The Keadby 3 Low Carbon Gas Power Station Project

PINS Ref: EN010114

The Keadby 3 Low-Carbon Gas Power Station Order

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

Preliminary Environmental Information (PEI) Report Volume II - Appendix 16A: Population and Health Signposting

The Planning Act 2008

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

Applicant: SSE Generation Limited

Date: November 2020

DOCUMENT HISTORY

Document Ref			
Revision	P1.0		
Author	Harriet Thomlinson		
Signed		**Date**	November 2020
Approved By	Susan Evans/ Richard Lowe		
Signed		**Date**	November 2020
Document Owner	AECOM		

GLOSSARY

Abbreviation	Description
ALERP	As low as reasonably practicable principal
CCG	Clinical Commissioning Group
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
EIA	Environmental Impact Assessment
ELV	Emission Limit Value
EMF	Electromagnetic Field
ENA	Energy Networks Association
ES	Environmental Statement
IED	Industrial Emissions Directive
NGET	National Grid Electricity Transmission
HGV	Heavy Goods Vehicle
HSE	Health and Safety Executive
ICNIRP	International Commission on Non-Ionizing Radiation Protection
JSNA	Joint Strategic Needs Assessment
NPPF	National Planning Policy Framework
NPS	National Policy Statement
PEI Report	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PHE	Public Health England
TTWA	Travel to Work Area
WHO	World Health Organisation

CONTENTS

TABLES

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. This assessment is predominantly a summary document, highlighting key aspects of the technical assessments completed and presented elsewhere in the Preliminary Environmental Information (PEI) Report (Volume I) in so far as they relate to human health and in particular, the following chapters:

- **Chapter 8:** Air Quality
- **Chapter 9:** Noise and Vibration;
- **Chapter 10:** Traffic and Transport;
- **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 (PEI Report, Volume I).

1.1.2 No figures are produced specifically for this appendix; rather figures produced for the purposes of other technical chapters of the PEI Report have been referenced. These are provided in PEI Report Volume III.

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 PEI Report (Volume I) including relevant legislation relating to each of these topics, presented in the respective chapters.

Planning Policy Context

National Planning Policy

1.2.4 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 described above and in **Chapter 7:** Legislative Context and Planning Policy (PEI Report Volume I).

1.2.5 The Overarching National Policy Statement (NPS) for Energy (EN-1) (Department of Energy and Climate Change (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."

1.2.6 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."

1.2.7 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."

1.2.8 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."

1.2.9 The NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) (DECC, 2011) 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".

1.2.10 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."

1.2.11 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.

1.2.12 The National Policy Statement for Electricity Networks Infrastructure (EN-5) (DECC, 2011b) 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."

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

1.2.14 The National Planning Policy Framework (NPPF) (MHCLG, 2019), described within other PEI Report technical chapters contains policies that are relevant at a national level and are supported and expanded upon by the 'Planning Practice Guidance', which is regularly updated.

1.2.15 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.

1.2.16 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, PEI Report Volume I), 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."

1.2.17 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

1.2.18 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 Resources 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) (PEI Report Volume I).

1.2.19 North Lincolnshire Council (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

1.2.20 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 inequality, including health inequality within this Appendix.
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 PEI Report. No significant residual effects are anticipated to arise.
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.

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, 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 (PEI Report Volume I) assesses the likely significant influx of workers during the construction stage and associated effects.

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 PEI Report.

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 PEI Report (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 (PEI Report Volume I), for the purposes of this assessment, moderate and major effects are deemed 'significant'.

Electromagnetic Fields

1.3.6 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 (included as **Appendix 1B**, PEI Report Volume II) (see consultation section below). 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.

1.3.7 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 µT
Occupational exposure	10 kV/ m	500 µT

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

1.3.8 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.

Extent of the Study Area

1.3.9 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 Resources and Flood Risk, **Chapter 13**: Geology, Hydrogeology and Contaminated Land, **Chapter 14:** Landscape and Visual Amenity, and **Chapter 16**: Socio-economics are set out in each chapter (see PEI Report Volume I). The study areas are determined by the receptors and impacts specific to each technical discipline and, as such, they vary in size.

