expected to increase to 83 years and 87 years respectively. Healthy life expectancy is growing at a similar rate, suggesting that the extra years of life will not necessarily be years of ill health. However, it is noted that medical advances, future patterns of disease and population behaviour could all have a significant impact on life expectancy and either drive it up or down.

2.1.21 The analysis predicts that the number of people with diseases will double over the next 20 years, for example, by 2030 there will be 3 million with cancer, but it states that many diseases will be easier to treat.

2.1.22 It forecasts that significant health inequalities are likely to persist, with people in more deprived populations having higher rates of disease and more than one disease. It suggests that population lifestyles will be a critical determinant of

future patterns of disease and as such, a change in population lifestyles offers the greatest opportunity to reduce the burden of chronic disease.

2.1.23 On this basis, future baseline conditions in 2022-2026 for public health are not anticipated to be significantly different to the existing baseline conditions, although population growth is expected (as per the national trend), with the highest growth increases being in the older population.

Mental Health

2.1.24 North Lincolnshire CCG recently produced the North Lincolnshire CCG Strategy 2019-2024 (North Lincolnshire Clinical Commissioning Group, 2019) which outlines a five year action plan of developing a programme of improvement initiatives for mental health and learning disabilities. This programme has the aim of the following outcomes:

- more people accessing psychological therapies including pathways for people with long term conditions;
- improved community based secondary care services including psychological therapies;
- increased access to mental health crisis care; and
- better physical health outcomes for people with mental health problems and learning disabilities.

2.1.25 The King's Fund analysis of mental health recognises that physical health problems significantly increase the risk of poor mental health, and vice versa, stating that approximately 30% of all people with a long-term physical health condition also have a mental health problem, most commonly depression/ anxiety.

2.1.26 It states that adult mental health has remained relatively stable over the last 20 years (The King's Fund, 2013). However, looking to the future, it recognises that prolonged economic instability can be expected to increase demand for mental health services, as there is a close link between unemployment, debt and mental health problems—particularly depression and anxiety.

2.1.27 The UK Government is taking steps to transform mental health services across the UK including specific actions and targets to be achieved by 2023/ 2024 at a local level (NHS North Lincolnshire Clinical Commissioning Group, 2019). Future baseline conditions in 2022-2026 for mental health and well-being therefore have the potential to improve, through provision of improved access to mental health services.

3.0 DEVELOPMENT DESIGN AND IMPACT AVOIDANCE

3.1 Overview

3.1.1 **Chapter 4: The Proposed Development (ES Volume I - Application Document Ref. 6.2)** describes the measures that have been incorporated in order to 'design-out' potential impacts that may affect health.

3.2 General Measures to avoid or reduce effects on health

3.2.1 As described in **Chapter 8: Air Quality (ES Volume I - Application Document Ref. 6.2)**, emissions of dust and particulates from the construction phase of the Proposed Development would be controlled in accordance with industry best practice, through incorporation of appropriate control measures, according to the risks posed by the activities undertaken, as determined through this assessment process. The management of dust and particulates and application of adequate mitigation measures would be controlled through the Construction Environmental Management Plan (CEMP). A Framework CEMP would be included with the DCO Application (**Application Document Ref. 7.1**). The selected contractor would be encouraged to be a member of the 'Considerate Constructors Scheme', which is an initiative open to all contractors undertaking building work, to assist in reducing potential nuisance dust from the Proposed Development.

3.2.2 The Proposed Development will be designed such that process emissions to air comply with the Emission Limit Values specified in the Industrial Emissions Directive or Large Combustion Plant Best Available Techniques (BAT) Reference document (The European Parliament and the Council of the European Union, 2010) and in accordance with use of BAT under the environmental permitting regime. This will be enforced by the Environment Agency through an Environmental Permit required for the operation of the generating station. The environmental effects from operation of the Proposed Development have been identified as not significant at all human receptors for the operation of the Proposed Development.

3.2.3 The stack height(s) for the plant has been optimised with consideration given to ground-level air quality impacts. Dispersion modelling has been undertaken to determine the optimum stack height range considering impacts on human health receptors. Further information on the determination of the stack heights is provided in **Appendix 8B: Operational Air Quality (ES Volume II - Application Document Ref. 6.3)**.

3.2.4 An air quality assessment of emissions of amines from the Proposed Development on human health and the environment has also been included in **Appendix 8B: Operational Air Quality (ES Volume II - Application Document Ref. 6.3)**. Amines can degrade to form other species, including nitrosamines and nitramines (collectively referred to as N-amines). Some N-amines are potentially carcinogenic therefore an assessment of these species is outlined

within **Appendix 8C: Air Quality Assessment of Amine Degradation Products** (ES Volume II – **Application Document Ref. 6.3**). The assessment results concluded that the predicted impacts are unlikely to result in an exceedance of the proposed Air Quality Assessment Level (AQAL) for N-nitroso-dimethylamine (NDMA), even when considering the combined impacts of both the direct and indirect emission processes. Therefore, impacts upon human health are not anticipated.