1.3.10 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 (PEI Report, Volume I).

1.3.11 To determine the Study Area in respect of EMF, it is necessary to consider where exposure to EMF is likely, considering the Proposed Development. 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.

1.3.12 As described in **Chapter 4**: The Proposed Development, 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).

1.3.13 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 3.2** (PEI Report Volume III).

1.3.14 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.

1.3.15 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 500m from the closest residential receptor, (North Moor Farm), and there will be no new EMF effects associated with its continued use for 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.

1.3.16 The 132kV Northern Powergrid substation is located circa 210m from the closest residential receptors, Hawthorne and Holly House, 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.

1.3.17 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 and that ground-level magnetic fields from underground cables fall much more rapidly with distance than those from a corresponding overhead line. However, magnetic fields can be higher at small distances from the cable and overall, fields reduce to background concentrations at distances of around 20m. 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.

1.3.18 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 Substation and at greater distances from the Electrical Connection Area to National Grid 400 kV substation (shown on **Figure 3.2**, PEI Report Volume III), respectively.

1.3.19 As such, no likely significant effects are anticipated in relation to EMF for any residential receptors. 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. No further assessment in relation to effects of EMF is presented in this appendix.

Sources of Information

1.3.20 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, section 8.3 and 8.4), noise and vibration (**Chapter 9**: Noise and Vibration, section 9.3 and 9.4), traffic and transport (**Chapter 10**: Traffic and Transport, section 10.3 and 10.4), emissions to water (**Chapter 12**: Water Resources and Flood Risk, section 12.3 and 12.4), land quality/ contamination (**Chapter 13**: Geology, Hydrogeology and Land Contamination, section 13.3 and 13.4) and socio-economics (**Chapter 16**: Socio-economics, section 16.3 and 16.4) (all PEI Report Volume I).

1.3.21 Health profiles produced by PHE (Public Health England, 2020) provide baseline data on the health of people within the local area, to compare with average values for all areas of England. 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.

1.3.22 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.

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 status of the population.

2.1.2 The distribution of the existing local population has been described earlier in this PEI Report (see **Chapter 3**: The Site and Surrounding Area, PEI Report Volume I).

Physical Health

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 reported in **Chapter 16**: Socio-economics (168,721). 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 the 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 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 NHS North Lincolnshire Clinical Commissioning Group (CCG) Joint Strategic Needs Assessment (JSNA) Report and are provided in **Table 5**.

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

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]
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
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 (Ministry of Housing, Communities and Local Government, 2019).
2.Aged 16 & over

2.1.13 **Chapter 16**: Socio-economics 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; and
- North Lincolnshire is in the top 25% of most deprived authorities for the 'Education, Skills and Training' domain;
- 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 PEI Report, 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 (PEI Report Volume I).

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:

- people live, work and socialise in healthy places;
- healthy lifestyles are the norm;
- children have the best start in life and thrive;
- 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, 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 (PEI Report Volume I) 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, 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. 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. This will be enforced by the Environment Agency through an Environmental Permit required for the operation of the generating station.

3.2.3 The stack height(s) for the plant will be 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 8A:** Operational Air Quality Appendix (PEI Report Volume II).

3.2.4 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; 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.

3.2.5 As described in **Chapter 9**: Noise and Vibration, 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:

- ensuring that all processes, procedures and measures are in place to minimise noise before works begin and throughout the construction programme;
- all contractors to be made familiar with current legislation and the guidance in BS 5228 (Parts 1 and 2);
- 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;
- use of modern plant, complying with applicable UK noise emission requirements and selection of inherently quiet plant;
- hydraulic techniques for breaking to be used 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, where reasonably practical;
- use of screening locally around significant noise producing plant and activities;
- 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 practical;
- all vehicles used on-site shall incorporate broadband reversing warning devices as opposed to the typical tonal reversing alarms to minimise noise disturbance where reasonably practicable;
- appropriate routing of construction traffic on public roads and along access tracks;
- consultation with North Lincolnshire Council and notification to local residents to advise of potential noisy works that are due to take place, particularly in relation to where these are outside of core working hours; 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 noise 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 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 Best Available Techniques (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.

3.2.11 As set out in **Chapter 10**: Traffic and Transport, 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.

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 will be provided with the DCO Application Document);
- 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); and
- the contractor would be required to prepare a CTMP to identify a number of measures to control the routing and impact that HGV would have on the local road network during construction (a Framework CTMP would be provided with the Application).

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 HGV.

3.2.14 **Chapter 12**: Water Resources and Flood Risk and specifically **Appendix 12A**: Flood Risk Assessment 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, construction works should not take place during times of high flow when there is a Flood Alert.
- A CEMP would incorporate measures aimed at preventing an increase in flood risk during construction works, as far as reasonably practicable. This would include:
  - topsoil and other construction materials would be stored outside of the 1 in 100-year (1% AEP) floodplain extent (Flood Zone 3), where reasonably practicable;
  - 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 would be notified of any potential flood occurring by use of the Flood line Warnings Direct service (see below);
  - the Contractor would be required to produce a Method statement outlining appropriate temporary dewatering/ pumping measures to be employed in the event of a breach; and
  - the Contractor would be required to produce a Flood Risk Management Action Plan which would provide details of the response to flooding in the event of a breach.
- potentially hazardous materials, construction equipment/ vehicles and welfare facilities would be located at locations that are outside of Flood Zones 2 and 3, or on raised areas;
- provision will be made for the safe access and egress from all working areas of the construction site in case of flooding;

3.2.16 During operation:

- implementation of a Flood Emergency Response Plan to be developed within the existing operating system of the Keadby 1 and Keadby 2 Power Stations' emergency response and subsequent management system procedures; to 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;
- immediate evacuation upon receipt of a flood warning (unless it is unsafe[1] to do so), in which case a place of safe refuge will be provided and sought on site.

3.2.17 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). As such, it is proposed that the vulnerable power infrastructure will be raised above the predicted water levels on site in a 0.5% AEP +35yr climate event and the predicted level from a breach (subject to further evaluation).

3.2.18 Wholesale land raising of the Proposed Development Site is not considered necessary to manage the risk and would require large scale import of material which is not sustainable. Agreement of the levels to which the power infrastructure will be raised will be sought with the Environment Agency as the EIA and consenting process progresses. It is envisaged that subject to final design, raising of critical infrastructure is likely to include:

- electrical equipment, switchboards and control panels,
- transformers,
- main boiler feed pumps,
- condensate extraction pumps,
- primary air fan and induced draught fan.

3.2.19 Further details are included within the FRA presented as **Appendix 12A** (PEI Report Volume II).

3.2.20 As described in **Chapter 13**: Geology, Hydrogeology and Land Contamination, 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

[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.

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 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 as an appendix, to deal with any removal of materials off-site.

3.2.23 Given the historical land use within the West Burton Power Station site, there is a potential for contamination to be encountered locally within excavations. The contractor(s) would be required to implement pollution control measures to deal with any land contamination encountered during the construction works. These measures would include, as a minimum, the following:

- all workers would be required to wear PPE as applicable;
- should any potentially contaminated ground, including isolated 'hotspots' of contamination and/or potential deposits of asbestos containing materials (ACM), be encountered during construction, the contractor(s) would be required to investigate the area and then assess whether there is a need for containment or disposal of the material. The contractor(s) would also be required to assess whether any additional health and safety measures are required. Any such investigations would be required to be undertaken in consultation with the Environment Agency and other appropriate consultees. To further minimise the risks of contaminants being transferred and contaminating other soils or water, construction workers would be briefed as to the possibility of the presence of such materials;
- in the event that contamination is identified during construction works, appropriate remediation measures would be taken to protect construction workers, future site users, water resources, structures and services; and
- the contractor(s) would implement, as required, a dust suppression/ management system in order to control the potential risk from airborne contamination migrating off-site to adjacent sites, specifically the adjacent agricultural land, surrounding villages and the River Trent.
- foundations and services would be designed and constructed to prevent the creation of pathways for the migration of contaminants and be constructed of materials that are suitable for the ground conditions and designed use;
- piling options will be fully defined on conclusion of scheme specific ground investigation at detailed design stage with final layout for the Proposed Development.

3.2.24 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.