- 3.2.5 Appropriate best practice mitigation measures will be applied during any decommissioning works and documented in a Decommissioning Environmental Management Plan (DEMP), secured via a Requirement of the draft DCO (**Application Document Ref. 2.1**); no additional mitigation for decommissioning of the Proposed Development beyond such best practice is considered necessary at this stage. The predicted air quality effects of eventual decommissioning of the Proposed Development are considered to be comparable to, or less than those assessed for construction activities. As described in **Chapter 9: Noise and Vibration** (ES Volume I – **Application Document Ref. 6.2**), measures to mitigate noise will be implemented during the construction phase of the Proposed Development in order to control impacts at local residential noise sensitive receptors (NSR), particularly with respect to activities required outside of core working hours. The appointed contractor(s) will produce a CEMP that would provide details of proposed environmental control measures, including measures related to noise based upon the Framework CEMP to be provided with the DCO Application. The appointed contractor will then implement the approved CEMP.
- 3.2.6 The following best practicable means (BPM) will be applied, as far as reasonably practicable, during construction works to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors arising from construction activities:
- abiding by agreed construction noise limits at locations to be agreed with NLC;
 - ensuring that all processes, procedures and measures are in place to minimise noise before works begin and ensuring that BPM are being achieved throughout the construction programme, including the use of localised screening around significant noise producing plant and activities;
 - all contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2), which should form a prerequisite of their appointment;
 - ensuring that noise and vibration is controlled at source (e.g. the selection of quiet and low vibration equipment), review of the construction programme and methodology to consider quieter methods, consideration of the location of equipment on-site and control of working hours;

- ensuring that modern plant is used, complying with applicable UK noise emission requirements and selection of inherently quiet plant where possible;
- hydraulic techniques for breaking to be used, where breaking is required, in preference to percussive techniques, where reasonably practicable;
- if piling is required, use of lower noise piling (such as rotary bored or hydraulic jacking) rather than the driven piling techniques where reasonably practicable;
- off-site pre-fabrication for components, where reasonably practical;
- all construction plant and equipment to be properly maintained, silenced where appropriate, operated to prevent excessive noise and switched off when not in use;
- loading and unloading of vehicles, dismantling of site equipment (such as scaffolding) or moving equipment or materials around the Proposed Development Site to be conducted in such a manner as to minimise noise generation as far as reasonably practicable;
- appropriate routing of construction traffic on public roads and along access tracks to reduce construction traffic noise, as far as reasonably practicable;
- provision of information to NLC and local residents to advise of potential noisy works that are due to take place; and
- monitoring of noise complaints and reporting to the contractor for immediate investigation.

3.2.7 Method Statements regarding construction management, traffic management, and overall site management will be prepared in accordance with best practice and relevant British Standards, to help to minimise impacts of construction works. One of the key aims of such Method Statements would be to minimise disruption to local residents during the construction phase as far as reasonably practicable.

3.2.8 Consultation and communication with the local community throughout the construction period would serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and providing lines of communication where complaints can be addressed.

3.2.9 A detailed noise assessment would be carried out once the contractor is appointed and further details of construction methods are known, in order to identify specific mitigation measures for the Proposed Development (including construction traffic). It is proposed that the control of noise during construction would be secured via a Requirement of the draft DCO (**Application Document Ref. 2.1**) to ensure that noise impacts relating to construction activities are controlled and appropriately monitored during construction.

3.2.10 The Proposed Development would be operated in accordance with an Environmental Permit issued and regulated by the Environment Agency. This will require operational noise from the generating station to be controlled through the use of BAT, which will be determined through the Environmental Permit application. It is proposed that operational noise would also be controlled via a Requirement of the draft DCO (**Application Document Ref. 2.1**).

3.2.11 As set out in **Chapter 10: Traffic and Transport** (ES Volume I – **Application Document Ref. 6.2**), traffic movements would be controlled during the Proposed Development construction phase in order to minimise potential impacts on the surrounding road network and local villages, namely construction HGV arriving or departing the Proposed Development Site would travel to/ from the A18, avoiding travelling through Keadby Village. In addition, a HGV and Abnormal Indivisible Load (AIL) routing plan would be included within a Construction Traffic Management Plan (CTMP) which HGV drivers would be required to adhere to, controlled by a Requirement of the draft DCO (**Application Document Ref. 2.1**).

3.2.12 In addition to the above, the Applicant would implement a range of good practice mitigation measures during the construction phase to minimise traffic impacts upon local highways, including:

- implementation of a Construction Workers' Travel Plan (CWTP) aimed at identifying measures and establishing procedures to encourage construction workers to adopt modes of transport (including walking and cycling) which reduce reliance on single occupancy private car use (a Framework CWTP is included in the DCO Application as **Application Document Ref. 7.3**);
- liaison with the appointed contractor for the potential to implement construction worker minibuses and car sharing options (which will be considered as part of the CWTP);
- implementation of the CTMP to include measures to control the routing and impact of HGV on the local road network during construction. A routing plan is provided within the Framework CTMP (**Application Document Ref. 7.2**), which HGV drivers would be required to adhere to. The CTMP would be secured by a Requirement of the draft DCO (**Application Document Ref. 2.1**); and
- during the operational phase, working with suppliers to ensure that all relevant materials (including chemicals) brought to the Proposed Development Site that are classified as hazardous are transported in compliance with applicable regulations including the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG Regs) (as amended). This will include, for example:
 - consignments being marked with the familiar "Emergency Action Codes"; and
 - Including a telephone number for advice in the event of an emergency.