3.2.25 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 Decommissioning Environmental Management Plan (DEMP) would be prepared to identify required measures to prevent pollution during this phase of the Proposed Development, based on the detailed decommissioning plan.

3.2.26 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.

3.2.27 **Chapter 14**: Landscape and Visual Amenity (PEI Volume I) 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 North Lincolnshire Council at the detailed design stage, secured through a Requirement of the draft DCO, 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 a Lighting Strategy to be submitted to accompany the DCO Application; 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 will be prepared and submitted as part of the Application for development consent describing these proposals.

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 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 PEI Report for the construction, operation and decommissioning phases of the Proposed Development. The decommissioning phase is not expected to commence until some point after 2050 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 may affect air quality with consequential health effects (see **Chapter 8:** Air Quality, PEI Report Volume I),
  - the effects of 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 that will be 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 the ELV will be met for the operational plant as required 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, except for N-amines, which have only been subject to a screening assessment at this stage. Further detailed modelling will be undertaken for the final ES;
- noise emissions, which in the absence of mitigation, can sometimes result in adverse effects on nearby sensitive receptors. Effects reported in **Chapter 9:** Noise and Vibration, PEI Report Volume I) confirm that:
  - construction noise effects at all residential NSR during construction of the Main Site within core 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. If not properly managed, construction effects at certain residential receptors may be significant adverse for certain noisier activities, particularly at night-time should such works be required. However, through appropriate scheduling of construction activities, and restrictions on those activities taking place outside core working hours so they do not exceed the relevant limits, significant adverse effects can be avoided, and effects are therefore be considered as having a minor adverse (not significant) effect;

  - effects at local residential NSR due to construction road traffic noise are predicted to be negligible (not significant);
  - during operation, in the absence of mitigation, effects at NSR are anticipated to be not significant at a number of properties but could be significant at others. Potential design mitigation options are being considered to reduce noise levels at a number of receptors towards the desired level (no greater than +5 dB when the assessment rating level is compared to the background sound level), such that residual effects are considered not significant;

- increase in traffic, which could lead to: severance of communities, reduction in pedestrian amenity, increase in fear and intimidation of pedestrians, and reduction in highway safety; potentially increasing the local road injuries and deaths figure outlined in **Table 4**. Significant effects are not predicted based on the volume of traffic required for the construction of the Proposed Development (see **Chapter 10:** Traffic and Transport, PEI Report Volume I) and through the use of appropriate travel plans for construction workers and HGVs. As stated in **Chapter 10**, the traffic and transport effects from construction, operation and decommissioning are predicted to be negligible adverse and there will be no significant effects on any of the road sections assessed;
- emissions to water have the potential to result in adverse effects on local water quality with potential consequential adverse health effects, (see **Chapter 12:** Water Resources and Flood Risk, PEI Report Volume I) unless embedded design measures prevent contamination of water resources. As stated in **Chapter 12:** Water Resources and Flood Risk, PEI Report Volume I) 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 has the potential, in the absence of mitigation, to result in human contact and result in adverse health effects for construction workers, (see **Chapter 13:** Geology, Hydrogeology and Land Contamination, PEI Report Volume I). As stated in **Chapter 13:** Geology, Hydrogeology and Land Contamination, the potential geological, hydrogeological and contamination related impacts associated with the Proposed Development have the potential to be adverse 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, PEI Report Volume I), 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, Keadby) and Viewpoint 4 (PRoW KEAD9 and KEAD10), north of Keadby would experience a medium magnitude of impact 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; and

- the construction and operation of a development can result in effects on the economy (see **Chapter 16:** Socio-economics, PEI Report Volume I) 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.
  - The direct expenditure involved in the construction phase would lead to increased output generated in the local (Scunthorpe Travel to work Area (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.
  - 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 (non-significant).

5.0 MITIGATION AND ENHANCEMENT MEASURES

5.1.1 Mitigation measures that would be relevant to human health are set out in the relevant technical chapters of this PEI Report. In summary, where significant effects have been identified, no additional mitigation measures are required in order to further reduce adverse effects. Where additional mitigation measures related to human health effects require consideration, these are outlined in the relevant technical chapters. As further assessment of proposed mitigation measures will take place prior to finalisation of the ES, these are not repeated in this section.

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 PEI Report chapters (Volume I).

7.0 RESIDUAL EFFECTS AND CONCLUSIONS

7.1 Overview

7.1.1 Health related effects are described in Chapters **8**: Air Quality, **9**: Noise and Vibration, **10**: Traffic and Transportation, **12**: Water Resources and Flood Risk, **13**: Geology, Hydrogeology and Land Contamination, **14**: Landscape and Visual Amenity, and **16**: Socio-economics (PEI Report, Volume I).

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					
Operation	Maximum N-amines Annual mean and Worst-case Receptor N-amine Annual Mean (human health impacts)	Whilst the majority of pollutant species released result in negligible adverse impacts at human health receptors, a significant adverse effect from amine degradation products (N-amines) is predicted. Up to moderate adverse	At this stage only a conservative screening assessment of these species has been carried out, and further evaluation is ongoing to refine the assumptions used and to prepare a more detailed assessment including identify whether additional mitigation is required	Up to moderate adverse on the basis of screening – re-evaluation of the classification of effect following detailed modelling.	Mt/T/D
Chapter 9: Noise and Vibration					
Construction	If construction works take place continuously over night-time periods, assuming the same intensity of working as for the daytime, there would	Moderate/ Major adverse (significant) during night-time periods.	Construction noise mitigation will be controlled by the Construction Environmental Management Plan	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)
	be the potential for adverse noise effects on some noise sensitive receptors (NSR). during construction on the Main Site and Electrical Connection to 132kv Substation Option.		(CEMP) which will be secured through a Requirement of the draft DCO. A Framework CEMP will be included within the DCO Application.		
Construction	Potential for adverse noise effects on some noise sensitive receptors (NSR) during construction works on the Water Connection Corridors.	Up to Major adverse (daytime) at single NSR4. Up to Moderate/ Major adverse (significant) (night-time).	Construction works occurring at night-time would be planned, managed and mitigated appropriately so as not to exceed the Significant Observed Adverse Effect Level (SOAEL) threshold values or relevant noise limit to be agreed. It is proposed that this would be secured by a Requirement in the draft DCO.	Up to Minor adverse (not significant), on the basis that BS 5228 and guidance on Best Practice Measures (section 11.5 of **Chapter 9**: Noise and Vibration) is applied.	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)
Operation	Based on the worst-case assessment, the impact magnitude ranges from very low to medium/ high at the ten NSR locations.	Effects between negligible/ minor adverse (not significant) to moderate/ major adverse (significant) could occur, in the absence of mitigation at NSR.	Reduction of sound power levels (SWL)/breakout noise from key plant/buildings required. Potential mitigation measures considered will focus on reducing noise at source from the CCP compressor, CCP absorber and turbine intake. Further assessment of indicative mitigated scenarios in the final ES is proposed to demonstrate the sound levels achieve the daytime and night-time LOAEL criterion of rating level no greater than	No greater than minor adverse (not significant) effect daytime and night-time, assuming that the threshold BS 4142 criterion of no greater than +5 dB is achieved at all NSR with the final site layout and technology at detailed design.	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)
			+5 dB above the defined representative background sound level at each NSR. It is proposed that operational noise would be secured by a Requirement in the draft DCO. During operation, use of Best Available Techniques (BAT) for the control of noise for the Environmental Permit		
Chapter 10: Traffic and Transport – no significant residual effects					
Chapter 12: Water Environment– no significant residual effects					
Chapter 14: Landscape and Visual Amenity					
Construction	Adverse visual amenity effects for residents at Viewpoint 1 (Chapel Lane West, Keadby), Viewpoint	Moderate adverse (significant)	No potential mitigation due to scale of structures. The design of the	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)
	2 (Gate Keepers Residence, Keadby) and Viewpoint 3 (PRoW KEAD9 and KEAD10), during construction activities.		Project will aim to minimise adverse effects through optimised design and layout as well as appropriate use of materials and finishes. A Landscape and Biodiversity Management and Enhancement Plan (LBMEP) will be prepared to accompany the DCO application which will present proposals for planting, although such planting would not reduce visual effects at these locations.		
Opening	As construction	Moderate adverse (significant)	None; as construction.	Moderate adverse (significant)	Lt/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)
Opening	As construction	Moderate adverse (significant)	None; as construction.	Moderate adverse (significant)	Lt/T/D
Operation	As construction	Moderate adverse (significant)	None; as construction.	Moderate adverse (significant)	Lt/P/D
Decommissioning	As construction	Moderate adverse (significant)	None; as construction.	Moderate adverse (significant)	Lt/P/D
Chapter 16: Socio-economics					
Construction	The effect of direct, indirect and induced employment created by the construction phase of the Proposed Development on the Scunthorpe Travel to Work Area (TTWA) and associated economy.	Major beneficial short-term significant) effect	Opportunities to enhance this benefit will be explored further as the EIA progresses, as informed by the ongoing refinement of proposals and the outcome of consultation.	Major beneficial short-term significant) effect	St/T/D