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- 3.2.13 Decommissioning would be expected to require some traffic movements associated with the removal (and recycling, as appropriate) of material arising from demolition and potentially the import of materials for land restoration and re-instatement. To minimise the impacts of decommissioning upon local highways, it is anticipated that a Decommissioning Traffic Management Plan (DTMP) would be prepared to control the routing and impact of HGVs. This would be secured by a requirement of the draft DCO (**Application Document Ref. 2.1**).
- 3.2.14 **Chapter 12: Water Environment and Flood Risk** (ES Volume I – **Application Document Ref. 6.2**) and specifically **Appendix 12A: Flood Risk Assessment** (ES Volume II – **Application Document Ref. 6.3**) sets out the following measures considered relevant to avoid impacts to human health.
- 3.2.15 During construction, due to the residual risk to construction personnel and equipment resulting from a breach of defences on the River Trent, installation of the cofferdam in the river would not take place during times of high flow when there is a Flood Alert.
- 3.2.16 The CEMP would incorporate measures aimed at preventing an increase in flood risk during construction works. The Framework CEMP (**Application Document Ref. 7.1**) incorporates measures to prevent an increase in flood risk during the construction works. Examples of such measures include:
- adequate containment of storage areas, to ensure that material does not wash away and cause pollution and damage to infrastructure;
 - the construction laydown area site office and supervisor will be notified of any potential flood occurring by use of the 'Floodline Warnings Direct' service;
 - the Contractor will be required to produce a Flood Risk Management Action Plan/ Method Statement which will provide details of the response to an impending flood and include:
 - a 24 hour availability of staff and ability to mobilise staff in the event of a flood warning;
 - the removal of all plant, machinery and material capable of being mobilised in a flood for the duration of any holiday close down period;
 - details of the evacuation and site closedown procedures; and
 - arrangements for removing any potentially hazardous material and anything capable of becoming entrained in floodwaters, from the temporary works area during a flood event.
- 3.2.17 During operation:
- A Flood Emergency Response will be developed for the Proposed Development which will link closely with the existing operating system of the Keadby 1 and Keadby 2 Power Stations' emergency response and subsequent management system procedures. The Flood Emergency

Response Plan will be prepared in consultation with the environment agency and shall cover emergency situations both during the core (24/7) operating hours and over holiday periods. This will provide details of the response to an impending flood and will include:

- access and egress routes from the Proposed Development Site;
- registration of the Proposed Development to receive flood warnings from the Environment Agency's 'Floodline Warnings Direct' service to inform if there is a risk of flooding from a tidal storm surge type event which could result in overtopping or breach of defences;
- monitoring of the warnings to mitigate the residual risk of tidal/ fluvial flooding in the event of defence failure in the vicinity;
- designation of at least one Flood Warden for the Proposed Development Site; and
- immediate evacuation upon receipt of a flood warning (unless it is unsafe¹ to do so), in which case a place of safe refuge will be provided and sought on site.

3.2.18 A number of flood resilience measures would be incorporated into the Proposed Development design to minimise, as far as reasonably practicable, the amount of damage and reduce the recovery time in the unlikely case of the Proposed Development Site becoming inundated (i.e. to protect against the residual risk of breach and the future risk from defence overtopping).

3.2.19 Further details are included within the FRA presented as **Appendix 12A** (ES Volume II - **Application Document Ref. 6.3**).

3.2.20 As described in **Chapter 13: Geology, Hydrogeology and Land Contamination** (ES Volume I - **Application Document Ref. 6.2**), during construction of the Proposed Development, the contractor(s) would be required to minimise potential adverse land contamination effects on sensitive receptors by implementing good operational practices (e.g. employing suitable surface water drainage control).

3.2.21 Construction workers would be protected from contact with hazardous materials by adopting appropriate health and safety measures including an assessment of appropriate measures under the Control of Substances Hazardous to Health (COSHH) Regulations 2002. Such measures would include suitable personal protective equipment, hygiene facilities and the implementation of dust control where considered necessary.

3.2.22 With regards to earthworks, the contractor(s) would ensure that all material is suitable for its proposed use and would not result in an increase in contamination-related risks on identified receptors including any landscaped

¹ In areas adjacent to tidal river defences, in the event of a defence breach, inundation is likely to be rapid and therefore evacuation from a Site and local area can sometimes be an unsafe option.

areas and underlying groundwater. The CEMP would include measures to ensure that all materials are suitable for the proposed end use. This may include a Materials Management Plan, to deal with any removal of materials off-site. A Framework CEMP is included in this application (**Application Document Ref. 7.1**).

3.2.23 As part of the Proposed Development, any on-site contamination that poses a potential unacceptable risk to any of the receptors will be further investigated, and where necessary, mitigated or remediated such that potential risks to identified receptors are minimised to a standard suitable for the proposed end use of the site.

3.2.24 A ground investigation will be undertaken before construction to inform the development of the preliminary and detailed design. The ground investigation will be designed to target the potentially contaminative sources identified, including the historical landfilling activities identified on the Proposed Development Site. Where risks are deemed to be unacceptable, further detailed quantitative risk assessment and if required, detailed remediation strategies will be developed accordingly, pursuant to the process set out by the planning authorities.

3.2.25 Potential impacts specific to construction workers during site preparation and construction would be mitigated by the following measures:

- measures to minimise dust generation;
- provision of Personal Protective Equipment (PPE), such as gloves, barrier cream, overalls etc. to minimise direct contact with soils;
- provision of adequate hygiene facilities and clean welfare facilities for all construction site workers;
- monitoring of confined spaces for potential ground gas accumulations, restricting access to confined spaces, i.e. to suitably trained personnel only, and use of specialist PPE, where necessary; and
- preparation and adoption of a site and task specific health and safety plan as is required under Health and Safety legislation.

3.2.26 A Pollution Response Plan will be in place prior to the commencement of construction works outlining key pollution mitigation measures to be adopted including a COSHH/ fuel inventory and key contacts to be notified in the event of a significant pollution incident, which may subsequently lead to the contamination of controlled waters or soils. All bulk fuel and COSHH items will be stored in accordance with the relevant Environment Agency Guidance for Pollution Prevention (GPP) or where GPP are yet to be published, Pollution Prevention Guidance (PPG) notes (withdrawn but widely considered good practice) and storage regulations.

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- 3.2.27 The design of the Proposed Development includes measures that would contain and control any releases of contaminants to ground and surface and foul drainage network.
- 3.2.28 With the above measures in place and with good housekeeping and management practices adopted and adhered to through compliance with the Environmental Permit, significant impacts to soil and groundwater can be avoided.
- 3.2.29 The Proposed Development would be subject to decommissioning under the conditions of the Environmental Permit, including conditions relating to chemical/polluting material handling, storage and use and emergency procedures in line with BAT. A detailed DEMP would be prepared to identify required measures to prevent pollution during this phase of the Proposed Development, based on the detailed decommissioning plan.
- 3.2.30 The impact avoidance measures for decommissioning would be similar to those identified above for the construction phase. As above, measures would be in place to prevent pollution in accordance with the permit.
- 3.2.31 **Chapter 14: Landscape and Visual Amenity (ES Volume I - Application Document Ref. 6.2)** describes the proposals to substantially retain existing well established vegetation within the Proposed Development Site and sets out impact avoidance measures that would either be incorporated into the design or are standard construction or operational measures including:
- suitable materials will be used, where reasonably practicable, in the construction of structures to reduce reflections and to assist with breaking up the massing of the buildings and structures;
 - the selection of finishes for the buildings and other infrastructure will be informed by the finishes of the adjacent developments including Keadby 2 Power Station, in order to reduce the visual impact of the Proposed Development including using lighter coloured materials on the taller structures to enable them to recede against the sky. It is proposed that finishes and materials would be agreed with relevant consultees and approved by NLC at the detailed design stage, secured through a Requirement of the draft DCO (**Application Document Ref. 2.1**), in order to minimise the visual impact of the Proposed Development;
 - lighting required during the construction and operation stages of the Proposed Development will be designed to reduce unnecessary light spill outside of the Proposed Development Site boundary, in accordance with an Indicative Lighting Strategy (**Application Document Ref. 5.11**); and
 - where existing vegetation is present along the Proposed Development Site boundary, this would be retained, as far as reasonably practicable, and managed to ensure its continued presence to aid the screening of low level views into the Proposed Development Site. A Landscaping and Biodiversity Management and Enhancement Plan (**Application Document Ref. 5.10**)

has been prepared and is submitted as part of the Application for development consent describing these proposals.

3.2.32 The visual impact of lighting as proposed in the Indicative Lighting Strategy (**Application Document Ref. 5.11**) has also been considered on the relevant viewpoints around the Proposed Development that may be affected. The following assumptions have been made with regards to the extent of lighting within the Proposed Development:

- adopting a lighting control strategy that turns lights off or dims as necessary for site safety and security;
- using photocells as a primary means of control to prevent light from being used when sufficient daylight is available;
- where possible, adopting LED luminaires to control obtrusive light due to their high directionality and accordingly the achievable ratio of useful light to spill light;
- careful consideration of placement of lighting column and luminaire positioning;
- adopting luminaires with minimal upward lighting ratio and full cut-off where possible;
- not tilting luminaire to have uplift above the horizontal, if this is not possible add shielding, hoods baffles, louvres as necessary to ensure potential upward light is controlled;
- optimising column heights to allow for sufficient light coverage and minimal tilt of luminaires;
- minimising building mounted luminaire heights;
- adopting lamps with similar correlated colour temperatures;
- using lamps with a limited ultraviolet (UV) spectrum in locations which might affect ecological receptors;
- using shields and baffles to luminaires;
- lighting the site boundaries with low power periphery lighting with an asymmetric forward optic having good back-light cut-off characteristics; and
- directing luminaires away from ecologically sensitive receptors.

3.2.33 The Framework CEMP and Framework Site Waste Management Plan (SWMP) (**Application Document Ref 7.1**), included as part of the application, outline potential risks to human health associated with waste arising from the Proposed Development Site, including the disposal and transportation of such waste, along with impact avoidance and mitigation measures.

3.2.34 The proposed construction phase SWMP will identify the types and quantities of waste anticipated to be generated, along with suitable disposal routes. The

construction phase SWMP will also include details as to how material reuse and recycling options will be maximised. The construction phase SWMP will be maintained as a live document, to be updated and monitored by the contractor, in order to demonstrate compliance with the Waste Duty of Care (HM Government, 2011) and other relevant regulations.