8.0 REFERENCES

DECC Department of Energy and Climate Change (2011a) *Overarching National Policy Statement for Energy* (EN-1).

DECC Department of Energy and Climate Change (2011b) *National Policy Statement for Electricity Networks* (EN-5).

DECC Department of energy and Climate Change (2012) *Power Lines: Demonstrating compliance with EMF public exposure guidelines – A Voluntary Code of Practice.*

EMFs.info (2020) *A guide to the debate on electric and magnetic fields and health*. Available from: http://www.emfs.info/

Energy Networks Association (2012). Electric and magnetic fields. Available from: https://www.nationalgrid.com/sites/default/files/documents/13791-Electric%20and%20Magnetic%20Fields%20-%20The%20facts.pdf

HM Government (2016) The Control of Electromagnetic Fields at Work Regulations 2016. Available from:

http://www.legislation.gov.uk/uksi/2016/588/pdfs/uksi_20160588_en.pdf

International Commission on Non-Ionising Radiation Protection (19981988) *Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)*.

MHCLG Ministry of Housing, Communities and Local Government (2019) *National Planning Policy Framework* ('NPPF').

MHCLG Ministry of Housing, Communities & Local Government (2019*). The English Indices of Deprivation 2019* (IoD2019). Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/835115/IoD2019_Statistical_Release.pdf

NHS North Lincolnshire Clinical Commissioning Group (2016) *North Lincolnshire Strategic Assessment 2016*. Available from: https://s.northlincs.gov.uk/sa/documents

NHS North Lincolnshire Clinical Commissioning Group (2018) *Joint Strategic Needs Assessment 2018.* Available from: https://s.northlincs.gov.uk/sa/resource/631

North Lincolnshire Clinical Commissioning Group (2019) *North Lincolnshire CCG Strategy 2019-2024*. Available from: https://northlincolnshireccg.nhs.uk/who-we-are/our-strategic-aims/

North Lincolnshire Council (2016) *Planning for Health and Wellbeing Supplementary Planning Document 2016*. Available from: http://www.planning.northlincs.gov.uk/PlanningReports/SPD/Health/Planning_for_Health_and_Wellbeing_2016.pdf

Public Health England (2018). *Mental Health and Wellbeing JSNA*. Available from: https://fingertips.phe.org.uk/mh-jsna#page/0/gid/1938132922/pat/6/par/E12000001/ati/102/are/E06000002

Public Health England (2019). *Local Authority Health Profiles*. Available from: https://fingertips.phe.org.uk/profile/health-profiles

The European Parliament and the Council of the European Union (2010). *Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (Recast)*. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010L0075&from=EN

The King's Fund (2013). *Time to Think Differently*. Available from: https://www.kingsfund.org.uk/projects/time-think-differently

The Planning Inspectorate (PINS) (2018). *Using the Rochdale Envelope*. Available from: https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf

UK Government (2010). *Equalities Act 2010*. Available from: http://www.legislation.gov.uk/ukpga/2010/15/pdfs/ukpga_20100015_en.pdf

UK Statutory Instruments, *The Control of Electromagnetic Fields at Work Regulations* (2016)

World Health Organisation (2020). *Constitution*. Available from: https://www.who.int/about/who-we-are/constitution