- 3.2.35 The SWMP will require that the contractor segregates waste streams on-site, prior to them being taken to a waste facility for recycling or disposal. All waste removal from the Proposed Development Site will be undertaken by fully licensed waste carriers and taken to permitted waste facilities.
- 3.2.36 It is anticipated that up to 65,000m³ of soils may need to be moved as part of the provision of a suitable platform for foundations and buildings/ equipment across the Proposed PCC Site. These materials would be removed from/ delivered to the Proposed Development Site via HGV using the access from the A18. Any excess spoil generated during construction will be managed through the SWMP that would form part of the final CEMP.
- 3.2.39 An Environmental Manager would hold overall responsibility for waste management, coordinate all waste and environmental issues on-site, monitor waste data and identify training needs.

3.3 Electromagnetic Field Design and Impact Avoidance Measures

- 3.3.1 As set out in the ICNIRP Guidelines (International Commission on Non-Ionising Radiation Protection, 1988), the occupationally EMF-exposed population will consist of adults working at the Proposed Development Site who are generally exposed under known conditions and are trained to be aware of potential risk and to take appropriate precautions.
- 3.3.2 Mitigation of any potentially significant effects on workers will be through the application of electromagnetic compatibility industry accepted practice. In accordance with good safety management principles, risks due to EMF from relevant sources including the substation and electrical connections will be reduced using the 'As Low As Reasonably Practicable' (ALARP) principle. Measures for the protection of workers from potential EMF effects could therefore include risk assessment, engineering and administrative controls, personal protection programmes, and medical surveillance in accordance with the Control of Electromagnetic Fields at Work Regulations 2016 (HM Government, 2016) and relevant guidance. In particular, appropriate protective measures will be implemented if exposure in the workplace is predicted to result in the basic restrictions set out within ICNIRP Guidelines being exceeded.

4.0 LIKELY IMPACTS AND EFFECTS

4.1 Overview

4.1.1 Potential impacts and effects from the Proposed Development, relating to population and human health that have been identified in the various chapters of the ES for the construction, operation and decommissioning phases of the Proposed Development. The decommissioning phase is not expected to commence until some point after 2051 and is not anticipated to present any significant environmental effects beyond those assessed for the construction phase of the Proposed Development. Potential impacts and effects from the Proposed Development on population and human health include:

- emissions to air, which could have the potential to affect air quality with consequential health effects unless appropriately controlled (see **Chapter 8: Air Quality** (ES Volume I - **Application Document Ref. 6.2**)):
 - the effects of dust, construction traffic and emissions to air from the construction site activities associated with the Proposed Development on the identified receptors are considered to be **not significant**, based on application of best practice mitigation measures outlined in the Framework CEMP and due to the distances to the identified sensitive receptors;
 - the air quality assessment of impacts at opening has assumed that ELVs will be met for the operational plant which will be set for the protection of human health and in accordance with use of BAT under the environmental permitting regime. No specific additional mitigation has been identified as necessary for the opening phase of the Proposed Development;
 - the environmental effects from operation of the Proposed Development have been identified as **not significant** at all human health receptors for the operation of the Proposed Development. An evaluation of the release height for the main stack has shown that a release height of 105m above ground level (based on the maximum absorber height that has been assessed) is capable of mitigating the short-term and long-term impacts of emissions to an acceptable level, taking into account existing air quality and ambient air quality standards at human health receptors. Emissions from the absorber stack would result in small increases in ground-level concentrations of the modelled pollutants which would be within current environmental standards for the protection of human health;
 - the effects of the Proposed Development are well below the Environment Agency Environmental Assessment Level for N-amines;
 - the predicted air quality effects of eventual decommissioning of the Proposed Development are considered to be comparable to, or less than, those assessed for construction activities.

- noise emissions, which in the absence of mitigation, could result in adverse effects on nearby sensitive receptors. Effects reported in **Chapter 9: Noise and Vibration (ES Volume I - Application Document Ref. 6.2)** confirm that:
 - construction noise effects at all residential NSR during construction of the Proposed PCC Site within core working hours are predicted to be minor adverse or negligible (**not significant**) due largely to the distances between the works and NSR;
 - it may be necessary for some construction activities to take place continuously over day, evening and night periods during peak construction times of the Proposed Development, although the exact nature of the works is unknown at this stage. During night-time, if not properly managed, construction effects at certain residential receptors may be moderate/ major adverse (**significant**) if the same intensity of working as for the daytime is assumed;
 - during the core daytime hours and Saturday mornings, predicted noise effects associated with construction of the electrical cable to the 132kv substation are assessed as negligible adverse (**not significant**) at all NSR. Should it be necessary to undertake works in the evening or other weekend periods at the same intensity as daytime works, moderate effects (**significant**) at one of the 11 NSR and at night, moderate or major adverse (**significant**) effects are predicted at 10 of the 11 NSR;
 - should works on the River Water Abstraction Option be undertaken, effects could be major adverse (**significant**) during the daytime period at NSR 4. This effect would be short-term and is predicted due to the short distance between the closest of the properties of the NSR to the River Water Abstraction Option cofferdam works. Should the preferred Canal Water Abstraction Option be selected, the closest property in this receptor group would be approximately 600m from the works area and effects would be **not significant** at NSR 4 or at any other receptor;
 - during the daytime core hours and Saturday mornings, predicted noise effects continuous flight auger piling for the replacement of Mabey Bridge are assessed as negligible adverse (**not significant**). Should it be necessary to undertake works in the night-time at the same intensity as daytime works, major adverse (**significant**) effects are predicted at one of the three NSR;
 - effects at local residential NSR due to construction road traffic noise, including AILs, are predicted to be negligible (**not significant**);
 - due to large distances (minimum 400m) between residential receptors and the static plant that is likely to produce higher levels of vibration (e.g. piling rigs) on the Main Site, vibration effects on both humans and buildings are likely to be negligible (**not significant**);
 - vibration effects resulting from sheet piling for cofferdam installation/removal are classified as minor adverse (**not significant**) for both the River Water Abstraction Option and Canal Water Abstraction Option at the worst-affected receptor;
 - the effects of eventual decommissioning are considered to be comparable to, or less than, those assessed for construction activities

and are therefore considered to be **not significant** for the Proposed PCC Site or Electrical connections during daytime working. Up to major adverse (**significant**) effects may result from the temporary works required to decommission plant and equipment within the Water Connection Corridor during the daytime at NSR 4;

- increase in traffic is not predicted to give rise to significant effects based on the volume of traffic required for the construction of the Proposed Development (see **Chapter 10: Traffic and Transport (ES Volume I - Application Document Ref. 6.2)**) and through the use of appropriate travel plans for construction workers and HGV. As stated in **Chapter 10: Traffic and Transport (ES Volume I - Application Document Ref. 6.2)**, the traffic and transport effects from construction, operation and decommissioning are predicted to be negligible adverse (**not significant**) on any of the road sections assessed;
- emissions to water are predicted to give rise to effects that are not significant (see **Chapter 12: Water Environment and Flood Risk (ES Volume I - Application Document Ref. 6.2)**) based on the embedded design measures to prevent contamination of water resources. As stated in **Chapter 12: Water Environment and Flood Risk (ES Volume I - Application Document Ref. 6.2)** during construction there are predicted slight adverse (**not significant**) residual effects on surface water quality for the River Trent and Stainforth and Keadby Canal due to suspended fine sediments and in the unlikely event of potential chemical spillages. No likely significant effects are anticipated during operation;
- land/ groundwater contamination or mobilisation of existing land contaminants are predicted to give rise to effects on receptors including construction workers that are not significant (see **Chapter 13: Geology, Hydrogeology and Land Contamination (ES Volume I - Application Document Ref. 6.2)**) based on the embedded design measures. As stated in that chapter, the potential geological, hydrogeological and contamination related impacts associated with the Proposed Development have the potential to be minor adverse (**not significant**) in the short term, in respect of mobilizing existing contamination. However, post-construction, there is the potential for a beneficial effect to be realised if land contamination is identified, particularly where any remediation has been undertaken;
- in terms of visual amenity (see **Chapter 14: Landscape and Visual Amenity (ES Volume I - Application Document Ref. 6.2)**), it has been assessed that the majority of visual receptors would experience a low or very low magnitude of impact during construction and operation of the Proposed Development, resulting in a negligible or minor adverse effect that is **not significant**. However, receptors at Viewpoint 1 (Chapel Lane West, Keadby), Viewpoint 2 (Gate Keepers Residence, Vazon Bridge, Keadby) and Viewpoint 4 (PRoW KEAD9 and KEAD10), north of Keadby would experience a medium magnitude of impact, in both scenarios with and without Keadby 1 Power Station, due to the introduction of built structures

against the skyline, making them more prominent and extending the amount of the view which includes large scale development. This would result in a moderate adverse effect on receptors at these locations during construction, operation and decommissioning that is considered to be **significant**. Without the presence of Keadby 1 Power Station, moderate adverse (**significant**) effects are anticipated at Viewpoint 6 (Trunk Road, Keadby) during Year 15 of operation;

- the construction and operation of a development can result in effects on the economy (see **Chapter 16: Socio-economics (ES Volume I - Application Document Ref. 6.2)**) potentially leading to changes in the socio-economic indices and mental health figures for the local area outlined in Table 5. In summary:
 - the Proposed Development would represent an opportunity to create a range of jobs during the construction phase, both directly and indirectly, and across a wide range of sectors and skills. Based on experience of similar projects, the Proposed Development is anticipated to create an average of approximately 776 temporary construction jobs, with a peak of circa 1,300 during the construction period. Although these jobs are temporary, they would provide a positive economic impact. It is considered that these job opportunities that would be created may create positive socio-economic impacts in the surrounding areas, reducing local inequalities;
 - the direct expenditure involved in the construction phase would lead to increased output generated in the local (Scunthorpe TTWA) economy. The magnitude of impact associated with the creation of short-term employment during the construction phase is considered to be high, as employment relating to the Proposed Development would represent around 12% of the TTWA existing construction workforce. The direct, indirect and induced employment created by the construction phase of the Proposed Development is therefore likely to have a major short-term beneficial effect, which would be **significant** in terms of the Scunthorpe TTWA economy;
 - during the Proposed Development operational phase, employment would be generated in operative, management and maintenance roles. Operation of the Proposed Development is anticipated to create up to circa 50 operational roles. Temporary and contractor employees associated with maintenance activities would also be employed as required. Such an operational effect is assessed as beneficial, although, **not significant**; and
 - there are not anticipated to be any impacts on businesses from the operation of the Proposed Development. The businesses in the area are currently located within close proximity to the existing Keadby Power Station and it is not anticipated they would experience any change from their current interaction with the wider Keadby site. The impact would be negligible (**not significant**).

5.0 MITIGATION AND ENHANCEMENT MEASURES

5.1 Overview

- 5.1.1 Mitigation measures that would be relevant to human health are set out in the relevant technical chapters of this ES, and also within the Framework CEMP and the Framework SWMP appended to it (**Application Document Ref 7.1**). In summary, where no significant effects have been identified, no additional mitigation measures are required in order to further reduce adverse effects.

6.0 LIMITATIONS OR DIFFICULTIES

6.1 Overview

- 6.1.1 No significant limitations or difficulties have been identified in the preparation of this assessment in relation to EMF effects. Other limitations and difficulties are set out, where necessary, in ES chapters (ES Volume I – **Application Document Ref. 6.2**).

7.0 RESIDUAL EFFECTS AND CONCLUSIONS

7.1 Overview

- 7.1.1 Health related effects are described in **Chapter 8**: Air Quality, **Chapter 9**: Noise and Vibration, **Chapter 10**: Traffic and Transportation, **Chapter 12**: Water Resources and Flood Risk, **Chapter 13**: Geology, Hydrogeology and Land Contamination, **Chapter 14**: Landscape and Visual Amenity, and **Chapter 16**: Socio-economics (ES Volume I - **Application Document Ref. 6.2**).
- 7.1.2 Residual significant effects relating to population and human health are outlined in Table 6, below:

Table 6: Summary of Likely Significant Residual Effects (Health)

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/ enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|--|---|--|---|--|---|
| Chapter 8: Air Quality (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | No significant effects are predicted to occur. | | | | |
| Operation | Human health effects. | Not significant | Not required | Not significant | Mt/T/D |
| Decommissioning | No significant effects are predicted to occur. | | | | |
| Chapter 9: Noise and Vibration (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | No significant vibration effects are predicted to occur | | | | |
| Construction | If construction works take place continuously over night-time periods, assuming the same intensity of working as for the daytime, there would be the potential for adverse noise effects on noise sensitive receptors | Moderate/ major adverse (significant) | Construction activities taking place outside core working hours will be planned, managed and controlled appropriately so they do not exceed the significant observed adverse effect level (SOAEL) threshold | Minor adverse (not significant) | St, T, D |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|-------------------|---|---|--|--|---|
| | (NSR 1, NSR 1A, NSR 2, NSR 3, NSR 7, NSR 8, NSR 10) during construction of the Proposed PCC Site. | | values or relevant limit agreed with NLC. It is proposed that this would be secured by a Requirement in the draft DCO (Application Document Ref. 2.1). | | |
| Construction | If construction works take place continuously over night-time periods, assuming the same intensity of working as for the daytime, there would be the potential for adverse noise effects on all NSR, with the exception of NSR 9 during topsoil stripping for laying the cable to the existing Northern Powergrid 132 kV Substation. Similarly, if works take place with the same | Up to Moderate/ Major adverse (significant) | Construction noise mitigation will be controlled by the Construction Environmental Management Plan (CEMP) which will be secured through a Requirement of the draft DCO (Application Document Ref. 2.1). A Framework | Minor adverse (not significant). | St, T, D |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/ enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|-------------------|---|--|--|--|---|
| | intensity in the evening period, there would be adverse effects at NSR 2 on Chapel Lane. | | CEMP is included as Application Document Ref. 7.1 . | | |
| Construction | Daytime working in the vicinity of NSR 4 predicted to result in adverse effects in the short-term during sheet piling for cofferdam installation, in the event that the River Water Abstraction Option is selected. This effect is primarily due to the short distance between the closest of the properties in this NSR group to the noise source. | Moderate/ Major adverse (significant) at NSR4 | Further detailed assessment and CEMP once contractor appointed. Should the River Water Abstraction Option be selected, during cofferdam piling, additional mitigation may include, but not limited to, use of a temporary acoustic barrier alongside the River Trent, use of a partial enclosure around hammer, and | Up to Minor adverse (not significant) | St, T, D |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/ enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|-------------------|--|---|--|---|---|
| Construction | If construction works take place continuously over night-time periods, assuming the same intensity of working as for the daytime, there would be the potential for adverse noise effects at NSR 11 in relation to continuous flight auger piling for Mabey Bridge replacement. | Major adverse (significant) | the use of a non-metallic dolly between the hammer and the driving helmet (for driven piling) to prevent metal on metal impact sound. | Minor adverse (not significant). | S/T/D |
| Operation | Based on the worst-case assessment for the Carbon Capture Plant (CCP) of a single absorber stack up to 107.6m Above Ordnance Datum (AOD) and Combined | Up to Major adverse (significant) subject to consideration of context. | Application of practical sound mitigation to reduce relevant noise at source for the CCP compressors, absorber stack casing, absorber stack exhaust, Heat Recovery Steam | Negligible/ minor adverse (not significant). | Lt/P/D |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/ enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|-------------------|---|--|---|--|---|
| | <p>Cycle Gas Turbine (CCGT) without additional mitigation, the impact magnitude on residential NSR ranges from very low to high during daytime and night-time assessment periods at the 11 NSR locations.</p> | | <p>Generator (HRSG) walls and roof, all pumps, hybrid cooling towers and turbine intake as shown in Table 9.35 of Chapter 9: Noise and Vibration (ES Volume I – Application Document Ref. 6.2).</p> <p>During detailed design, an operational noise control scheme (including agreed noise limits) will be prepared, secured by a Requirement of the draft DCO (Application Document Ref 2.1), which would demonstrate use of BAT for the control of</p> | | |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|---|--|--|---|--|---|
| | | | noise for the Environmental Permit. | | |
| Decommissioning | Adverse noise effects at (NSR 4) during decommissioning of the Water Connection Corridor (if River Water Abstraction Option selected). | Up to Major adverse (significant). | This effect is primarily related to the distance between this NSR and the works. No additional mitigation for decommissioning of the Proposed Development is specified at this stage but would be considered in advance of decommissioning to use best practicable means (BPM) measures available at that time. | Minor adverse (not significant). | St, T, D |
| Chapter 10: Traffic and Transport (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | No significant effects are predicted to occur. | | | | |
| Operation | No significant effects are predicted to occur. | | | | |
| Decommissioning | No significant effects are predicted to occur. | | | | |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|--|--|--|--|--|---|
| Chapter 12: Water Environment (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | No significant effects are predicted to occur. | | | | |
| Operation | No significant effects are predicted to occur. | | | | |
| Decommissioning | No significant effects are predicted to occur. | | | | |
| Chapter 13: Geology, Hydrogeology and Land Contamination (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | No significant effects are predicted to occur. | | | | |
| Operation | No significant effects are predicted to occur. | | | | |
| Decommissioning | No significant effects are predicted to occur. | | | | |
| Chapter 14: Landscape and Visual Amenity (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction, Operation and Decommissioning | No significant effects on landscape character are predicted to occur | | | | |
| Construction | Adverse visual amenity effects for residents at Viewpoint 1 (Chapel Lane West, Keadby), Viewpoint 2 (Gate Keepers Residence, Vazon Bridge, Keadby) and | Moderate adverse (significant) | Opportunity for mitigation of visual amenity effects limited due to size and scale of Proposed Development. An integrated design approach that | Moderate adverse (significant) | St/T/D |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/ enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|-------------------|---|--|--|--|---|
| | users of the canal and towpath at viewpoint 2 and users at viewpoint 4 (PRoW KEAD9, KEAD10 north of Keadby) during construction activities. | | <p>considers massing and the disposition of taller structures within the Proposed PCC Site to minimise potential wall effects has the potential to reduce visual impacts of the Proposed Development.</p> <p>A Landscape and Biodiversity Management and Enhancement Plan (LBMEP) (Application Document Ref. 5.10) accompanies the DCO application which presents proposals for planting, although such planting would not reduce the significance</p> | | |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|---|---|--|---|--|---|
| | | | of visual effects at these locations. | | |
| Opening | As construction | Moderate adverse (significant) | None; as construction. | Moderate adverse (significant) | Lt/T/D |
| Operation (with and without Keadby 1 Power Station) | As construction | Moderate adverse (significant) | None; as construction. | Moderate adverse (significant) | Lt/P/D |
| Operation (scenario 2 - with Keadby 1 Power Station structures not present) | Adverse visual amenity effects on residents at viewpoint 6 (Truck Road, Keadby). | Moderate adverse (significant) | Opportunity for mitigation of visual amenity effects limited due to size and scale of Proposed Development. An integrated design approach that considers massing and the disposition of taller structures within the Proposed PCC Site to minimise potential wall | Moderate adverse (significant) | Lt/P/D |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/ enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|-------------------|---|--|--|--|---|
| | | | <p>effects has the potential to reduce visual impacts of the Proposed Development.</p> <p>A Landscape and Biodiversity Management and Enhancement Plan (LBMEP) (Application Document Ref. 5.10) accompanies the DCO application which presents proposals for planting, although such planting would not reduce the significance of visual effects at these locations.</p> | | |

| Development stage | Environmental Effect (following development design and impact avoidance measures) | Classification of effect prior to mitigation | Mitigation/enhancement (if identified) | Classification of residual effect after mitigation | Nature of effect(s) (Lt/ Mt/ St and P/ T and D/ In) |
|---|--|--|--|--|---|
| Decommissioning | As construction | Moderate adverse (significant) | None; as construction. | Moderate adverse (significant) | Lt/P/D |
| Chapter 16: Socio-economics (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | The effect of direct, indirect and induced employment created by the construction phase of the Proposed Development on the Scunthorpe TTWA and associated economy. | Major beneficial (significant) | As no significant adverse effects have been identified, no mitigation is required. | Major beneficial (significant) | St/T/D |
| Operation | No significant effects are predicted to occur. | | | | |
| Decommissioning | No significant effects are predicted to occur. | | | | |
| Chapter 19: Cumulative and Combined Effects (ES Volume I – Application Document Ref. 6.2). | | | | | |
| Construction | No new combined or cumulative significant effects are predicted to occur. | | | | |
| Operation | No new combined or cumulative significant effects are predicted to occur. | | | | |
| Decommissioning | No new combined or cumulative significant effects are predicted to occur. | | | | |

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